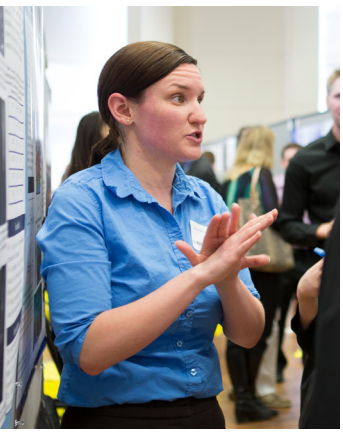

GW RESEARCH DAYS

TUESDAY, APRIL 1, 2014

THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

GW RESEARCH DAYS 2014

ANNUAL RESEARCH DAY

TUESDAY, APRIL 1, 2014

MARVIN CENTER

800 21ST STREET, NW, 3RD FLOOR

8:30–10:00 a.m.	**Registration and Breakfast** *(Grand and Continental Ballrooms)*
8:30–10:00 a.m.	**Posters Setup** *(Grand and Continental Ballrooms)*
9:00 a.m.–3:00 p.m	**Research Days Vendor Showcase** *(Grand and Continental Ballrooms)* *http://research.gwu.edu/research-days-vendor-showcase-2014*
10:00 a.m.–1:00 p.m.	**Poster Presentations and Judging** *(Grand and Continental Ballrooms)*
1:00–2:30 p.m.	**Poster Removal** *(Grand and Continental Ballrooms)*
1:00–2:30 p.m.	**Go Team! Writing and Publishing in Collaborative Science** *(Marvin Center 405)*
2:00–3:00 p.m.	**DC I-Corps Information Session** *(Marvin Center 301)*

RESEARCH DAYS 2014 WEBSITE

ONLINE - *HTTP://RESEARCH.GWU.EDU/RESEARCH-DAYS-2014*

6:00–6:15 p.m.	**Award Ceremony**

Dr. Steven Lerman, PhD
Provost and Executive Vice President for Academic Affairs

Dr. Leo Chalupa, PhD
Vice President for Research

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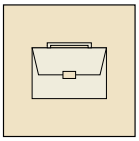
BUSINESS



SCHOOL OF BUSINESS

Small- To Medium-Size Biotech Firms' Marketing Efforts During the Fuzzy Front End of Innovation

The purpose of this study is to understand the extent to which the type and extent of marketing efforts help with the continuation of early-stage innovations. The locus between the phases of Research and Development and New Product Development is defined as the Fuzzy Front End of Innovation. Frequently called the "Valley of Death," this early-stage of innovation is typified by high risks and scarcity of project resources. The challenge for a firm as it develops an early-stage innovation is securing adequate financial, human, and physical project resources. For this study, early-stage innovations are represented by the U.S. National Institutes of Health licenses accorded to small- to medium-size firms. The study develops firm profiles that describe combinations of marketing efforts that enable innovation continuation during the Fuzzy Front End of Innovation. Profiles are evident in terms of marketing variables, firm attributes, and project resources. These profiles vary for type of firm and also by the stage in the firm's life cycle. The contributions of this study are to: 1.) Develop combinations of variables and profiles for describing predicting early-stage innovation continuation, 2.) Provide pragmatic information to potential stakeholders about how to identify and foster early-stage innovations, and 3.) Help small- to medium-size firms understand how to position and promote themselves in order to obtain resources and advance early-stage innovations.

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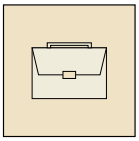
BUSINESS



SCHOOL OF BUSINESS

Evolution or Revolution? The Price Revolution of the Sixteenth Century

BACKGROUND

Beginning around 1500 AD, prices in Western Europe began to rise. By 1650, prices were 6 to 10 times higher. This has been called the "price revolution of the sixteenth century". Initially, the dominant form of money was silver coins. Commodity money is not usually associated with sustained inflation. Why did this happen?

BY 1500 AD, Banking in Europe had been dominated by Italians for centuries.After 1500, Germans and Northwest Europeans came to be at least as prominent. Why did Italian dominance give way?

These phenomena have not been linked in the literature. The price revolution and the rise of non-Italians have been extensively studied, but without producing a compelling story.

OBJECTIVE

We will reexamine these phenomena using the conceptual tools of modern finance and historical research.

METHODS

Begin with the literature. To our thinking, the puzzles remain unsolved. Recall the quantity equation from economics. Briefly: MV = PQ, where "M" = money, "V" = velocity, "P" = prices, and "Q" = output of goods and services. Past researchers have focused on changing money supply. Our hypothesis is that there were also important changes in the nature of money.

RESULTS

Initially we thought the change was in the nature of banking - more secure and therefore increased deposits. Now we suspect that the change was in how deposits are used - if deposits become more secure even as coins are subject to inflation and devaluation, depositors will prefer to transfer deposits rather than coins when transacting. Here, in Northern Europe, a medieval innovation, "Bills of Exchange", is increasingly made to support wholesale trade more generally. The increased sophistication of bills of exchange and resulting increasing velocity could explain both the price revolution, and the dominance of Northern Europeans.

CONCLUSION

Changes in European Banking were gradual, but over time, culminated in revolutionary changes in finance, and the economy.

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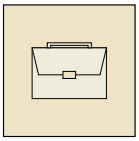
BUSINESS



SCHOOL OF BUSINESS

Chinese Financial History: Where were the Banks?

BACKGROUND

Chinese financial history differs from western financial history. On the one hand, Chinese monetary doctrine may have been more advanced before the modern era. Chinese governments often took responsibility for regulating the means of trade, and could issue coin fiat money 2000 years ago, and paper money almost 1000 years ago, whereas many European governments could not be trusted to not debase their coins, hence the reliance on commodity money (silver, gold).

By the 17th century, the roles were reversed. After a series of inflationary episodes, the Chinese distrusted fiat money, and silver had become the principal form of money. Meanwhile, western financial institutions developed to where consumers and merchants could rely less on commodity money, and more on bank money. Banks would eventually facilitate sustained economic growth. Bank development was clearly important.

So where were the Chinese banks? Some historians have suggested that China did not have banks before the late 18th century, when western models were imported. To our ears, that's incredible. It is well documented that early Chinese technology was centuries more advanced than western technology across a broad range of industries. Why not banks?

OBJECTIVE

We will reexamine Chinese history, using the conceptual tools of modern finance and historical research, in search of evidence of bank development, or of why it did not happen.

METHODS

We will scan the historical literature to look for more evidence of financial activity or intermediation. We will closely examine the circumstances to see whether and why they did or did not evolve into something that looks like a bank.

RESULTS

We've already found some reports of financial activity, and financial intermediation. Why didn't the entities involved become banks?
To be determined.

CONCLUSION

Either bank development in China was restrained by unknown circumstances, or overlooked by previous general historians. To be determined.

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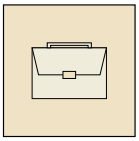

SCHOOL OF BUSINESS

Understanding the Challenges Facing Mary Kay® Cosmetics

Our report explores the challenges Mary Kay® cosmetics faces in attracting female millennial consumers aged 18-25 and encouraging them to become Independent Beauty Consultant (IBCs). We study the beauty industry, competitor brands, young millennials, Mary Kay®'s direct selling model, and current trends. Using online and in-person focus groups, dozens of in-depth interviews, and a nationwide survey, we are able to develop a national, fully-integrated marketing campaign to implement from February 2015 to February 2016. Our objective is to use our extensive secondary and primary research to build a strategic $10 million proposal that will leverage the Mary Kay® brand, history, and values. To date, we have completed 3 focus groups, 25 in-depth interviews, and extensively analyzed hundreds of articles and research studies. We have identified the specific target markets that will lead to the highest return for the company and we will specify how to reach them most effectively through traditional, digital, and social media tactics. Our end goal is to increase awareness, positive perception, consideration for product purchase, and most importantly sales of Mary Kay® products.

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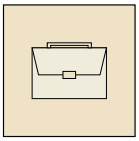

SCHOOL OF BUSINESS

Translating Global Corporate Social Responsibility: Pursuing a unified conception amongst political, economic and ethical inequalities

The paper considers the current CSR activities in the U.S. and considers how applicable they are to adoption in China, and specifically, Chinese state-owned enterprises. First, I will make a survey of current CSR practices and identify the rationale behind the expectation that they will have a positive impact on society and stakeholders. As part of the assessment, I consider what roles and expectations for business are implicit (and explicit) – what I call business social norms. With that as background, I compare the social norms for business associated with CSR with the business social norms in China and other Asia Pacific countries. Furthermore I investigate, from a historical perspective, how these norms arose, and strategically, how they impact the current situation. An analysis is made on the compatibility of the social norms that inform CSR in the U.S. with traditional Chinese culture and business social norms. The assessment will help to inform the proposition that CSR practices (as undertaken in the U.S.) might be adopted by Chinese firms.

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A Comprehensive Case Study of a Gay-Straight Alliance: Fostering Safe, Supportive Schools for LGBT Students

This dissertation studied a gay-straight alliance (GSA) in a midwestern, suburban high school, including its purpose, participants, and approaches to supporting students and engaging its larger community. This study examined not only the GSA's implementation, but also its larger school and district context including the experiences of and supports for lesbian, gay, bisexual, and transgender (LGBT) students in the school. Furthermore, to understand how the GSA is similar and different from other student clubs intended to create a safe, supportive school environment for potentially disenfranchised students, the study included a focus on two such comparison clubs. The primary research objective was to contribute to the field's understanding of GSAs through a detailed description of how a GSA has been implemented in its setting, given its school and district characteristics and influences. Moreover, with an understanding that GSAs and other student clubs exist within and interact with a larger school setting, the study examined the GSA's high school and district policies along with practices to create a safe, supportive learning environment. This study included 36 in-depth interviews including six with GSA members, multiple school and GSA meeting observations, 69 teacher surveys, 31 student surveys, and documents. This study examined why, when, and how the GSA was implemented. Key informants identified various GSA purposes, but commonly pointed to one: providing a safe, welcoming space for all ideas and people. Factors affecting the GSA's implementation at the high school included faculty and administrative support, its visibility in the school, student leadership, member recruitment and participation, and the quality of meetings. Second, the study examined whether the GSA affected the experiences and perception of safety and support in the school, and if so, how. The GSA's greatest benefits to students were in the areas of emotional safety, support, and empowerment. Finally, the study synthesized school and district policies/practices intended to create safe, supportive learning environments for students. The GSA is in a school with numerous practices intended to foster a safe, supportive learning environment. Significantly, this study found that a GSA was still an important resource despite being in a physically safe school with significant support from adults and peers. The GSA helped to address a key need: providing a space for all students to express their true identity and experience emotional support from their peers. This was especially the case for students worried about or experiencing negative family reactions to their LGBT identity.

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Positive Factors in Decision-Making: The Need for Developing a Teacher-Led Model with an Emphasis on the African-American Male

Implementing behaviors, performance, and social relationships are all challenges faced by teachers today. Although uncommon in its identity, the real issue stems from the same underlying problem in some students; poor decision-making skills. Teachers are exposed daily to the symptoms of inadequate decision-making skills, yet they may diagnose the symptoms as the cause. Unfortunately, there is an exorbitant amount of research identifying the problems with remedies; however, these elaborate responses have not reduced nor eliminated the obvious disparity in behaviors for certain demographics; namely African American males. This article examines literature that offers results for these concerns from all perspectives involved with students: administrators, parents, and teachers. Learning how to properly make decisions come from first knowing how to do so for all areas in one's life. Adequate decision-making skills mean selecting the most positive choice from among a list of options; to yield the most positive, long-term outcome possible. The literature examined in this review and the data collected and analyzed will serve as a catalyst for establishing the need for an innovative, teacher-led approach for a decision-making model to impede the disparity gap between African-American males and their counterparts.

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Closing the Gap Between What Scientists Know and What Policymakers Do: A Neuroscience-Based Framework for the Education of Vulnerable Children

Recent advances in brain research have resulted in a large body of knowledge about the processes underlying human learning, especially during early childhood. The fundamental—and largely universal—mechanisms of human brain development may offer insight for the field of education, whether in research, policy, or practice. However, education policymakers have failed to act on the insight of neuroscientists. Misappropriation of neuroscience is also widespread, and the pace of development of so-called "brain-based" interventions has proceeded far more quickly than has the actual ability of the fields of neuroscience and education to communicate. The aim of this study is to determine which applications of brain development research are useful to the education, and how the fields of neuroscience and education may coalesce to address the many challenges that inhibit cognitive development and lead to poor educational outcomes in vulnerable children. A systematic review of relevant studies from a variety of sources was conducted with the purpose of determining if and how the fundamentally agreed-upon concepts of brain development should apply to educational interventions. The study found that the most popular existing applications of neuroscience to educational interventions are based on a limited knowledge of neuroscience, or on widespread myths about the mechanisms of the brain, and have little to no long-term impact on educational outcomes. The study also found that attempts to justify legitimate, efficacious interventions on the basis of neuroscience gain little traction in policy and practice due to their perceived high cost of implementation and limited short-term impact. The findings of the research indicate that the highest impact neuroscience-based interventions for improving cognitive development in vulnerable children are those that occur during prenatal and early childhood periods, and provide protective, direct support not only for children, but also for their families.

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Assessing the impact of cultural beliefs of medical students on their experience with cadaver dissection in gross anatomy lab

BACKGROUND

Cadaveric dissection has been a well established teaching method for medical students in gross anatomy courses. Studies have been done to look at various aspects of this experience; however, no study has addressed the question of how cultural identity and beliefs impact the emotional response to cadaver dissection.

OBJECTIVE

The purpose of this study is to examine the role of cultural self-identification, beliefs, on medical students' cadaveric dissection experience in gross anatomy laboratory.

METHODS

Eighty first-year medical students (mean age ± SD 24.1 ± 2.6 years) enrolled in the gross anatomy course at the George Washington University School of Medicine and Health Sciences were recruited over two academic years. An online subjective survey was used and consent was obtained via email. The survey included three sections to assess the dissection experience, level of identification with a cultural belief and its importance to the participant and in gross anatomy lab, and the views of the learning outcomes of the experience. Likert assessment scales were used for all questions and students were able to expand on some questions via free text responses. Results: Our statistical analysis shows that strong cultural identity correlates with high impact of cultural views on the cadaver lab experience, strong religious views, and a higher positive dissection experience. Qualitatively, non-cultural students expressed emotionally enriching experiences that do not rely on cultural identity but on professional development. No statistically significant differences were found in the various learning outcomes between the groups. All students reported more positive than negative attitudes towards dissection but males had both more positive and negative experiences compared to females.

CONCLUSIONS

This study is the first to reveal that cultural identification may not account for significant learning disparities in gross anatomy lab. Self-identified cultural students and males tend to have a more positive experience in the gross anatomy laboratory. Medical educators can use these results for curriculum preparation prior to the dissection experience.

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Self-similar field dependent curves for a Heusler alloy

Heusler alloys display first-order ferri-to-ferromagnetic and second-order ferro-to-paramagnetic transitions. This paper presents a new temperature scaling methodology which exhibits a self-similar field dependence $(\partial M/\partial T)_H$ curve. This methodology, based on temperature, extends Franco's transformation [1] by: (i) adding ferri-to-ferromagnetic transition, (ii) performing the scaling methodology on the $(\partial M/\partial T)_H$ curve instead of $\Delta S_M(T,H)$ curve, and (iii) redefining the arbitrary temperature references used by Franco, by employing constant temperatures which can be determined from $(\partial^2 M/\partial T^2)_H$ and $(\partial M/\partial T)_H$ curves. Using this new computational method, the composition of ferrimagnetic, ferromagnetic and paramagnetic clusters for Heusler alloys exhibiting the first-order and second-order phase transitions can be calculated. The self-similarity phenomenon within the material's $(\partial M/\partial T)_H$ curve then aids in formulating compositions[2].

By applying the self-similarity model, we evaluated the effectiveness of this new analytical approach, the cluster composition functions for $Ni_{51}Mn_{33.4}In_{15.6}$, which exhibits first-order ferri-to-ferromagnetic and second order ferro-to-paramagnetic transitions. Self-similarity, which magnetization vs. temperature at each applied field exhibits, is defined in mathematics as an object that is exactly or approximately similar to a part of itself. By rescaling the modified Franco's transformation, all the $(\partial M/\partial T)_H$ curves collapsed on to the single self-similar curve with a low index of dispersion. Once collapsed, the curve is asymmetric and negatively skewed due to the intrinsic transition differences in the mixed- state region. The mixed-state region of the self-similar curve is distinctly bell-shaped as shown in the figure. The self-similar curves are optimally modelled using the maximum entropy method.

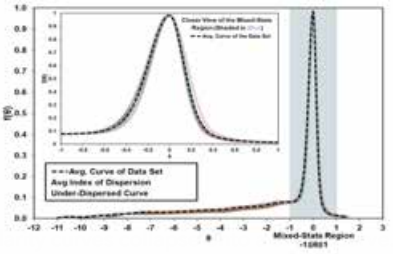

Figure 1: Self-sim The inset shows a closer view of the mixed-state region.

[1] V. Franco Applied Physics letters 89, 222512(2006)

[2] http://dx.doi.org/10.1016/j.physb.2011.09.044

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Capability-based Scalable Security Monitoring and Enforcing System in Smartphones

Currently, when users want to install an Android app, they need to accept all permissions requested by the app, or they have to cancel it. This scheme is inflexible and vulnerable to various kinds of attacks, such as information leakage and remote control. Massive researches intended to solve that, using methods like information flow tracking, and anomaly detection. Most of them either solve only single aspect of the problems, or cause large overhead. As Android flows into more and more aspects of people's daily lives, it is unprecedentedly important to enable it with the ability to monitor behaviors of the system, and enforce security rules when necessary. We started with analysis of a large collection of Android malware, and then unified 3 classes of capabilities – Conditional Access, Camouflage, and Elastic Endurance into the security monitoring and enforcing system. Next, as the system goes complex, defense decisions become harder to make. To alleviate users from tedious manual configurations, we designed a capability recommendation algorithm to automatically assign capabilities rules to application and entity pairs. It enables a cost-aware capability optimization, which gets the most appropriate decisions that is amicable to performance overhead. Finally, we successfully implemented our security system, by modifying the Android open source code. We demonstrated the feasibility of the system by showing that the CPU and memory overhead of our system is very low.

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Vision-based Spacecraft Attitude Formation Control

RESEARCH QUESTION

Relative attitude determination is a key component for multi-spacecraft missions. This research investigates a novel scheme based on vision-based sensors to control the relative attitude formation among multiple spacecraft accurately while the spacecraft are moving and deploy their missions. Research Method: Two pointing directions, referring to line-of-sight measurements, from a spacecraft to two distinct objects can determine the full attitude of singlespacecraft uniquely as long as they are not parallel to each other. Similarly, line-of-sight measurements among multiple spacecraft in formation can be applied to obtain the relative attitudes completely. A nonlinear controller is developed to track a given desired formation command. Since the relative attitude is directly expressed in terms of line-of-sight measurements, thereby avoiding needs for expensive inertial measurement units. Further, the controller is constructed in a coordinate-free fashion on the nonlinear configuration manifold directly.

RESEARCH RESULTS

Vision-based spacecraft formation control scheme is developed for an arbitrary number of spacecraft, and stability of the proposed control scheme is analyzed based on rigorous mathematical analysis according to modern geometric nonlinear controls. By using the geometric propertyof the configuration manifold, the controller proposed in this research exhibits almost global asymptotical stability of the desired time-varying tracking command with a daisy-chaining network. A constellation of 7 spacecraft is selected to be the simulation model by using MATLAB.

RESEARCH CONCLUSIONS

The presented relative attitude control system is unique from the aspect that control inputs are directly expressed in terms of line-of-sight measurements such that determining the full absolute attitude of spacecraft in formation is not required. The proposed control law can be applied to various missions since there are no limitations on the number of spacecraft and the control scheme allow the spacecraft to move around as long as the line-of-sights can be detected and measured.

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Detecting Water Quality: A Comprehensive Study on pH, Total Dissolved Solids (TDS), Electrical Conductivity (EC), and Salinity

RESEARCH QUESTION

Whether provided by tap, distillation, filtration, or bottled, is the water truly safe to drink?

MOTIVATION

The lack of available clean water contributes to numerous waterborne diseases, causing the death of millions of people annually. Indeed, the U.S. has water treatment plants; however, that does not eliminate the potential problem of contaminated water. Therefore, my research has been divided into three phases: First, measuring water from various different sources; second, testing filtration and distillation methods; and third, building a portable prototype that can transmit measurements wirelessly. This research will help analyze how effective these water treatment methods are and set the foundation for a detection and prevention system that can notify and transmit data to the Environmental Protection Agency (EPA) and the National Science Foundation (NSF) of unsafe drinking water levels in certain regions.

RESEARCH METHOD

The first approach is gathering data for pH, electrical conductivity, total dissolved solids, and salinity of tap water, a number of water brands, and some samples of varying salinities. This is done with an Arduino UNO microcontroller, some miniature circuits, and probes for the following measurements. Next, two water treatment methods approved by the EPA will be tested and its data will be compared to that from phase 1, using a BRITA filter and a pot of boiling water at various saline levels. Lastly, a prototype circuit or device will be constructed to transmit the measurement of electrical conductivity wirelessly. A XBee module will be utilized to transmit data serially and an intricate circuit will be designed in that it will convert AC to DC voltage, which will either interface with an Arduino microcontroller or some other interface.

RESULTS

With regards to the first phase, a few general trends stand out. Some purified water brands have a pH level that appears to be outside the range of safe drinking water, but this lowered pH level is a small tradeoff for a “purer” taste, as shown by the 0 TDS level. Other water brands yield a relatively high TDS value due to their origins from mountain spring sources.

CONCLUSION

From the first phase of gathering data from a wide range of water sources, the results are promising; however, additional tests are required to evaluate if these results are valid. The research is still ongoing since parts of phase 2 and all of phase 3 has yet to be completed at this point.

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Joint Latency and Cost Optimization for Erasure-coded Data Center Storage

Modern distributed storage systems offer large capacity to satisfy the exponentially increasing need of storage space. They often use erasure codes to protect against disk and node failures to increase reliability, while trying to meet the latency requirements of the applications and clients. This paper provides a quantification of the service delay in such erasure-coded storage consisting of both queuing delay and network delay. It not only improves known service delay bounds, but also enables a novel problem of joint latency and storage cost minimization over three dimensions: selecting the strength of the erasure code, placement of encoded chunks, and deciding load balancing policy for accessing the data. The problem is efficiently solved via the computation of a sequence of convex approximations with provable convergence guarantee. We further provide a prototype of our solution in an open-source, cloud storage deployment over three geographically distributed data centers. Experimental results validate our theoretical delay analysis and show significant latency reduction, providing valuable insights into the proposed latency-cost tradeoff in erasure-coded storage.

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Biomimetic Robotic Tails for Agile Maneuvering of Field Mobile Robots

Current field robots for search and rescue are predominantly slow and often require human rescue by failing to respond fast enough to unforeseen dynamic disturbances (such as loss of footing) due to unstructured terrain. Therefore, new mechanisms to load the mobile robot independent of the locomotion mechanism (e.g., legs or wheels) are needed to improve stability and maneuverability. Looking to nature, animals use tails to turn in midair while running (cheetahs), balance (house cats), and re-orient while jumping (lizards). The research objective is to enable continuum tails to (1) stabilize legged robots gaits by controlling the center of mass position, (2) dynamically stabilize robots in response to external disturbances, and (3) maneuver robots without changing their locomotive gait. The resulting improved dynamic agility and gait stability will lead to faster performance of tasks such as search and rescue. Previous robotic tail research focuses on rigid-link tails with a single link rotating in a fixed plane. This research studies a flexible biomimetic multi-segment continuum tail with spatial motion. The spatial motion enables the robot to generate loading in any direction, instead of the fixed direction defined by the link's rotation. The continuum tail structure is a solid elastic core along which disks are mounted. Rods and cables attach to disks along the tail, and the rods' and cables' prescribed tensions or displacements controls the tail's shape. This research utilizes mechanics models to simulate the tail. In each model, the internal loading (force and moment) at the tail's base is calculated. A Cosserat rod model is used to analyze the tail's loading due to factors related to the tail's trajectory, such as the tail's mode shape, speed,bending magnitude and bending plane angle, and factors related to the tail's design, such as the tail's segment lengths and mass distribution. A virtual power model is used to study the tail's inertial loading using a higher-accuracy actuation model to generate the tail trajectory. Preliminary results indicate the continuum tail can generate the required loading for a variety of corrective actions on-board the mobile robot. Key conclusions from the analysis are presented, including: (1) the tail structure that provides greatest range of motion and highest tail speeds, and (2) methods to actuate the tail to help dampen undesired oscillations. The current research progress assists with the design of a full-scale continuum robotic tail that will experimentally validate the tail's effectiveness to enable agile mobile robots.

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Real-time estimation of naval ship air wake using unmanned aerial vehicles

This research presents a wireless instrumentation system for real-time estimation of ship air wake patterns which is an important naval application. Aircraft interaction with ship air wake along with the limited deck area on naval vessels makes launch and recovery of rotary wing aircrafts a difficult task. Currently, safe takeoff and landing envelops, which are governed by ship air wake patterns, are estimated by CFD models and such envelopes require rigorous flight testing before approval. Such testing is not only expensive and potentially hazardous but also highly subjective since it depends on the test pilot's personal flight experience. Thus, there is a need for an instrumentation system capable of estimating ship air wake patterns in a safe, cost effective and non-subjective manner. To meet this requirement, the proposed system uses an unmanned aerial vehicle (RC helicopter) fitted with developed instrumentation board to provide estimates of air wake wirelessly in real-time. As the ultimate aim of this research is to find safe launch and recovery envelops, the proposed system correlates ship air wake with induced vibrations in the helicopter rather than wind velocities. Thus, it uses an onboard IMU (inertial measurement unit) to measure vibrational responses of the helicopter to ship air wake. Two instrumentation boards (one used as the transmitter and other as receiver) with sensors like IMU, GPS and barometer were developed to measure and transmit the helicopter's vibrational response wirelessly to the cruising ship. The vibrations induced in the helicopter due to radio-controlled pilot inputs were removed effectively from the sensor readings with developed Neural Network algorithms running on the receiver computer in real-time in order to estimate the air wake intensity. The system performance was tested in the Chesapeake Bay and the results in the form air wake patterns generated by YP676 naval training craft are shown this research.

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Preliminary Evaluation of Current Activated Tip-based Sintering (CATS) as a Micro-fabrication Tool

BACKGROUND

Spark Plasma Sintering (SPS) has unique manufacturing advantages. During SPS, loose powders are heated and pressed to produce a consolidated material. SPS reduces material fabrication temperatures and times and produces materials with unique, controllable microstructural properties. However, SPS has been limited to the production of bulk, macro-scale products of simple geometries. We enable the localization of SPS through Current Activated Tip-based Sintering (CATS): electric current is applied through a mobile conducting tip to targeted regions. Precise control of tip geometry, size and scanning speed together with the unprecedented ultra high current densities result in swift, controllable, localized consolidation of macro-, micro- and possibly even nano-scale features. Our technique enables hierarchical materials engineering across multiple length scales.

OBJECTIVES

To produce micro-scale regions of dense, sintered material over large areas using moving CATS tips and determine the effect of tip size, speed, current and green compact particle size/density on nickel and copper powder consolidation.

METHODS

A novel micro-CATS machine equipped with a high-precision motion controlled X-Y stage was used to move micro-scale tips (10 & 50 μm diameter) across a powder bed. The tip fixture was equipped with a piezoelectric material to monitor the contact between the tip and powder bed during the tip movement and ensure a constant, closed electric circuit. Specimens were sectioned across the sintered lines and fine polished for microstructural examination with scanning electron microscopy.

RESULTS

Fully dense regions with thicknesses within the micron range were consolidated on nickel and copper powder compacts. A high degree of consolidation was achieved with 1) tips moving at lower speeds because local heating is promoted under longer current exposure time and 2) multiple passes with higher tip speeds. Specimens with small initial particle size and high green densities were easier to consolidate since inter-particle spacing was low.

CONCLUSIONS

CATS was successfully used in the production of micro-scale features of extended geometries which could enable selective sintering of two dimensional nanoscale features with further control of tip size and geometry.

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Healthy Cities through Technology: The impact of zero-emission vehicles on air quality and human health

RESEARCH OBJECTIVES

In this research we strive to understand the correlation between the usage of zero-emission vehicles with the influences on air quality, human health, and the power grid (including with the addition of V2G and wind turbines).

MOTIVATION FOR THE RESEARCH

In the 21st century, health related issues are becoming a major concern for both developed and developing societies. This trend is exacerbated by the rapid population growth in urban areas. In this project we focus specifically on the impact of air pollution, with the aim to help countries and cities understand cause and effect of disease from respiratory infections, heart disease, and lung cancer [1].

RESEARCH APPROACH

A survey was distributed in Washington, D.C. in order to understand interest in EVs. Next, EV projection models were created to analyze growth of the vehicles. This data is used as inputs into our energy simulations, dispersion modeling, and finally health impacts as a result of emission inhalation. Health impacts are compared to those caused by gas vehicle emissions.

RESEARCH RESULTS

- Current load simulations indicate grid issues as electric vehicle penetration increases.
- V2G implementation along with wind turbine integration can increase the voltages beyond the upper limits.
- Grid optimization can reduce power plants emissions by 33% making EVs cleaner.
- The introduction of 100,000 EVs in Washington, D.C. can decrease the lung cancer relative risk by 24%.
- By optimizing the operation of the grid, the lung cancer relative risk can be further decreased by 17%.
- The adoption of 200,000 EVs in Washington, D.C. by 2030, along with grid improvements, can prevent 732 deaths per year associated with cardiopulmonary and lung cancer mortality.

RESEARCH CONCLUSION

EVs successfully shift the pollution away from people and into a rural environment. Issues occur with power consumption when vehicle penetration increases.

REFERENCES

[1] Media Centre, “Air quality and health”, Fact Sheet N 313 (2011).

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An Exploration of the Use of Image Interpolation to Improve Image Registration

This project seeks to reduce the amount of time needed to register medical images by using image pre-processing. Image registration is the act of finding an appropriate transformation that will align two or more two- or three-dimensional images that represent a single object. In the scope of medical imaging, this concerns the images from medical scans such as MRI, PET, or x-ray CT. Registration can be performed traditionally or using shape-based techniques; traditional registration overall has less accuracy but is much faster to compute. Shape-based registration, by contrast, has better accuracy but has typically been computationally disadvantageous. We explore the possibility of pre-processing the image in advance of the registration (when time may not be a constraint) in order to obtain a greatly oversampled image. In this way, when image registration is carried out in real time the sampling required may be very simple, and more computationally rigorous techniques may be used. We compare traditional interpolation methods with our proposed use of pre-processing.

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Objectivity in Molecular Dynamics

In classical mechanics, axiom of objectivity requires that all balance laws and all constitutive equations must be form-invariant with respect to rigid motions of the spatial frame of reference. Any tensorial quantity is said to be objective if it obeys the tensor transformation law at all time, in other words, it is independent of the motion of the observer. Quantities such as temperature and stress tensor should be objective. In Molecular Dynamics Simulation, which is a prevailing numerical model to study nanomechanics at atomic level during the last several decades, objectivity was rarely discussed. This paper is to generally assess the objectivity of the governing equation and constitutive equations in Molecular Dynamics (MD). It can be shown that the interatomic potential and the derived interatomic force are objective because they are calculated based on relative position vectors of atoms, which are objective. Also, the governing equation in MD can be demonstrated to satisfy objectivity too. On the other hand, velocity and relative velocity can be shown to be not objective. As a consequence, quantities such as temperature and Virial stress that are calculated based on velocities of atoms are not objective. This becomes an issue if the simulation is conducted in a non-inertial reference frame, i.e., the reference frame undergoes acceleration or rotation. To resolve this deficiency, this paper adopts the formulation of thermal velocity and further proves that the thermal velocity of each atom is objective. Therefore, the objectivity of temperature and Virial stress is restored. It is considered that the application of axiom of objectivity on Molecular Dynamics will provide more credibility to the simulations of complex systems.

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Extracting Social Networks from Text Data with a Case Study on an FDA Advisory Panel

The dynamics of knowledge transfer is a topic of major concern to scholars of organization and decision-making. We use a new method to study knowledge boundaries in expert groups, applied to transcript data from the U.S. Food and Drug Administration's Circulatory Systems Advisory Panel. Consistent with prior theory, we find that knowledge boundaries emerge as the group faces increasingly challenging problems. Beyond this theory, we find that knowledge boundaries disappear when the group's expert ability is insufficient to solve its task. We conjecture that the amount of expert knowledge that the group can collectively bring to bear is a determining factor in boundary formation, and that some knowledge boundaries may aid, rather than hinder, knowledge aggregation. We briefly explore this conjecture using qualitative exploration of several relevant meetings. Finally, we discuss implications of these results for organizations attempting to leverage their expertise given the state of their collective knowledge.

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Identification and Enumeration of Lymphocytes Expressing Human CD4 Antigen in Whole Blood Using A Microfluidic Device

RESEARCH QUESTION

Can hydrodynamic trapping microfluidics and optical imaging be used to measure CD4 concentration in small whole blood samples?

MOTIVATION FOR THE RESEARCH

Counting the reduction in CD4 expressing lymphocytes has been the accepted method of determining the clinical stage of an HIV/AIDS infection. Flow cytometry is currently the standard technology for determining the number of CD4 cells; however, there are drawbacks such as high costs, bulky instrument, complexity and large blood samples (>100 µL). Microfluidic devices have been used to capture microspheres which are of a similar shape and size to CD4 cells. Such devices were validated by simulation, which are not directly applicable to biologic cell capture. Creating simulations to test the applicability of existing microsphere designs will simplify future design processes. The proposed device consists of a microfluidic chip that captures lymphocytes for microscopic imaging, and an image processing algorithm to count those that express CD4. It requires a smaller volume of blood and reduces equipment required to perform tests, making it simpler and cheaper to perform CD4 counts potentially with a portable system.

RESEARCH METHOD/APPROACH

The microfluidic device was made of poly-di-methyl-siloxane (PDMS) from a silicon mold and captures lymphocytes based on size. Whole blood is processed such that CD4 expressing cells are fluorescently labeled with FITC conjugated monoclonal antibody to CD4, and then pushed through the device. A 10 µL sample requires less than 1 hour to pass completely through a single channel. Images are taken of the device holding the captured cells and these are input into an algorithm to count the fluorescing CD4 cells. The design was also simulated in COMSOL Multiphysics to recreate the observed phenomena of using microsphere capture designs for biological cell trapping. A segment of our device geometry was input to the simulation profile and the cell was modeled as a viscous droplet in another flowing fluid. The droplet and interface parameters were manipulated such that they represented a lymphocyte. Parameters such as droplet radius and carrier fluid velocity were then manipulated to observe cell deformation, capture and slippage through a trap.

RESEARCH RESULTS

Our device has shown that it is possible to capture and count CD4 Cells. Using 10 µL of blood and pressures under 2 lb/in^2 it has successfully captured cells which were then counted. 2D simulation resulted in observed biological cell deformation and slippage based on fluid velocity and cell size.

RESEARCH CONCLUSION

This technique can be further modified to include the blood sampling and processing procedure on the device itself to create a lab-on-a-chip portable HIV/AIDS test. The adaptation of existing microsphere simulation models for biological cell capture appears promising. Future work will include validation of trap sizes relative to size varying CD4 cells and implementation of channels with trap size gradients, in addition to full channel imaging and enumeration. These results are promising for using microfluidics for cell counting of not only CD4 cells but others as well such as tumor cells and stem cells.

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The Gestational Prediction Project: A model for determining probable fetal counts in early pregnancy without ultrasound technology

The Gestational Prediction Project (GPP) is a long-term study being conducted on the relationship between beta human Chorionic Gonadotropin (beta-hCG) and the number of fetuses in gestation. In this project, a calculator is designed to predict the number of fetuses in a pregnancy at 4 weeks gestation, two weeks before ultrasound is able to detect a viable pregnancy. Folic acid is critical at 5 weeks gestation to prevent neural tube defects (NTDs), and women carrying more than one fetus require additional supplementation. Using a mathematical model, this will be a novel way for medical providers to provide early detection of these pregnancies and offer earlier treatment options to improve fetal outcome. Using a secure server to collect anonymous beta-hCG sets from volunteers, we are developing a dataset of beta-hCG values associated with singleton, twin, and triplet pregnancies. Through data analysis we have developed a mathematical model to determine the probability of fetal counts for individuals with a set of beta-hCG values. We used Java to develop a calculator that predicts the probability of an individual carrying multiples based on their unique beta-hCG values. It is our hope that medical providers will use this tool to provide patients with higher multiple probabilities additional folic acid to prevent the incidence of NTDs.

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COLLEGE OF PROFESSIONAL STUDIES

Big Data In Health Care and Privacy

As the health care industry struggles to incorporate electronic health record systems (EHRs) into their business workflow, the amount of data that will be collected will begin to expand rapidly. Many agree that organizations stand to benefit greatly from the data that will be collected, and new data analytic techniques offer a tremendous opportunity for the advancement of health care, medical research and disease prevention. Others, such as researchers and businesses, stand to gain as well from the massive data sets that will be amassed. This collection of data will become "big data," or data sets that are large and complex. It is important to understand that with the advent of big data come big problems with data privacy. The increasing availability of electronic patient data increases the likelihood of data breaches that would be detrimental to patient privacy, to health care organizations and to insurance providers. In the health provider realm, the Health Insurance Portability and Accountability Act (HIPAA) protects patient data. Specifically, HIPAA protects against the unlawful disclosure of patient data and sets standards for electronic health care transactions. This research will examine the data exchange process after a patient visits his or her doctor. It will also examine methods that data exchanges use to protect data including record de-identification. Research includes examination of HIPAA privacy laws. Interviews will be conducted with a health care privacy officer, Debora Peele founder of PatientPrivacyRights.org and with a health care privacy lawyer. Findings will indicate that there is significant cause for concern for the advent of increased data breaches involving health records. New policies and laws need to be implemented to protect health record data.
Keywords: privacy protection, de-identification, health information exchange, re-identify, electronic health record (EHR).

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COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The Hypoglossal nucleus in mouse models of DiGeorge Syndrome

DiGeorge Syndrome/22q11 deletion is an inherent developmental disorder that results in compromised cranio-facial development. Patients suffer from dysphagia and aberrant facial features, which suggests abnormal organization cranial motor nerves. Since the underlying origins of dysphagia in patients with DiGeorge Syndrome are largely unknown, our overarching objective is to search for the anatomical substrate. The study focuses on the hypoglossal nucleus since it carries the motor neurons innervating the tongue. By assessing the change in the number of neurons and volumes between the normal and LgDel/22q11 mice, this research will determine the anatomical origins of dysphagia. To approach this problem, a mouse model presenting with LgDel deletion corresponding to the human 22q11 deletion sequence was crossed with another mouse expressing ChAT/GFP. ChAT/GFP is a well-defined marker for motorneurons which readily allows for their identification. The resulting ice pups were genotyped as either 22q11/ChAT/GFP or ChAT/GFP. Pups were perfused and their brainstems and spinal cords were dissected. The brainstems were cut into 100μm thick sections and imaged using spectral confocal techniques using a 25x/0.8 oil immersion lens. The subsequent 3D image sets were analyzed using Velocity, 3D-image analysis software, to effectively isolate the cell bodies and to algorithmically count the number of neurons. This study resulted in the successful generation of a unique mouse model by crossing LgDel with ChAT/GFP, which was validated as a valuable tool to study the abnormalities occurring in DiGeorge Syndrome. The hypoglossal nucleus showed aberrant neuronal cell bodies in LgDel, compared to the control littermates. These quantified motoneuronal abnormalities may lead to compromised integrative function resulting in reduced tongue motility and coordination. The approaches in this study provide concrete support and validation for the use of LgDel/ChAT/GFP mouse models for further studies involving oro-facial coordination and will vastly enhance the research regarding DiGeorge Syndrome.

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COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Mathematical model for high-grade gliomas

With this work we present a novel mathematical model, called Glioma Model, that describes brain tumors growth based in two cell phenotypes, one more migratory and the other more proliferative, with transition between them. This model has been formulated in an interdisciplinary collaboration with biologists and clinicians. In particular it has been established collaborative work between IMACI (Institute of Applied Mathematics, Science and Technology), the Department of Medical Science of UCLM (University of Castilla La Mancha), the Mathematics Department of UCLM, the University Hospital of Salamanca and the Mathematics Department of GW we show how hypoxic events may have crucial role on the acceleration of the growth speed of high-grade gliomas under go-or-grow hypothesis.. The mathematical model consists of a system of parabolic equations of Lotka-Volterra type. We show existence, uniqueness of solutions and their regularity. Due to the non-linear character of the equations more sophisticated mathematical techniques such as Euler-Garlerkin approximation and discrete approximations are needed. We present the numerical results based on a finite-differences method: the cascade of malignant transformations associated with hypoxia, the differences between the two phenotypes and the go-or-grow dichotomy of the Glioma Model. The results suggest that preventing the cascade of malignant transformations associated with hypoxia may result in a smaller invasion speed; therefore we can consider a treatment with vascular regularizing therapy or antithrombotic medication.

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The State of mHealth in Senegal

OBJECTIVES & BACKGROUND

Senegal was one of the first countries in Sub-Saharan Africa (SSA) to embrace the use of mobile health technologies (mHealth) to support the achievement of national health objectives. No literature review to date has focused on the opportunities and challenges facing mHealth in Senegal. This is the first review of how mHealth fairs within Senegal's challenging environment.

METHODS

Documents for this review were identified through: 1) an Internet keyword search via PubMed, LexisNexis, MEDLINE, SIT eLibrary database, and GoogleScholar using keywords, including, but not limited to: mHealth Senegal, mHealth SSA, mobile phone Senegal; 2) a manual search of websites of organizations working on mHealth in SSA; and 3) a Google keyword search to identify relevant blog posts, news articles, and initiative websites. Eligibility criteria included that the initiative used mHealth to support the achievement of health objectives, was active >6 months within the past five years, and completed its pilot phase. Initiatives were also classified in accordance with World Health Organization guidelines.

RESULTS TO DATE

Of the six initiatives reviewed most faced challenges that threatened to undermine the viability of mHealth in Senegal. The review identified 16 opportunities for initiatives to improve healthcare in Senegal, including the ability to lower healthcare costs, process data faster, and reduce time prior to care. The review also identified 7 challenges that stymie mHealth in Senegal, such as fragmentation of information, resources, and services, and reliance of short-term funding. While all initiatives reviewed made a positive impact on healthcare delivery in Senegal, some benefited from unique opportunities depending on project design.

CONCLUSION

This review concluded that Senegal's mHealth sector is strong thanks to the government's support, but more needs to be done to ensure mHealth's long-term sustainability and success, such as overcoming sector fragmentation and short-term funding dependence.

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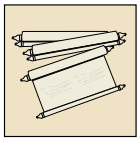

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The French Canadian War of 1812

The bicentennial of the War of 1812 renewed interest in the origins, history, and consequences of the war. Although the history of the conflict in Anglophone North America is well documented, the French Canadian population is largely ignored in the literature. This disparity has ultimately led to misunderstandings between the two cultures and histories through overgeneralized statements about national identity. This project seeks to recover the French Canadian experience in the War of 1812. The study relies heavily upon document analysis and comparison; in particular, it examines the content and significance of French-language newspapers, manuscripts, and other documents from the early nineteenth century. These documents were found in libraries in both the United States and Canada, such as the Library of Congress in Washington, the McGill University Libraries in Montreal, and the Library and Archives Canada in Ottawa. This project also uses digitized documents, hosted by other research depositories in the United States and Canada. Together, these different primary source documents reveal complexities in early nineteenth century Canadian society. British recruiting efforts in Canada relied upon an appeal for self-preservation rather than any form of national identity. Indeed, other documents studied in the project illustrate a Canadian society divided by language, religion, culture, and class. The project ultimately concludes that national identities in Canada were not an important component of French Canadian culture during the early nineteenth century. Instead, it highlights the connections French Canadians shared with a larger francophone Atlantic world. This research makes important contributions to the histories of Canada, the War of 1812, and the early nineteen-century Atlantic world.

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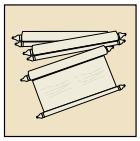

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

“Such thievery made on a Christian people”: Furta Sacra Narratives and the Fourth Crusade

During the Fourth Crusade, some crusaders stole saints’ relics from Constantinople, acts which have not been previously investigated for their implications for the study of the Fourth Crusade or the role of relics in Europe. These thefts were recorded in furta sacra, or “holy theft,” narratives, an older tradition which was adapted and diversified to meet the needs of the Fourth Crusade. The three manuscript texts which the paper considers – the Translatio Symonensis, the Hystoria Constantinopolitana, and De terra Iherosolimitana – record the thefts of relics and the miracles which the relics perform in their new homes, always with reference to the context of the Fourth Crusade. In addition to analyzing how these texts fit into the older furta sacra tradition, the paper also explores how the relic thefts were incorporated into the context of the Crusade. It examines how, in justifying the theft of the relics, the texts also attempted to justify the events of the Crusade itself. Thus, the Fourth Crusade can rightly be perceived as a “crisis event” for the West, and the theft of relics should be seen as a method of crisis intervention best suited to the Crusaders’ needs.

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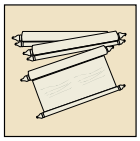

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

GWU Veteran's History Project: 95 Years of History and Service

The primary goal of the GWU Veteran's History Project is that provide a narrative of the long-standing relationship between the university and those who have served their country. During the past century many students at the George Washington University have at one time or another answered the call to service. Be it Europe, the shores of the Pacific, the jungles of Vietnam or the deserts of the Middle East, GWU student veterans have been part of every major conflict since the Civil War. The story isn't just of service but the lives they lived that shaped both their communities and the university.

I am a veteran and have received a GWU Diversity Research Fellowship to pursue this project. Most of the primary sources for the VHP originated and are stored at GWU. Throughout this project, I have been making extensive use of the University Archives Special Collections, Fraternal Organization Records, and the GW Hatchet Archive.The final research component of the VHP involves using the National Archives and the Department of Veterans Affairs Graves Registration database. Records in the National Archives indicate any related service records of veteran students before and after their time at the university. I am using the Veterans Affairs Graves Registration database to identify students who fell in combat overseas, where many are likely still interred.

This story is not just about individuals but the changes the university has undergone as a result of America's wars. The university has witnessed the mass exodus of students leaving to fight in wars overseas as well as their return to campus. Few, if any, external factors have done more to shape the university's student body. The story continues to this day in the nation's capital at the George Washington University.

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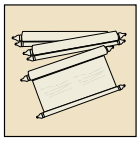

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Exploding Fantasies: Gothic Creationism in American Cinema from 1931 to 1960

Why – as contemporary Americans – do we find ourselves engrossed in monster movies, specifically those in which the monsters are manmade? In this paper, I examine how the manmade monster has changed from 1931-1960 in order to argue that monsters function within film to portray and echo the American psyche. As filmic monsters gradually begin to embody American fears about our environment and the human role within the environment, they shift from mere science experiments to products of extreme technology such as nuclear energy. The monsters I discuss in this paper are from films such as Frankenstein (1931), Dr. Jekyll & Mr. Hyde (1931), Beast from 20,000 Fathoms (1953), and Them! (1954) found at the UCLA Film & Television Archive. Each supports the idea that the manmade monster conveys the modern American fear of the real "Gothic creationism," or classic Frankensteinian notion of "playing god." Moreover, films in this archive indicate and perpetuate the changing fears of scientific experimentation and Cold War nuclear energy. Put another way, as World War II revealed the power of technology to destroy humanity and the environment, public figures such as J. Robert Oppenheimer indeed "played God," becoming real life Dr. Frankensteins and producing veritable fears of destruction that were echoed in cinema. In turn, the films changed from merely being inquiries about scientific exploration to being byproducts of greater social anxieties such as technology and nuclear energy – mediums for the destruction of the environment. Although such human creations are indeed "monstrous" and threaten our existence with the disintegration of our body, they are not necessarily entities to fear or demolish, as they are extensions of human existence. More specifically, this paper concludes that we cannot fear what we create because our creations ultimately embody ourselves, which we cannot fear or hate without complete self-annihilation.

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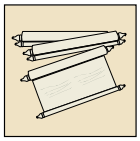

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Dogs as Citizen-Soldiers in First World War Austria

This paper is the culmination of research funded by the Luther Rice Undergraduate Research Fellowship and explores the historical roots of Austrians' renowned passion for dogs, with particular emphasis on the impact of the First World War. A paltry literature covers the dedicated service of canines on the part of the Central Powers in this conflict, but investigation into the largest corps, that of Austria-Hungary, reveals a deeper phenomenon in Austrian culture. Tracing the ascent of canines in Austria from unwanted vermin early in the nineteenth century to legally-protected household staples by the twentieth, this paper analyzes the little-studied role of these animals as frontline army auxiliaries by the thousands from 1914 to 1918. Used by the medical service to find wounded soldiers in No Man's Land and by the army to haul supply carts across difficult terrain, their admirable successes and favored status in the eyes of propaganda writers gifted them with a disproportionately large significance among the Austrian public.

Based on a large body of primary source material from the Austrian State & War Archives, the Austrian Canine Society, museum collections, and German- and Italian-language secondary literature, as well as a sizeable amount of original photographs and postcards, I assert in this paper that the Great War represented a watershed event in convincing Austrians to reinterpret their canine partners as pseudo-citizens with rights and societal roles. These were earned, in many minds, through the real and imagined feats of heroism these four-footed soldiers exhibited at the front on a daily basis for four years. This study is the first to explore the historical origins of this facet of modern Austrian culture in light of the fundamental changes of total war in the early twentieth century.

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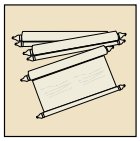

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Reducing Employee Turnover through Organizational Onboarding Systems: A Meta-Analysis

Following decades of research supporting the role of organizational culture in various factors of success, many organizations have begun developing "Onboarding Programs" in hopes to efficiently socialize their new employees into the existing organizational culture. While case studies have looked at the effect of different onboarding programs on individual organizations, conclusive results regarding these programs has yet to have been published. This study explored the relationship between onboarding programs and one measure of organizational success, employee turnover rates The relationship was explored through a Meta-Analysis of research conducted on onboarding programs between 1980, when the first model of organizational culture was developed, to the present (Hofstede, 1980). Specifically, the relationships between length of time, formality and espoused goals of onboarding programs were considered in terms of their relationship with employee turnover rates. The findings as well as their implications for further study are discussed.

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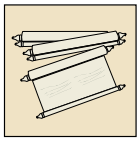

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Adaptable and Open Leadership and its Effects on Organizational Innovation

The purpose of this paper is to understand the relationship between leadership characteristics, specifically openness to experience and adaptability, and organizational innovation. The aim is to determine what type of effect, if any, openness and adaptability within a leader has on organizational innovation. This research is based on a literature review, a case study of Richard Branson and the Virgin Group, coding of words indicating adaptability and openness, and measurements of innovation (as found through number of new markets entered and number of patents, compared to a national average). The findings will discuss the relationship of the variables, an understanding of the case, as well as implications.

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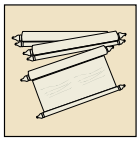

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Beyond Duty: Familial Responsibility in Leir and Two Lears

When William Shakespeare wrote his enduring tragedy King Lear, he appropriated the sixteenth-century anonymous play King Leir, significantly altering the characters of Leir and his three daughters. Over four hundred years later, Sir Trevor Nunn's twenty-first-century filmed stage production of King Lear reinterpreted the dysfunctional Lear family for postmodern audiences. This study analyzed Leir, Shakespeare's play, and Nunn's Lear to explore their imaginings of a daughter's duty or responsibility to her father and its ideal motivators. Although Shakespeare's Lear has received much attention over the centuries, the three works together form a trans-temporal arc that showcases the vicissitudes of notions of duty. Using textual criticism, the project found that the moralistic play Leir – complete with fairy-tale princess Cordella and wicked sisters Gonorill and Ragan – proposes an absolute standard of filial duty based on a child's respectful gratitude for a parent's care. The study contextualized the notion of filial duty through archival research into early modern English expectations of proper daughterly behavior. Further textual exploration revealed that Shakespeare questions Leir's simple, gratitude-based standard through portrayals of King Lear as demanding respect he does not deserve, Cordelia as transcending obligation through unconditional love, and her sisters as neglecting Lear out of selfish exasperation. Finally, the study examined Nunn's Lear through a performance studies approach, finding that Nunn's postmodern adaptation depicts a Cordelia whose dutiful actions spring from pity and a Goneril and Regan who defensively detach themselves from a demented Lear. Through this trans-temporal investigation, the project concluded that the arc of the three works' perspectives on duty runs from filial obligation through forgiving care and finally to emotional sympathy. The analysis suggests that Leir and the Lears not only represent historical and literary trends, but also offer insight into the nature and motivation of familial responsibility in different times.

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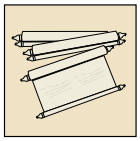

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

"Male/Female; Hetero/Homo: Dichotomy, Definition, and a New Understanding of Sexuality in the New Negro Era"

My research explores the intersections of two emerging, intersecting discourses between World Wars I and II in American culture: an intra-racial discourse surrounding gender roles and expectations in the black community during the New Negro era, and the hetero/homo dichotomy that was constructed in medical, legal, and social discourse. New Negros, in some cases, worked to conform to these new gendered expectations, however many actively differentiated themselves in various ways, rejecting the modern hetero-patriarchal New Negro gendered imperative. To explicate these two threads and the ways in which they worked, I am examining Harlem's Hamilton Lodge Ball, the era's most famous drag ball, where both threads were operative within a specific and evolving milieu. I have taken advantage of, and will utilize, cultural sources such as the popular press, contemporary fiction, official vice reports, and New York City Police records. Ultimately, I posit that as homosexuality was being defined for the first time, associated specifically with gendered sexual object choice and performance, New Negroes, especially New Negro men, began to identify themselves as the antithesis, heterosexual.

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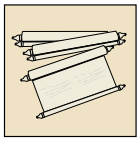

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Conveying affect through pitch: the minor mode and sadness in music and speech

Both speech and music provide people with means of communication. Although there are clear differences between the two, potential similarities are not widely studied. Despite its initial perception as filling contrasting roles, the use of pitch in both speech and music is an intriguing similarity. The most notable difference between major and minor modes in music is the third scale degree, which is colloquially associated with sadness in Western culture. Associations between minor mode and negative affect, as well as major mode and positive affect, are present in children as young as three years of age. Like music, speech can use pitch to convey affective information. Minor intervals are used more commonly in speech conveying sadness, while major intervals were more often associated with happiness. The connection between affective information in music and speech is furthered by the positive influence of musical training on a person's sensitivity to emotions. The use of the minor mode to convey sadness in the music associated with Western culture is paralleled by the use of the interval of the minor third to portray sadness in speech. This is evidenced through the affective associations of children and adults to music in minor modes, the intonation patterns in speech related to the emotion of sadness, as well as the commonalities seen in the relation between affect and pitch in these two modes of communication. The similarities between pitch patterns associated with specific affects in speech and music can be used as support for evolutionary arguments, as well as in treatment of people with prosodic speech disorders.

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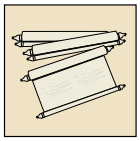

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

How do individuals living in poverty close the housing affordability gap?

An estimated 14 million households live below the poverty line in the United States (Housing and Urban Development, 2012).This population is generally stigmatized as relying on government subsidies to afford housing when the reality is that only 4.8 million receive some kind of government housing subsidy (US Census, 2012). The other 9 million employ many techniques to afford housing. The US Department of Urban Development estimates that a household should not pay more than a third of their income in rent (2012). However the average household in DC spends more than half their income in housing month (National Low Income Housing Coalition, 2012). This gap between what a household can afford to pay in rent and what they have to pay, commonly called the affordability gap, is an important issue in the United States, and one the literature does not fully understand. This study looks at individuals living below the poverty line in Washington DC to learn how they manage to close this gap and afford housing. In Washington, DC 18.2% of the population lives in poverty compared to the 14.3% nationally (U.S. Census, 2011). Washington, DC is therefore a good place to study to better understand how this population manages to close the affordability gap. Further, this study hopes to identify their experiences in the process. To do so, this study utilizes individual interviews, approximately 60 minutes in length, with six individuals that live below the poverty line in Washington, DC. These individuals must be over 18 and must have lived in Washington, DC for at least three years. All participants will be given a pseudonym to protect their personal information. The interviews will be transcribed verbatim and the data will be coded to find major themes across the interviews. Using the literature and interview themes, this study will use these interviews to learn more about low-income tenants, how they manage to close the affordability gap, and their experience in the process. The results of the study will be discussed and implications for future practices and research will be provided.

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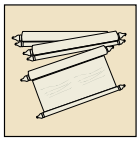

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The Fiction of Collective Moral Agency's Implications for Moral Responsibility

In this paper I examine the arguments for corporate personhood and their implications for the moral responsibility of supra-individual entities. I look at theories of corporate personhood which argue that collectives, as entities over and above their constitutive members, are agents because they have decision making procedures that are close enough to the decision making procedures of individual moral agents. Additionally, an examination of common English language usage in makes the assumption that supra-individual agencies possess agency intuitive. However, if collectives are to be seen as agents, moral duties and responsibility follow. When this is understood, it is clear that theories of corporate personhood fallaciously anthropomorphize collectives. Claims regarding the moral duties of collectives are only analyzable as claims about individuals. Acceptance of collective moral agency leads to the obviation of responsibility for individuals acting within a collective. Speaking as though collectives are moral agents, individuals, the true holders of moral obligations, are not held accountable for their actions.

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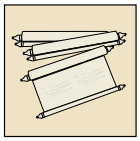

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Cosmopolitan Folk: The Cultural Politics of the North American Folk Music Revival in Washington, D.C.

This dissertation examines the American folksong revival in Washington, D.C., metropolitan region during the Cold War and Civil Rights era. Looking at the strengths and weaknesses of folk revival scholarship, local media reports, and oral histories, the folk and blues revival is seen as a mass mediated phenomenon with multiple factions. The revival in Washington shows how restorative cultural projects and issues of authenticity have become central to modernity and illuminate shifts from a populist, labor oriented Old Left to a more inward, personalized politics of the New Left. Folk culture became part of strategy to ease fears and legitimize suburban, white, American consumer culture. Centered on the Library of Congress, Washington distinguished itself as a cosmopolitan and sophisticated city with a unique cultural geography. While moving folklore studies towards context and cultural democracy, the insistence on apolitical, traditional, and rural forms of folksong as the most authentic re-inscribed racial and class hierarchies even as it promoted Washington's status. Washington, D.C., ultimately shifted the loose folk revival "movement" into permanent cultural institutions and organizations. In turn, the city gained a cosmopolitan reputation for folk music that intermingled with its identity as the nation's capital and site of public protest.

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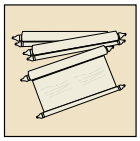

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

"We're Here, We're Queer, and a Little Unclear: Pride as Pilgrimage, Protest, and Performance"

My research examines the trajectory by which Pride and queer visibility movements have become increasingly commercialized in shifting from political protest to parties and performance. I use as case studies my contrasting experiences abroad at Pride in London and Dyke March London, supplementing personal experience with scholarly discourse from the fields of queer studies, queer theory, and women's and gender studies. Beginning with selections from the edited volume Shrines and Pilgrimage in the Modern World: New Itineraries into the Sacred, I attempt to craft a working definition of pilgrimage. With the help of conceptual frameworks and ideas laid out by Judith Halberstam, Martin Manalansan, Lisa Duggan, and Catharine MacKinnon, I work through the process of defining queer and synthesize queerness with pilgrimage. After establishing the complexity of queer pilgrimage, I introduce the history of Pride, utilizing a firsthand account of the first gay pride parade and contemporary reflections on the meaning of pride as I do so. I then discuss the histories of and my experiences at Pride in London and Dyke March London, concluding that Dyke March London felt more like a pilgrimage for me than Pride did.

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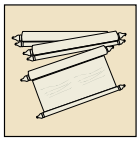

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Meaning and Learning: Neil Tennant versus Psychological Evidence

This paper takes the conception of meaning and comprehension posited by Neil Tennant in The Taming of the True and compares it with current psychological research on word learning and sentence comprehension. Tennant uses his definition of an anti-realist's conception of meaning to prove certain avenues of investigation to be impassable and his approach is focused on an interpretation of meaning comprehension treated as generally applicable. The paper hopes to demonstrate that this conception does not satisfy the definition of meaning understanding for a particular case: the process of word learning in infants. Thus, this paper proposes a definition of meaning understanding that remains closer to actual human experiences than that proposed by Tennant.

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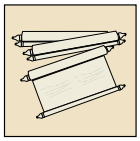

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The Temples of Poseidon and Athena at Cape Sounion

As part of the CCAS Dean's Globalization Seminar on Alexander the Great (HIST/CLAS 3111) in the spring of 2014 the class is traveling to Greece over spring break. I have studied the ancient temples of Athena and Poseidon located at Cape Sounion, 60 meters above the Aegean Sea and at one of the southern most points in Europe. I will be presenting to the group my research on the ancient ruins while on site. My study is an examination of the historical and mythical significance of this archaeological site that is dated to the fifth century BCE. According to a classical myth which was first found in The Odyssey, Cape Sounion is the spot where King Aegeus leapt to his death off the cliff after mistaking an incoming black sail as an indication of his son's death, which in turn, gave his name to the Aegean Sea. Archaeological finds from the site date to as early as 700 BCE. The Temple of Poseidon includes well-preserved 6-meter high columns. It is larger and in better condition than the Temple of Athena. The temples were built of tufa and destroyed in 480 BCE by Xerxes and the Persian troops during the Greco-Persian War. The temples and surrounding areas were destroyed as punishment for the Athenians' defiance. The temples of Poseidon and Athena were important for sacrifice and worship to the gods. These spiritual practices were a priority in ancient Greek religion. I will mainly present information on the historical and cultural significance of the archaeological site at Cape Sounion.

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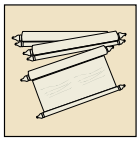

ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

International Successes of Russian Jewish Violinists in the Opening Decades of the Twentieth Century

QUESTION

What were key factors that led 20th century Russian Jews success in their early international debuts? I will address this question by highlighting experiences of four young Russian Jews who astounded audiences in the early 20th century: Mischa Elman, Efrem Zimbalist, Jascha Heifetz, and Nathan Milstein. In my research, I focus on factors that affected these musicians from the cradle to their early international debuts. My argument derives from demographic statistics and primary sources from the artists themselves. I trace the early lives of these violinists, beginning with the harsh socio-economic and political conditions in the Pale of Settlement where all four men were born. Since socio-economic conditions for Jews in the Pale were austere, the social and political benefits offered by the St. Petersburg Conservatory were a beacon for Russian Jewish betterment. The next step for these budding young musician was acceptance into St. Petersburg Conservatory, under the tutelage of Leopold Auer. Auer had no codified violin method. However, he did have a hand in his students' success, chiefly through his constant demand for technical and musical excellence and his promotion of his most talented students. Finally, Auer's most talented young violinists, which included Elman, Zimbalist, Heifetz, were launched into their international careers primarily by Auer himself. Given Elman, Zimbalist, Heifetz, and Milstein's shared experiences in youth, these Jewish violinists reflect the summation of a multilevel, extremely competitive musical system in Imperial Russia that was stimulated by the juxtaposition of Jewish socio-economic and political hardship with the vast potential benefits offered to Imperial educated musicians. In effect, Russian Jewish debut successes in the early twentieth century were the result of an music system that permitted only the most accomplished, hard working Jews to survive and flourish.

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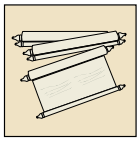

ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

Shelley and Brontë: Romantic Visionaries

This research project examines Percy Shelley's "Ode to the West Wind," published in 1820, and Charlotte Brontë's Jane Eyre, published in 1847, as texts that implore individuals not to be consumed in the chaos of the external realm, nor conceal themselves in the internal realm, but to attain a balance and fusion between the two forces. Following Shelley's objective of dynamic union gained through the balancing of the external environment and internal sense of self, Bronte's eponymous heroine also strives to achieve the Romantic ideal of liberation. This union allows her to call out to the expanding Victorian world for social progress, echoing Shelley's desire for social progress a generation earlier. Shelley's ode harks to the dangers of external chaos, internal exploration of the relationship between humans and nature, and a culmination of these internal and external forces in a "new birth" (line 64). Shelley's Romantic observation of external expansion, internal contraction, and reconciliation of the two opposing forces is recreated in Jane Eyre, which parallels Shelley's framework for Romantic union of the external environment and internal sense on self, and desire for social progress. The first two cantos of "Ode to the West Wind" and Jane's childhood in Jane Eyre emphasize the imbalances found in the external environment. Both literary works begin with a reference to a frenzied landscape. Shelley commences with a metamorphic scene in which "the leaves dead / Are driven like ghosts" (lines 2-3), while Brontë begins with Jane's description of "the leafless shrubbery…somber clouds, and a rain so penetrating" (63). Both artists perceive the exterior world as a dangerous, haunting place in which humans are vulnerable. Shelley himself observed war and conflict within the external environment throughout his lifetime. The scars of the French Revolution left Europe stirring with ideas for future revolutions; small wars left no country untouched. The Victorian era also felt the destruction of war; 39 conflicts and wars occurred between the years 1837 and 1847, and there were nearly 190 other conflicts from 1848 to 1901 (Farwell 364-372). The description of Jane's childhood and Shelley's ode reflect turbulent realities. Jane's life reflects the horror of these conflicts at Lowood, where "Pestilence-stricken multitudes" (Shelley line 5), perish as if unable to confront the toxicity of their environment. Applying Shelley's use of thelulling words "lie…and low" (Shelley line 7) as a parallel to Jane's childhood, reveals the Romantic belief in the drudgery and insignificance humans feel in the external world (Clubbe and Lovell 3). Shelley's experiences within a warring Europe are echoed in Jane's experience in the red room. Both works reference "crimson" (Brontë 70) or "hectic red" (Shelley line 4) to describe the helplessness against the "preternatural" (Brontë 101), and therefore uncontrollable, forces. Jane feels "the reverberation" (Brontë 77) of her red-room punishment, as if she was a soldier with flashbacks of a bloody battle. Shelley's depiction of "decaying leaves" (Shelley line 16) is echoed in Jane, left thrashing for survival in an external environment whose "airy surge[s]" (Shelley line 19) provide only cruelties and disorder.

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The Role of Risk in Force Employment: A Tactical Level Analysis of Drone Weapon Use

Drones have become an increasingly prevalent weapon on the U.S. battlefield. Despite this explosion of drones in combat, little academic research has been conducted into the tactical decisions ground fires personnel make between manned and unmanned means of force employment. Drawing on recent research by the authors on the role of risk at the strategic level of decision making, we seek to understand the role that risk may play in decisions to employ unmanned weaponry at the tactical level. We hypothesize that ground personnel will be more likely to employ drones over manned options in missions that have low risk of mission failure and low need for quick responsiveness. We expect to see a greater preference for manned options when missions are time sensitive and face a high risk of failure. In order to test these hypotheses, we utilize two methods. First, we survey ground fires personnel with combat experience in Iraq or Afghanistan from 2003 to 2013. We combine these survey results with interviews about the role of risk calculations in choices between manned and unmanned air support. Our findings indicate that tactical level personnel, unlike those at the strategic level, frame risk around mission success. This divergence in risk perception causes unmanned weaponry to be more likely to be utilized at a strategic than a tactical level. These results indicate that the role of risk is an important explanatory factor in understanding variation in force employment decisions at all levels of the battlefield.

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Military Attitudes Toward Humanitarian Law Compliance: A Survey Experiment

This project is an investigation into why militaries comply with or violate international humanitarian law (IHL), the body of law which, for humanitarian ends, sets limits on the ways wars can be waged. Past studies of IHL compliance have tended to focus on the factors that influence policy formation. While these accounts are valuable, they do not address directly a crucial component of IHL compliance: the behavior of military personnel. Because these men and women are the ones ultimately responsible for waging war, it is their behavior that determines whether a military fights lawfully. Yet there has been little study of IHL compliance from their perspective. This project aims to change that by studying the attitudes of United States military personnel toward IHL. It uses a survey experiment to test the hypothesis that the type of enemy the U.S. is engaged with has an effect on U.S. military personnel's tolerance for IHL violations. Specifically, it looks to see whether U.S. military personnel are more tolerant of U.S. forces violating IHL when at war with a non-state group (as opposed to a state's military), especially if this group has a history of violating IHL. Because our survey is still being fielded and because our sample size is not yet large enough to draw firm conclusions, it is too soon to tell whether this hypothesis will find empirical support. However, its confirmation would certainly be significant, as U.S. forces are legally obligated to comply with IHL at all times, regardless of who its enemy happens to be.

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Empowering Women Collectively and Individually from *Her* Perspective: A Case Study

Most of the existing literature on women's empowerment and self-help groups in South Asia emphasizes quantitative indicators about their results, ignoring the voices of the women participating in the organizations. This study examines the changes in the members of the Self Employed Women's Association (SEWA) in New Delhi as an effect of being part of SEWA. I use qualitative data collected from interviews and focus groups during the summer of 2013. The research traces the process of increasing confidence and expanding the capabilities of members by highlighting the voices of the women of SEWA Delhi, using their words instead of an abstract measure of empowerment. The women emphasized the importance of sisterhood and an increase in knowledge about opportunities, particularly in the realm of work and government projects. Qualitative data provides a more complete picture of how development programs, in this case a women's self help group, can improve women's lives.

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Competing Creeds: Disaggregating the Role of Religion in Civil War

How can competing logics regarding the causal role of religion in civil war be reconciled in useful way for future research? The prominent literature has failed to distinguish between wars in which religion is peripheral and wars in which religion is central to the goals of actors in their attempts to understand the connection between religion and civil war. The present research reconsiders the independent variable of religion in the context of civil wars. The paper disaggregates the designation 'religion' into analytically-distinct categories with regard to civil war, and uses these categories to re-code a large-N sample of civil, judging whether religion plays a central, peripheral, or negligible role in the violence. I argue that there is an analytical distinction which must be considered when examining the role of religion within civil wars. Wars fought over the implementation and doctrinal substance of a religion must be conceptualized as distinct from those civil conflicts fought for territorial or other political power gains that instrumentalize the language of religion to mobilize support for the cause. Additionally, I reduce the units of analysis to the dyadic level, in order to better measure the religious dimensions of civil war. I argue that understanding these more micro-level elements of religious civil war can contribute to more internally-valid coding and analyses of the data. According to the findings of this paper, there are significantly more instances of religious civil war with a peripheral religious link than with a central religious focus. Cases of civil war in which religion played a central role have at least one common element – Islam. This paper explores the implication that successful mobilization for the attainment of religious ends is more difficult than for political ends.

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Analyzing the Impact of Public Libraries Powering International Development in Romania

Public libraries in Romania play an important role in providing information access to a population in which only 47 percent of members have internet connection in their homes. Facing defunding and closure during the economic crisis in 2008, Romanian libraries remained open after receiving a $27 million grant through the Bill and Melinda Gates Global Libraries program. Biblionet Romania was created to bolster development by equipping all libraries with new computers and providing librarian training courses. Current research shows that libraries have had positive effects for users since the implementation of the program, such as helping community members find employment, learn English language, and find medical information. This study seeks to dig deeper and assess the library's impact on community development and ethnic inclusion by assessing which populations are using the services provided, why they find those services important, and how the library represents the interests of various groups. This research also examines the disparity between low levels of library use (only 16 percent of the population) despite the high need for internet connection. Using comparative qualitative research, I conducted 30 interviews with librarians, library users, and Biblionet program creators in five diverse regions of Romania. In addition, quantitative data was collected through anonymous library use surveys. Key obstacles to library driven development identified were political mismanagement of library administration, lack of library outreach to the population, and funding challenges to offering quality materials. Successful community engagement was often directly linked to library outreach efforts and capacity for program design.

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The Impact of Syrian Refugees on Socio-ecological Resilience and Community Tensions in the Northern Badia of Jordan

The crisis in Syria has caused a massive influx of refugees into Jordan to the detriment of the Jordanian host communities. This research paper seeks to examine and explain the impact of the Syrian Refugees on the socio-economic and environmental sustainability of Jordanian host communities in the Northern Badia. Ultimately, the paper will cultivate a feasible solution that focuses on resilience, sustainable development, and conflict resolution. The hypothesis is that the large influx of refugees has led to socioeconomic decline for host communities and an overconsumption of scarce resources, leading to intensified environmental degradation and increased conflict. The methodology consists of two major parts. First, quantitative and qualitative data will be analyzed from previous field interviews and surveys in Jordan. Second, interviews will be conducted with representatives from a variety of institutions and non-governmental organizations (NGO) in Washington, DC. This research is significant because it examines a different side of the pressing and contemporary topic of the Syrian crisis by focusing on the plight of average Jordanians. The government of Jordan (GoJ) and the international community have largely neglected these communities, and by identifying their needs this research is a call to action for sustainable development. The situation in the Mafraq Governorate continues to rapidly deteriorate with disastrous consequences. The researcher ultimately recommends investing in sustainable and resilient livelihoods for families and supporting conflict resolution between the Jordanian host communities and Syrian refugees.

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The Impact of Lower Caste Parties on India's Development

India's economic development has been stunningly inequitable. Due to India's heavy investment in capital-intensive industries and complicated labor laws undereducated or rural citizens face a dearth of employment opportunities while Indians who attend university more easily find employment. This employment inequality is one of many factors causing India's rural populace to lag behind its urban counterparts in terms of education, health, and other development metrics. This research project will analyze the effects of lower caste political parties (LCPs) on inequitable development in India. Lower caste political parties attract constituents based on identity rather than ideology, creating a strong patron-client system. Recent scholarship has hinted that these parties produce disincentives for communities to diversify employment options, which in turn hinders social and economic development. In order to measure the relationship between LCPs and development, this study examines the connection between the successes of special economic zones—zones intended to encourage economic growth, foreign direct investment, and local employment—and LCP presence. Through an analysis of case studies in six states, each with differing levels of LCP occurrence, this study argues that LCPs do not directly affect the success of special economic zones. SEZ success is ultimately hindered by the flawed design of the program, which emphasizes foreign direct investment without a thorough understanding of how projects will impact local communities.

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Changing the Education System in Burma: Preparing to Repatriate Karen Refugees

Recent democratic developments in Burma (Myanmar) and the 2012 ceasefire agreement between the Burmese government and the Karen National Union (KNU), ending 63 years of civil war, have led to discussions about the repatriation of Burmese refugees in Thailand. From interviews conducted on the Thai-Burmese border with Karen refugees and organizations in Thailand working with these refugees, this research finds that the majority of refugees belonging to the Karen ethnic group (the majority of the Thailand refugee camp population) are concerned about repatriation, with a major concern being the educational system in Burma. I interviewed sixteen Karen refugees between the ages of eighteen and forty. Fourteen of these interviewees were born in Burma, and all fourteen cited better educational opportunities as one of the main reasons they moved to Thailand's refugee camps. The young Karen interviewed did not wish to return to Burma because of the lack of recognition of educational certificates received in the refugee camps, a lack of educational and economic opportunities in Burma, and the poor quality of Burmese higher education. This research suggests that the Burmese government should recognize refugees' educational certificates, prioritize improving the quality of higher education, and reform the higher educational system in a way that encourages the participation of returning refugee students. In addition, this research found that many Karen desire an education system which incorporates ethnic languages, histories, and cultures into the standard curriculum. This research suggests that one of the outcomes of the peace process between the Burmese government, the KNU, and other ethnic minority groups should be a decentralized national education system which incorporates these desired elements. This thesis highlights the lessons learned from the education systems in South Sudan, Bosnia and Herzegovina, and India to provide guidance in establishing a decentralized ethnic education system in Burma.

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Motivations and Impacts of Border Policies: A Case Study of Costa Rican Border Regions

This research projects studies the motivations and impacts of border management policies on cross-border dynamics between Costa Rica and its neighbors, Panama and Nicaragua. The research first analyzes Costa Rica's border management policies in theory and in practice, exploring the motivations behind the different manifestation of these policies in each border region. Then, it studies the distinct impacts these approaches have on the movement of goods and people at the three main checkpoints in each border region, analyzing these movements both at a macro and micro scale. The study uses a mixed methodology and mainly relies on 30 interviews with local residents and officials, and business owners conducted in the border regions in August and December 2013. While the qualitative component is key to understand local dynamics that are often informal and undocumented, the project uses quantitative data to demonstrate larger scale trends in cross-border activity. Interviews with Costa Rican policy makers and experts in the area also allow a better understanding of the nature and motives behind border management. The findings suggest the Costa Rican central government is primarily concerned with geopolitical imperatives and large-scale trade, while border residents and officials have differing interests that generally respond to the human and physical geography surrounding each checkpoint. The findings suggest that while in both border regions policies have facilitated large-scale movements of goods and capital, in the case of the Nicaraguan border region they have hindered local social and commercial dynamics whereas with Panama local commercial activity is largely uninterrupted. This comprehensive case study contributes to a limited body of literature about Costa Rica's border regions and how border politics shape the relations of developing countries in an increasingly globalized world.

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Neocortical architecture of manatees (Trichechus manatus)

Afrotherians diverged near the base of the eutherian clade and maintain primitive neuroanatomical features likely shared with the stem eutherian mammal. The manatee (Trichechus manatus) occupies an aquatic niche, which is unique among Afrotherians. As such, a comparison of manatee neocortical architecture with close phylogenetic relatives would allow for a more complete view of Afrotherians and early mammalian brain evolution. The present study investigated total neuron and interneuron density of two regions in the manatee somatosensory cortex (S1) (n=2). Using immunohistochemistry, we examined the density of neocortical interneurons stained for calbindin, calretinin, parvalbumin, neuropeptide Y, and nonphosphorylated neurofilament protein (NPNFP) and compared the results to previous findings for other Afrotherians (e.g., rock hyrax, giant elephant shrew). We also observed neuronal morphology using a modified rapid Golgi stain and compared these results with previous observations of neuromorphology in rock hyraxes and African elephants. Overall neuron density in the manatee primary somatosensory cortex (S1) does not significantly differ from other Afrotherians. Interneuron density, however, is considerably lower than in other Afrotherians for all interneuron types in S1. Such decreased interneuron density in the manatee neocortex may indicate reduced local inhibitory connectivity. NPNFP-immunoreactive neurons are long range, metabolically expensive neuron types, and generally increase along with brain mass. Density of NPNFP- immunoreactive neurons in layer 5 were as expected for the mass of a manatee brain (364 g). Golgi stained tissue showed that the pyramidal neuron morphology is more similar to that of the rock hyrax than the elephant in that a greater proportion of spiny neurons displayed a “typical” pyramidal shape. This suggests that the neuronal morphology associated with manatees and rock hyraxes may represent a more primitive state compared to the high degree of spiny neuromorphological variability that characterizes the elephant neocortex. In sum, the manatee exhibits primitive traits that may be related to its niche as a moderately social aquatic browser with no natural predators.

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Land-use factors influencing plant species similarity between forests and agroforests

Land use change from forest to agriculture results in a variety of environmental issues (i.e. greenhouse gas emissions, erosion, decreased diversity) but agroforestry or organic management can reduce the impact of agricultural deforestation by continuing to provide some ecosystem services.

RESEARCH OBJECTIVES

This study examines two important questions 1) the impact of surrounding forest area on plant diversity in agroforestry systems and 2) the effect of organic versus conventional farm management on species similarity between coffee agroforests and surrounding forest fragments.

METHODOLOGY

We studied seven conventional and seven organic coffee farms as well as five forest fragments in the Central Valley of Costa Rica. Woody stemmed plants (DBH of >5cm) in 1 ha plot were identified and species information was compared. Species similarity was calculated with the Sorensen coefficient and an ANCOVA was used to analyze the effects of farm management and surrounding forest area on level of species similarity between farms and forests.

RESULTS

The combined effects of forest area and farm type explained 40% of species similarity (R:Adj = 0.40, p = 0.02). Individually, the forest area had a significant effect (p = 0.02) on species similarity but farm type's influence was not significant (p = 0.09). Organic coffee farms had higher average species similarity and diversity than conventional farms. The positive species similarity relationship implies that forest fragments are a diversity source for the farms and therefore should be maintained in order to protect tropical biodiversity and it's ecosystem services.

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Chandra and Suzaku Observations of Two Galactic TeV Sources

Multi-wavelength observations of the HESS J1809−193 field reveal a complex picture. Although the majority of the bright TeV emission can be attributed to the pulsar-wind nebula (PWN) of PSR J1809−1917, several supernova remnants, as well as another PWN, may contribute to the observed VHE emission. The H.E.S.S. image shows an extension toward north-east, which could be a separate TeV source. We present preliminary results from three Chandra and two Suzaku observations of this region. One of the X-ray sources in the field is the low-mass X-ray binary candidate XTE J1810-189, for which we show the outburst history from multiple observatories. We present our analysis of the gamma-ray (Fermi), radio and X-ray data for this region. Analysis of the Fermi LAT data of the area around these sources will be presented in this poster. Preliminary multi-wavelength classification is presented for the brightest X-ray sources in the Chandra ACIS fields. We investigate whether there is any correlation between the TeV "extension" and any of the sources seen at lower energies. We also present the analysis of Fermi LAT and Chandra data of H.E.S.S J1741-302A.
This research was partially supported by NASA grants NNX10AH82G, NNX09AC81G, and NASA/SAO grant GO3-14049X.

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An optimal energy dissipation strategy of the MinCDE oscillator in regulating symmetric bacterial cell division

Rod-like bacterial cells utilize a MinCDE system to locate the cytokinesis machinery to mid-cell for symmetric cell division. In Escherichia coli, this regulation is implemented through the pole-to-pole oscillation of the Min proteins. State-of-art experimental approaches have identified the involved bio-molecules and most of their interactions, based on which several dynamic models have been developed and have successfully explained the emergence of the oscillatory phenomenon. However, a more fundamental understanding of this bio-oscillator's dissipative nature and its relation to the regulatory function is lacking. Here, we address this problem by studying the energetics of the MinCDE reaction network in E. coli. We derive the mathematical expression for the network's energy dissipation and relate it to a phenomenologically defined regulatory ``performance". Our results indicate that, unlike the stationary sensory adaptation systems whose regulatory performance can be monotonically improved to their upper limits by higher energy dissipation, the MinCDE oscillator has a more complicated performance-to-cost relation: energy is required to drive the oscillation but excess energy dissipation could reduce its regulatory performance. We further show that to achieve optimal performance, most of the energy from ATP hydrolysis has to be strategically assigned to the MinE-aided MinD release and the MinD immobilization steps. These discoveries suggest an optimal dissipation strategy in the MinCDE oscillatory system and imply that E. coli cells live within this optimal regime.

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Deep Chandra Observations of Pulsar Tails: PSR B0355+54

Pulsar wind nebulae (PWNe) are sources of nonthermal X-ray emission and prominent sites of particle acceleration. Among other parameters, the PWN appearance (and possibly other properties) depend on the pulsar velocity. If a pulsar moves with a supersonic speed, the ram pressure exceeds the ambient medium pressure, resulting in a bow-shock PWN with a tail behind the pulsar. Here we report on X-ray observations of the extended pulsar tail behind PSR B0355+54 carried out as a part of the Chandra XVP program (8 observations; 395 ks total exposure over a period of 8 months). To examine long-term variations, we also re-analyzed the archival data. We investigate the spatial and spectral properties of the compact nebula and the of the extended tail. We also study the changes in the compact nebula for various timescales. The spectrum of the compact nebula is rather hard with the photon index Γ =1.4±0.1, and we find a hint of only slow cooling along the tail ($\Delta\Gamma$=0.2) up to 5′ from the pulsar. The compact nebula is variable on timescale of years and is likely to be variable on months timescale as well. These results are compared to those obtained for other pulsar tails such as that of PSR J1509-5850.

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Combinatorial Heegaard Floer Homology and Branched Spines

Heegaard Floer homology is a collection of invariants for closed oriented three-manifolds, introduced by Ozsvath and Szabo in 2004. The simplest version is defined as the homology of a chain complex coming from a Heegaard diagram of the three manifold. In the original definition, the differentials count the number of points in certain moduli spaces of holomorphic disks, which are hard to compute in general. More recently, Sarkar and Wang (2008) and Ozsvath, Stipsicz, and Szabo (2010) have determined combinatorial methods for computing this homology with Z_2 coefficients. Both methods rely on the construction of very specific Heegaard diagrams for the manifold, which are generally very complicated. In 1988 Matveev and Piergallini introduced the concept of branched spines as efficient and powerful descriptors of three-manifolds. We show that a branched spine gives rise to a natural Heegaard decomposition. By comparing our construction with Sarkar and Wang's we have found a more streamlined combinatorial description of the Heegaard Floer homology for certain manifolds. We present the natural Heegaard decomposition coming from branched spines graphically in the form of a strip diagram. Using properties of strip diagrams, we show that our description of the homology theory is both realizable and efficient. Finally, we (try to) describe how to reformulate our construction in terms of the branched spines explicitly – we give a concrete description of generators and explain where the differentials should come from.

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Concordant integrative analysis of multiple gene expression data sets

Microarray is an experimental method by which tens of thousands of genes can be printed on a small chip. This technology enables us to measure genome-wide expression profiles. The cost of a microarray experiment is still relatively high. Therefore, the sample size of a microarray experiment is still relatively small. For some important disease studies, microarray data have been collected by different laboratories. We expect to obtain more efficient analysis results if different data sets collected for the same or similar study can be integrated. However, due to many complicated experimental issues, it is necessary to evaluate the genome-wide concordance among these data sets before their integrative analysis. If the underlying behavior of a gene is consistent among different experiments, then the related expression profiles in different data sets will be concordant. Statistically, mixture models have been widely used to accommodate unobserved heterogeneities in a study population. A mixture model based method has been proposed for the integrative concordant analysis of two microarray data sets. It is necessary to extend this approach for an integrative analysis of multiple data sets.

The general statistical framework for our integrative analysis is the partial concordance/discordance (PCD) model. Its related statistical estimation difficulty is that its parameter space increases exponentially with the number of data sets. Since the complete concordance model (CC) and the complete independence (CI) model are two basic statistical frameworks that can be derived from the PCD model, we propose a two-level mixture model to approximate the PCD model. It combines the basic CC and CI models and its parameter space increases linearly with the number of data sets. We have implemented an expectation-maximization (E-M) algorithm for the model parameter estimation. Simulation studies have been conducted to understand the performance of our method. We have also applied our method to a collection of microarray gene expression data sets for a lung cancer study.

Furthermore, we have also developed other approaches to decrease the parameter space of PCD model by simplifying the non-diagonal proportion parameters. The inspiration comes from the exchangeable structure and AR(1) structure in GEE, as well as the multiset coefficient in combinatorics. We still consider expectation-maximization algorithm to achieve the model fitting. The performance of the proposed methods is examined using simulation studies. We have also compared these methods with the two-level one through applications to the same experimental data sets from the lung cancer study.

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Automated classification of Chandra X-ray sources

With the advent of the latest generation X-ray telescopes there has been a major influx of data associated with the detection of hundreds of thousands X-ray sources. As one can rarely tell a source type from its X-ray properties alone, the full potential of the X-ray catalogs can only be unlocked by correlating multiwavelength (MW) properties via cross-identification with other surveys. However, one would spend an enormous amount of time classifying these objects by their physical nature if the classification was to be done on a source-by-source basis by humans. Therefore, we are using a supervised learning algorithm to classify sources detected by the Chandra X-ray Observatory. The classifications are based on a training dataset which currently includes about 7,000 X-ray sources of known nature (main sequence stars, Wolf-Rayet stars, young stars, active galactic nuclei, low mass X-ray binaries, high mass x-ray binaries, and neutron stars). For each source, the training dataset includes up to 24 multiwavelength properties. The efficiency and accuracy of the classification is verified by dividing the training dataset in two and performing cross-validation. The results are also inspected by plotting source properties in 2D slices of the parameter space. As an application of our automated procedure we classified unidentified sources in the supernova remnant (SNR) G352.7-0.1, in the field of HESS J1809-193, and in part of the Chandra Source Catalog 1.0. We present the results of the verification tests and the classification results. This research was partially supported by NASA/SAO grant AR3-14017X.

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Characterization of Aging of the Innate Immune Response to Bacterial Infections in *Drosophila melanogaster*

Aging is a complex process that involves the accumulation of deleterious changes resulting in the overall decline in several vital physiological functions. The innate immune system is the most important host defense mechanism in invertebrates consisting of both humoral and cellular responses to pathogenic infections. The fruit fly Drosophila melanogaster is an outstanding model organism for studying the molecular and functional basis of complex biological processes, such as aging and immunity. This study involves the use of mutant flies and the virulent insect pathogen Photorhabdus luminescens to understand the interaction between aging and the insect immune response. Our data show that mutations in the gene Chico, which codes for the insulin receptor substrate and extends lifespan in Drosophila, might regulate the survival response of the fly to bacterial infections. In addition, our preliminary results suggest that immune signaling pathways that result in the expression of antimicrobial peptide molecules in Drosophila may also be differentially regulated in the Chico mutant flies. Current experiments involve the estimation of bacterial load in Chico mutants and their wild-type controls to assess potential effects of aging on the resistance/tolerance of the fly to the bacterial challenge. Such studies will lay the foundation for understanding the mechanisms that interrelate aging and the immune response in invertebrates, and perhaps in vertebrate animals.

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The Sp185/333 proteins from the California purple sea urchin augment phagocytosis and retard bacterial growth

The California purple sea urchin, Strongylocentrotus purpuratus, is used to study the evolution and fundamental functions of innate immunity. Purple sea urchins have an unexpectedly complex innate immune system relying on mechanisms such as opsonization, phagocytosis, melanization, agglutination, and encapsulation for host protection. Coelomocytes (immune cells) express the large family of Sp185/333 genes which encode an abundant array of Sp185/333 proteins with a wide range of size and sequence diversity (≤260 variants upon immune challenge). The diversity of the Sp185/333 proteins suggests that different variants may have different immune effector functions. Using confocal microscopy, we demonstrated that when Vibrio diazotrophicus (Gram-negative) are incubated with coelomocytes for 24 hours, the bacteria become coated with Sp185/333 proteins. This suggests that Sp185/333 proteins, once thought to be strictly membrane-associated, are secreted from the coelomocytes and bind to bacteria in culture. Nickel-isolated native Sp185/333 proteins (Ni-natSp185/333), a subset of the native Sp185/333 proteins, bind to both Gram-positive and Gram-negative bacteria and baker's yeast with saturable kinetics. Binding of Ni-natSp185/333 proteins also shows selectivity, in that Ni-natSp185/333 proteins isolated from individual sea urchins appeared to be of different sizes and different amounts when bound to different microbes. A recombinant Sp185/333 protein, rSp0032, also shows saturable binding kinetics against Vibrio. Microbial binding is the first step in the process of phagocytosis; thus we tested whether Vibrio opsonized with Sp185/333 proteins would augment phagocytosis. We used Ni-natSp185/333 and rSp0032 bound to bacteria and found that Ni-natSp185/333 proteins augment phagocytosis of bacteria, whereas rSp0032 does not. Furthermore, turbidity assays show that growth rates of bacteria, in the presence of Sp185/333 proteins, are significantly retarded. Our results demonstrate how sea urchin Sp185/333 immune proteins function to identify pathogens and promote their removal from the host.

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Spatial-Temporal Modeling of Active Layer Thickness

The objective of this study is to provide the methodology to model and estimate spatial-temporal variation in the active layer thickness (ALT) at the U1 Barrow site of the Circumpolar Active Layer Monitoring network, and to demonstrate its use in spatial-temporal interpolation. Specifically, we use 19 years of data (1995---2013) collected on 11 by 11 square grid of locations separated by 100 meters. Then, we use the data collected in 2013 to demonstrate the validity and predictive power of our methodology. In our study, we propose models that provide a realistic description of space-time variability in ALT. At the same time, these models are feasible to efficiently estimate model parameters from available data. Specifically, we adopt linear modeling approach. The main modeling difficulties lie in defining a deterministic trend that represents the large scale spatial and temporal variation, and a realistic stochastic model that characterizes the space-time dependency of the residuals. Formulations that take into account interactions among spatial and temporal components are also developed. Fitting the space-time geostatistical model can be computationally demanding since the number of observations is large. Hence, we use a composite likelihood approach which is a criterion function based on the likelihood of marginal events. In our data analysis, we demonstrate that our models resemble the empirical patterns. Moreover, we compare our models to the naive one, which does not take the spatial and temporal correlation in residuals into consideration. The root mean squared error is reduced by 27 percent when our approach is taken.

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Genomic phylogeography and species delimitation in Brown and Red-bellied snakes (Storeria)

Next-generation genomic sequencing promises to yield large-scale datasets to address phylogeographic questions, but many popular analytical approaches are computationally intractable with more than a few loci. Here, we show that simple methods such as population clustering and more complex approaches such as diffusion approximations to the allele frequency spectrum allow for many of the same phylogeographic hypotheses to be tested in a reasonable time-frame using hundreds of loci. We also highlight the need for careful assessment of species delimitation, combining both computational genetic methods as well as traditional character-based descriptions. We suggest a general analytical pipeline and set of best practices for genomic phylogeography and species delimitation in an integrative framework. We show that while the Red-bellied snake (Storeria occipitomaculata) contains considerable genetic diversity throughout its range, it represents a monotypic species. In contrast, the Brown snake (S. dekayi) exhibits species-level cryptic divergence in the Florida Peninsula (S. victa), and deep intra specific divergence across the Mississippi River. Levels of gene-flow within and among species have been low but non-zero, and divergences are likely associated with range expansion and contraction due to glacial cycles interacting with physical barriers to dispersal.

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Complex origins of sexual size dimorphism (SSD) in New World pitvipers (Serpentes: Viperidae)

Sexual size dimorphism (SSD) is a widespread phenomenon in the animal kingdom, and much research has been focused on addressing questions related to why males and females of the same species might reach different physical optima. Hypotheses for the origin and maintenance of SSD fall into three primary categories: (i) sexual selection on male size, (ii) fecundity selection on female size, and (iii) ecological selection for gender-specific niche divergence. The objective of this study is to apply a comparative phylogenetic approach to elucidating the drivers of SSD in a group of snakes, the New World pitvipers (Crotalinae). We aim to examine how SSD changes within evolutionary lineages, and also how SSD scales with body size by testing established hypotheses for the allometry of SSD. We constructed a phylogeny from up to 8 genes (7 mitochondrial, 1 nuclear) for 104 species of NW crotalines. We gathered morphological and ecological data for 82 species for comparative analyses. Allometric analyses found no indication that SSD scales with body size (Rensch's Rule), nor that there is directional selection for increasing male size (the Fairbairn-Preziosi hypothesis). Correlation tests indicate a strong link between male body size and SSD, suggesting sexual selection on male size as a driver of SSD in the group. However there is no significant correlation of female body size and SSD, suggesting that fecundity selection has no major role. Ancestral reconstructions of body size onto the phylogeny reveal interesting patterns in body size shifts and direction of SSD. Finally, and perhaps most interestingly, we find a link between SSD and speciation rate such that lineages with higher magnitudes of SSD experience lower speciation rates. In conclusion, SSD evolution in NW pitvipers is driven by a combination of sexual and ecological selective forces.

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Somatic DNA Modification in the Sp185/333 gene family of the California purple sea urchin

The Sp185/333 gene family has a central role in the echinoid innate immune system and its expression is significantly elevated in response to marine bacteria and pathogen associated molecular patterns (PAMPs). The family consists of an estimated 50(±10) members per genome that share a basic gene structure yet show significant sequence diversity, primarily due to the mosaic appearance of short blocks of sequence called elements. The Sp185/333 genes are expressed in phagocytes, subpopulations of sea urchin cells called coelomocytes. Bioinformatic predictions suggest that Sp185/333 gene diversification may occur through frequent gene recombinations, conversions, deletions, and duplications. However it is not known whether these events may occur in the germline during meiosis and/or may occur in the soma during cell proliferation and differentiation. To address this question, we have used PCR and fragment analysis to characterize the Sp185/333 gene repertoire in sperm, tubefeet and coelomocytes from the same animal before and after immune challenge with heat-killed marine bacteria. The sensitivity of fragment length analysis has enabled us to identify gene sizes with great accuracy and to predict the gene copy ratios among different gene sizes. Surprisingly, results show that the Sp185/333 gene repertoire is significantly different in the post-challenged coelomocytes compared to the other tissues including pre-challenge coelomocytes, and consists of a different gene copy ratio as well as a new gene size. These results suggest the existence of a novel molecular mechanism for somatic DNA modification in the immune cells of the purple sea urchin in response to infection.

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Four new species of metaine spiders (Tetragnathidae, Metainae)

The long-jaw orb-weaver subfamily Metainae (Araneoidea, Tetragnathidae) is composed of over 200 described species in five genera. However, the relationships among these genera are unclear, and many species remain unknown. Based on morphological differences – primarily in male genitalia – we describe four new species metaines here. These include two Meta Koch, 1836, and two Metellina Chamberlin & Ivie, 1941. Three of these localities are notable extensions of the ranges of these taxa: the Metellina are the first to be identified from Africa, and one of the Meta is among the first described from the Neotropics. The differences between Meta and Metellina are reviewed, along with illustrations of the new species. More metaines remain to be described, particularly from Africa, Asia, and the Pacific Islands.

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Maternally-inherited Determinants of Neural Fate

In the developing frog embryo, ventral-animal cells will become epidermis (skin) whereas dorsal-animal cells will become nervous system. The Moody laboratory found that the dorsal-animal cells autonomously differentiate into neural tissue when explanted from the intact embryo into a culture dish, demonstrating that molecules intrinsic to these cells, inherited from the maternal store in the egg, are important determinants of what type of tissue the cell will become. We are studying whether four maternally-inherited mRNAs are involved in dorsal-animal cells acquiring a neural fate. First, we tested whether expressing each of these mRNAs in ventral-animal cells converts them from epidermal to neural. mRNAs encoding the neural transcription factors Foxd4L1, Sox11, Zic2 and Gmnn were synthesized and microinjected (in combination with beta-galactosidase mRNA as a lineage tracer) into ventral-animal cells of 8-16 cell Xenopus laevis embryos. When the embryos reached the 32-64 cell stage, the daughters of the injected cells were microdissected free from the embryo and placed in tissue culture for 24 hours. They then were stained for the presence of lineage tracer and processed for in situ hybridization analysis of neural, mesodermal and epidermal genes. We found that FoxD4L1 strongly converts ventral-animal cells to a neural fate; Zic2 and Gmmn have a moderate effect and Sox11 has a weak effect. To determine if these effects are due to mRNA expression during the maternal (cleavage) or zygotic (blastula) phase of development, we microinjected a hormone-inducible version of either FoxD4L1 or Zic2 mRNA, and added hormone to the culture medium at either cleavage or blastula stages. These experiments show that FoxD4L1 is required at both the maternal and zygotic phases, whereas Zic2 is only required at the maternal phase. Finally, to determine whether maternally-inherited mRNA is required in the dorsal-animal cells for them to express a neural fate, we reduced the expression of endogenous FoxD4L1 by microinjecting a specific antisense morpholino oligonucleotide into dorsal-animal cells and made explants as above. We found that loss of FoxD4L1 reduces neural gene expression and increases mesoderm gene expression in these explants. Together, these studies show that FoxD4L1 and Zic2 act as maternally-inherited determinants of neural cell fate. The presence of these molecules in an embryonic cell biases them to become part of the nervous system. Since these same molecules are also expressed in mammals, our results may be very important for learning how to manipulate embryonic stem cells for neural replacement therapies.

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In Situ Analysis of Single Plant Cells by Laser Ablation Electrospray Ionization Mass Spectrometry with Ion Mobility Separation

In situ metabolic and lipidomic profiling of single cells can advance our understanding of cellular phenotypic variability and cell responses to external stimuli. Laser ablation electrospray ionization (LAESI) mass spectrometry (MS) based on laser pulse delivery by an etched optical fiber has enabled the metabolic analysis of single epidermal cells and their subcellular compartments. [1] [2] In this study, ion mobility separation (IMS) coupled with LAESI-MS is introduced for the enhanced metabolic and lipidomic analysis of single plant cells, such as Lilium longiflorum pollen tubes, L. longiflorum leaf and Allium cepa epidermal cells. L. longiflorum pollen tube was grown in a sugar medium on 0.5% agarose gel. L. longiflorum and A. cepa epidermal cells were harvested in the form of monolayers. Mid-infrared laser pulses were delivered through an optical fiber tip to single cells targeted for ablation. The targeting and ablation were visualized by two long distance microscopes. The ablation plume was ionized by an electrospray, sampled into an IMS system and subjected to MS analysis. Approximately 20 different ions were detected from the pollen tube segments corresponding to 60 pL ablated cell materials. The produced mass spectra were dominated by flavonoids and phosphatidylcholine (PC) that were clearly separated in different mobility regions of the DT vs. m/z map (see Figure 1). For chemical structure identification, tandem MS was performed on a small population of pollen grains after 4 hours of germination. Reactive LAESI-MS, with Li+ in the electrospray solution, was used to determine the acyl chain lengths of the PC lipids. After resolving the isobaric interferences, signal enhancement was observed in the spectra of single A. cepa epidermal cells compared to previous data obtained without IMS. Our results indicate that the introduction of IMS enables the lipidomic profiling and enhances the metabolic analysis of single plant cells by LAESI-MS.

[1] B. Shrestha and A. Vertes, Anal. Chem.,2009, 81, 8265.
[2] J.A. Stolee, B. Shrestha, G. Mengistu, and A. Vertes, Angew. Chem. Int. Ed.,2012,51, 10386.

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Axiom of Choice across Mathematical Disciplines

The Axiom of Choice states that given a collection of nonempty sets, we can choose one element from each set. This statement is obvious if we have finitely many sets or some way of selecting distinguished elements in particular sets. For instance, given any, even infinite, collection of pairs of shoes, one can pick out the left shoe from each pair to obtain an appropriate selection. However, such choice is not possible to establish in general for infinite families. The use of the Axiom of Choice is often disguised since it is equivalent to hundreds of other mathematical statements. One such equivalent is given any two sets, one set has cardinality (number of elements of a set) less than or equal to that of the other set. So, are the mathematical results under consideration equivalent to the Axiom of Choice, or are they weaker than the Axiom of Choice, that is, only implied by the Axiom of Choice? Since the Axiom of Choice is independent from the other axioms of set theory, we can consider models in which the Axiom of Choice holds and also models in which Axiom of Choice does not hold. In order to answer this question we have used analytical methods and various mathematical proof techniques. In particular, we used mathematical induction on ordinals, since the Axiom of Choice is equivalent to the statement that every set can be well-ordered, and thus can be represented by an ordinal. This research will clarify and systematize into a coherent body of knowledge various results scattered throughout different mathematical courses for which the Axiom of Choice has been used. We will also discuss philosophical ramifications and how different mathematical theories would be if the Axiom of Choice is not accepted.

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Effect of endosymbionts on the *Drosophila* immune defense against bacterial infection

Nearly a third of all known arthropod species are demonstrated to be colonized by endosymbiotic bacteria which, while not essential for host viability, provide some advantage to the host via a mutualistic relationship. Wolbachia pipientis and Spiroplasma poulsonii are well-known endosymbiotic bacteria, which inhabit the fruit fly Drosophila melanogaster and are known to manipulate the host by regulating various physiological processes. These endosymbionts have recently been shown to also interfere with the insect immune response to bacterial pathogens, such as Photorhabdus luminescens which is able to invade and kill insects. In order to study the effect that the presence of endosymbiotic bacteria have on the immune response, we have obtained four strains of Drosophila carrying both Wolbachia and Spiroplasma, one, or none of the bacteria. We hypothesize that the presence of endosymbiotic bacteria may improve pathogen surveillance, allowing for rapid recognition and elimination of pathogenic bacteria that invade the fly. I have used quantitative and qualitative assays to provide evidence that Drosophila flies containing endosymbionts show increased resistance to infection by pathogenic bacteria. The long term goal is to identify the molecular basis of any changes that occur in the immune response of flies harboring endosymbiotic bacteria in the presence or absence of pathogenic infection.

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Intracellular trafficking and localization of the pancreatic hormone human amylin

Human amylin (hA) is a 37 amino acid polypeptide that has often been implicated in the progression and pathogenesis of type II diabetes mellitus (T2DM). Although recent studies have shown that pancreatic cells can recycle amylin monomers and toxic oligomers, the exact uptake mechanism and trafficking routes and its subsequent association with amylin toxicity is yet to be determined. Heat shock proteins (Hsp) are a family of proteins which play a role in protein folding and protect cells from stress. Little is known about the cellular factors and mechanisms that may protect pancreatic cells from amylin insult. However, some studies suggest an upregulation in the heat shock response (HSR) system in response to cellular stress. Hence, in the current study, we investigated amylin trafficking in pancreatic rat insulinoma (RIN-m5F) and human islets of langerhans, and explored the connection between amylin turnover, HSR and toxicity in these cells. The cellular trafficking of human amylin was explored using confocal microscopy, cell fractionation and ELISA (Enzyme Linked ImmunoSorbent Assay). Cellular compartments such as nucleus, mitochondria and cytosol were isolated using cell fractionation technique and their purity was determined using specific markers for each fraction. Human amylin localization in these fractions was determined using human amylin ELISA kit. The localization was reconfirmed by confocal microscopy. Our results suggest that upon entry into the cell, human amylin primarily localizes in the nucleus in comparison to the cytosol. Cytotoxic concentrations of human amylin (30 uM) results in a decrease in mitochondrial viability (as determined by MTT assay), an increase in HSP90 expression in the cytosol as well as an increase in the extent of PARP (Poly ADP ribose polymerase) cleavage, all of which are known cellular stress responses. Based on these results, we propose that contrary to popular belief, human amylin localizes in the nucleus instead of the cytosol and initiates a series of cytotoxic responses such as upregulation of HSR and other apoptotic pathways.

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Longitudinal Weight Calibration with Estimated Control Totals for Cross Sectional Survey Data: Theory and Application

The National Science Foundation (NSF) Survey of Doctorate Recipients (SDR) collects information on a sample of individuals in the United States with PhD degrees. A significant portion of the sampled individuals appear in multiple survey years and can be linked across time. Survey weights in each year are created and adjusted for oversampling and nonresponse on a cross-sectional basis. No longitudinal weight exists that would enable estimation of statistical models or comparison of finite population characteristics using data from multiple survey waves together. This poster presents a method for survey weight calibration for the purposes of enabling longitudinal analysis using multiple survey waves. Some cases of survey weight calibration, the control totals are themselves estimated from an outside source with its own uncertainties. When the estimator uses survey weights produced through survey weight calibration to estimation control totals it is called a calibrated estimator with estimated controls (CEEC). Methods for variance estimations of the CEEC are developed. Theory and simulation results in longitudinal studies of longitudinal CEEC estimator are illustrated. Application to NSF survey data is presented. Methods presented here have potential applications in several large-scale federal surveys. Properties of the longitudinal CEEC and developed variance estimator are given. Suggestions are made for addressing the non-existence of values in non-sampled survey years for some respondents and for analyzing longitudinal statistical models in a finite population with survey weights. Methods are studied through simulation and analysis of NSF SDR data. The method of creating longitudinal weights should be applicable to many overlapping panel surveys in addition to the NSF SDR.

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Localization of human cytomegalovirus vMIA using superresolution microscopy

BACKGROUND

The human cytomegalovirus (HCMV) UL37 exon 1 gene encodes viral mitochondria-localized inhibitor of apoptosis (vMIA). This protein traffics to mitochondria-associated membranes (MAM) at sites where the endoplasmic reticulum (ER) forms direct contacts with the outer mitochondrial membrane (OMM). It is at the MAM and OMM that vMIA is able to function as an inhibitor of mitochondria mediated apoptosis. Because of the close proximity of the ER and mitochondrial membranes, visualization of vMIA's precise localization using conventional confocal microscopy has been hampered by its diffraction limitation.

OBJECTIVES

While it has been shown biochemically that vMIA associates with the MAM, this association has not been directly visualized due to limited resolution of optical imaging. To address this, we used three superresolution microscopy approaches including gated stimulated emission depletion (GSTED), multifocal structured illumination microscopy (MSIM), and photoactivated localization microscopy (PALM) to examine localization of vMIA in the ER and sub-mitochondrial sites.

METHODS

Primary human foreskin fibroblasts (HFFs) were transfected with vectors expressing vMIA tagged with enhanced green fluorescent protein (vMIA-EGFP) and cellular markers including those for ER lumen (ER-red fluorescent protein), mitochondrial intermembrane space (IMS, MitoTracker Red) and mitochondrial matrix (DSRed1-mito). Transfected cells expressing fluorophore tagged vMIA and cellular markers were then imaged by conventional confocal microscopy, GSTED, MSIM and PALM. These images were deconvolved and analyzed using image processing software.

RESULTS

After analyzing the confocal images, we find that vMIA localizes in proximity to the ER but away from the mitochondrial matrix. The increased resolution provided by superresolution imaging demonstrates that vMIA-EGFP localizes away from the mitochondrial matrix and IMS, consistent with its localization at the OMM. Further, superresolution imaging allowed for the visualization of clustering of vMIA around the periphery of mitochondria. The vMIA clusters (~115 nm) were below diffraction limit as they were visualized by superresolution imaging but not by conventional confocal microscopy.

CONCLUSIONS

Multiple superresolution imaging techniques, GSTED, MSIM and PALM, allowed us to compare their relative advantages and show nanoscale localization of HCMV vMIA in clusters organization at mitochondrial periphery but not in the IMS or mitochondrial matrix.

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Comparative Metabolic Profiling of Single Plant Cells by Capillary Microsampling and Electrospray Ionization Mass Spectrometry

Single cell analysis holds the promise of identifying key molecules involved in cell heterogeneity, pathogenesis, and metabolism. Progress in the field of single cell metabolic profiling has been facilitated by advances in mass spectrometry (MS). Microcapillary sampling, a method that extracts cellular contents into a capillary of subcellular diameter, has been coupled with MS techniques for single cell analysis. Ion mobility separation (IMS) that retains ions based on their collision cross sections is used before MS analysis to enhance the molecular coverage. Here we present capillary microsampling combined with electrospray ionization (ESI) IMS-MS for comparative metabolic analysis of Arabidopsis thaliana epidermal cell types, i.e., pavement and basal cells, and trichomes. A. thaliana leaves were removed from the plant and mechanically attached to microscope slides under an upright microscope, where the three different cell types could be visualized. A pulled borosilicate capillary, held by a motorized micromanipulator, was used to puncture the cell wall and membrane to allow for the uptake of cellular contents into the capillary tip. The capillary was removed from the micromanipulator and back-filled with an electrospray solution. A platinum wire was then placed in contact with the electrospray solution inside the capillary. Once fixed in front of the orifice of the mass spectrometer, high voltage was applied and an electrospray established. The produced ions were initially separated by IMS system according to their drift time (DT) and then analyzed by the mass spectrometer. For each sampled cell observed under the microscope (see the insets of Figure 1), a DT vs. m/z map was generated by the IMS-MS system (see Figure 1). By comparing the ion intensities, distinct metabolic variations were observed in the three different cell types. Our results indicate the potential applications of microcapillary sampling combined with ESI-IMS-MS for metabolic profiling and subcellular analysis.

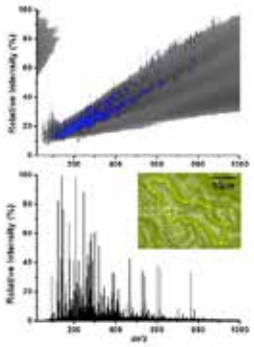

Figure 1. (Top) DT vs. m/z map of a single A. thaliana pavement cell with (bottom) the corresponding mass spectrum. The inset shows the microscope image of microcapillary sampling.

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Inducing Coelomocyte Proliferation and the Search for their Source in the Purple Sea Urchin

In the purple sea urchin, Stronglyocentrotus purpuratus, challenge with heat-killed marine bacteria, Vibrio diazotrophicus, caused a 6-fold increase in the number of immune cells (coelomocytes) in the coelomic fluid (CF). It is unclear whether the increase resulted from proliferation of new immune cells, the release of pre-existing cells into the CF, or both. The Sp185/333 immune proteins, which may be coelomocyte markers, are highest in the axial organ, suggesting that it may be a source of coelomocytes. Therefore, we measured coelomocyte proliferation using ethynyl deoxyuridine (EdU), which incorporates into newly synthesized DNA. To simulate immune-challenge, 5% of the CF was initially removed from experimental animals (n=12), but not from controls (n=6). EdU was injected for three days before 1.5% (control) or 5% (experimental) of CF was removed again. Samples of coelomocytes were withdrawn each day for 4 to 6 days, and processed for EdU, Sp185/333 proteins, nuclear DNA, and actin. Results showed that a single CF removal causes increased EdU-labeling, which accounted for 10% of coelomocytes in the CF, suggesting that the remaining 90% were pre-existing coelomocytes that appear after challenge. EdU-labeled coelomocytes after a single CF removal increased by ~1.5% within 24 hours and continued to increase thereafter, presumably replacing cells lost from CF removal. However, a second CF removal limited proliferation, possibly due to stress from CF loss. The percentage of EdU-labeled cells after a single CF removal was similar to no CF removal in the axial organ, but higher in the esophagus and gut. Furthermore, the three tissues had more EdU-labeled cells expressing Sp185/333. These results suggest that level of newly proliferated coelomocytes increased in response to CF loss. The unchanged levels of proliferated cells in the axial organ after CF removal suggest that coelomocytes proliferated and were released from the axial organ into the CF.

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How do Sp185/333 proteins associate with sea urchin cell membranes?

The purple sea urchin, Strongylocentrotus purpuratus, has an innate, but complex immune system. The Sp185/333 gene and message sequence diversity, up-regulation of gene expression upon immune challenges, and variation in protein characteristics (≥260 protein variants) after pathogen exposure suggests that Sp185/333 proteins are immune-related. Sp185/333 proteins are found in subsets of coelomocytes (sea urchin immune cells); in perinuclear vesicles in three types of phagocytes and on the surface of small phagocytes. Yet membrane association is unexpected because the proteins have no obvious transmembrane regions or conserved sequences for GPI linkages based on bioinformatic predictions of the amino acid sequence. To better understand how the proteins are associating with coelomocyte membranes, binding assays using the Sp185/333 recombinant protein (rSp0032) with PIP and Membrane Lipid Strips showed that rSp0032 binds to phosphatidic acid (PA). PA is a minor lipid constituent of cell membranes and a precursor molecule involved in the formation of other phospholipids responsible for immune-related functions, such as endocytosis, exocytosis, phagocytosis, vesicle formation, Ca2+ regulation, and signaling transduction. We have produced synthetic liposomes composed of PA and phosphatidylcholine (PC) to confirm binding of rSp0032 to PA by Fluorescence Resonance Energy Transfer (FRET) analysis. Preliminary results shows that FRET activity occurs between PA labeled with DiI (a red fluorescent dye used for staining cell membranes) and fluorescein added to the liposome mixture. Future research will analyze FRET interactions between the fluorescein-labeled recombinant protein and the DiI-labeled PA as the protein is titrated into solutions of the liposomes.

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Relation Between Long-term Winter Ground Surface Temperature and Snow Cover in Arctic Alaska

Continuous spatial monitoring of air and ground surface temperature under natural covers (vegetation and snow) was conducted in an array at Arctic Alaska sites representing a range of undisturbed tundra landscapes since 1995. This data set is utilized in presented analysis to assess the complex relation between snow cover and winter ground surface temperature regime. Snow cover has a strong influence on ground surface temperatures during the winter by slowing the heat transfer between the atmosphere and ground. The range of direct observational methods and analytical techniques was used to assess the thickness and duration of snow. The annual duration of snow cover at each site was determined by estimating variation in soil-surface temperature amplitudes. A vertical array of Thermochron IButton® temperature loggers, arranged form the ground surface to 1m above the surface and lapse-time digital cameras were installed at observational sites during 2010-2012 period to assess snow depth. The short observational record and high failure rate of snow monitoring equipment, attributable to logistical and environmental constraints, have resulted in highly inconsistent snow depth data. Supplementary snow depth information derived from direct observations and estimated from winter precipitations obtained from nearby USDA SNOTEL sites was used to fill temporal and spatial gaps in site-specific snow depth records. The snow and ground temperature records were used to calculate several indexes (e.g., n-factors, temperature/degree days offsets) suitable for quantitative assessment of temporal and spatial variability in snow-ground temperature interactions for tundra landscapes characteristic of the North Slope of Alaska.

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Testing strained superlattice GaAsSb/AlGaAsP photocathodes at Thomas Jefferson National Accelerator Facility

At present, photoemission from strained GaAs activated to negative electron affinity (NEA) is a main source of polarized electrons for modern nuclear-physics and particle-physics facilities. Future experiments at advanced electron colliders will require highly efficient polarized electron beams which could provide high polarization and luminosity. This sets new requirements for photocathodes in terms of high quantum efficiency (QE) (>>1%) and polarization (~85%). The polarized electron source group at Thomas Jefferson National Accelerator Facility, Newport News, VA (Jefferson Lab) has been working on testing novel types of photocathodes, GaAsSb/AlGaAsP in particular. The purpose of the present project was to assemble a photocathode test chamber, use it to measure photocurrent and determine QE as a function of excitation wavelength, heat cycle temperature, and time and compare the results to the standard materials being used at Jefferson Lab. Photoemission curves were fitted by Spicer's three-step model. The model was also applied to fit the experimental data from GaAs grown via MOCVD on a thick GaAs substrate with intervening barrier layers. Least-squares fits of Spicer's three-step model parameters were obtained. It was found that GaAsSb/AlGaAsP provided QE ≈ 1% at λ ≈ 620 nm that did not depend significantly on the heat temperature. At the next stage of the research, the Monte Carlo model will be developed and compared to the experimental results. Detailed simulation and modeling of physics processes in photocathodes will be important for optimization of their design in order to achieve high QE and reduce depolarization mechanisms.

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Role of Endosymbionts in the Host Immune Response to Bacterial Infections

Despite impressive advances in the broad field of insect innate immunity, our understanding of the role of endosymbiotic microbes in the host immune response to pathogenic infections remains incomplete. The objective of this project is to explore whether endosymbiotic microorganisms cause functional changes in the immune system of invertebrate animals and to gain a more detailed and comprehensive grasp on insect defense mechanisms against bacterial pathogens. It has been postulated that endosymbiotic microbes alter the immune capability of the host by increasing its capacity to quickly detect and mount a response to the infection. If endosymbionts were able to enhance the insect immune system, I would expect to see decreased sensitivity of insects to pathogenic infection. Here, I hypothesize that the presence of endosymbiotic bacteria may improve pathogen surveillance. To investigate this, I use strains of the model insect Drosophila melanogaster containing a combination of two endosymbionts (Wolbachia pipientis and Spiroplasma pulsonii) to analyze the immune function in response to the virulent insect pathogen Photorhabdus luminescens. Methods include fly survival experiments, pathogen load assays, and immune gene expression tests. Results of such studies are of particular interest for improving fundamental knowledge on host-symbiont-pathogen interactions that can potentially be translated into economic benefits through the development of alternative strategies, such as transgenic approaches, for the efficient management of noxious insects.

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Decode Chromatin Folding by Small-Angle Scattering Studies of Tetrameric Nucleosome Arrays

Though chromatin is closely involved in fundamentally important DNA-directed processes, such as transcription, replication and repair, its conformation and dynamics remains unsolved despite decades of intense research. At the simplest level, chromatin can be viewed as a compacted array of nucleosomes, each consisting of ~147 bp of dsDNA wrapped around a protein core. These nucleosomes are connected by 10 to 90 bp of dsDNA resembling "beads-on-a-string." Key factors determining the packaging of nucleosome arrays to form chromatin include ionic condition, linker DNA length, and epigenetic modifications, especially of the histone tails. We have investigated how the conformations of model tetra-NCP arrays are modulated by these factors using small angle x-ray scattering (SAXS) and are now modeling these scattering results. Rigid body modeling (RBM) results have only produced high-quality fits for samples measured in the lowest ionic conditions. To supplement the RBM, we are developing an algorithm using SASMOL which will be able to produce large ensembles of DNA-protein complexes for structure modeling.

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NMR Studies Of Alpha4, an Important Protein Associated with Cell Growth and Cancer

BACKGROUND

Alpha4 (α4) is a key regulator of protein phosphatase 2A (PP2A) and MID1. The N-terminal domain of α4 (α4-N, residue 1-235) binds to the catalytic subunit of PP2A (PP2Ac), one of the most abundant enzymes in human cells that is directly involved in metabolism, cell proliferation, apoptosis, cell migration, and DNA repair. The C-terminal domain of α4 (α4-C, residue 236-339) interacts with MID1, a microtubule-associated ubiquitin E3 ligase that regulates the function of PP2A. The MID1- α4-PP2Ac complex modulates the functions of both PP2A and MID1. Objective: To understand the detailed mechanisms of how α4 interacts with PP2A and MID1 and regulates their activities, the molecular structure of α4 is studied by NMR spectroscopy

METHOD

To produce lots of proteins needed for the structural study, we inserted the gene for a4N and a4C into E.Coli bacterial cells. We then grew and purified 13C- and 15N- isotopically labeled α4-N and α4-C from the cells. Using the isotopic labeled protein, we acquired two- and three-dimensional NMR dataset that are important to identify all of the atoms of the protein. Results: We were successful in obtaining isotopically labeled proteins and acquiring multiple 2-D and 3-D NMR spectra for α4-N and α4-C. We are currently making assignment of the NMR signals that will allow us to identify all of the atoms, their protein backbone structure, and the tertiary structure. We are determining that the backbone structures of both domains are helical.

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Revealing the binding properties behind copper(II)'s anti-aggregative effect on human amylin

Islet amyloid polypeptide (amylin) is a 37-residue hormone that is co-secreted with insulin from the pancreatic β-cells. Studies suggest that human amylin can aggregate and contribute to type 2 diabetes mellitus (TD2M) by inducing β-cell death. The inhibitory effect of copper(II) on amylin toxicity has been recently discovered but little is known about the details of the interaction. In this study, circular dichroism (CD) spectroscopy and laser ablation electrospray ionization mass spectrometry (LAESI-MS) were introduced to further understand the molecular and chemical interactions between Cu(II) and amylin. Results from CD spectroscopy indicated that the accumulation of human amylin β-sheet conformations was blocked in the presence of Cu(II). LAESI-MS revealed that Cu(II)-amylin complex formation was dependent on time and Cu(II) concentration. The structure of Cu(II)-amylin complex was also studied by collision-induced dissociation using LAESI-MS/MS. The results suggested that the binding site of Cu(II) was within amino acid residues 18-25 (-HSSNNFGA-). Since histidine (His-18) is involved in the folding mechanism for toxic amylin aggregates, our data suggests that His could indeed participate in Cu(II) binding to amylin. This potentially mediates Cu(II)'s inhibitory effect on amylin aggregation and toxicity and is relevant to the progression of T2DM.

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BP1 Protein, a Transcription Factor, is Actively Secreted from Cultured Breast Cancer Cells Leading to Increased Proliferation in Breast Cancer and Normal Breast Cell Lines

BACKGROUND

BP1 is a homeobox gene that is normally expressed during early hematopoiesis. Homeotic proteins regulate the expression of multiple genes involved in development and differentiation. We have previously shown that BP1 mRNA and protein levels are elevated in 80% of women with breast cancer. Also, BP1 overexpression has been found to stimulate known oncogenes including Bcl-2 and c-myc. These genetic interactions lead to a decreased cell death and increased proliferation in cultured breast cancer cell lines. Objective. Our goal is to determine a possible mechanism of BP1 communication and demonstrate its effects. Methods. Levels of BP1 protein (pBP1) were detected in cell extracts (CE) and conditioned media (CM) using Western Blot analysis. Depleted media (DM), in which the pBP1 was removed, and recombinant BP1 protein (rpBP1) were used as controls. Cell viability was assessed using MTT assays. Real-time qPCR was used to measure expression of selected oncogenes. Finally, known amino acid secretion and internalization signals were compared between BP1 and other secreted homeotic proteins using statistical analysis. Results. pBP1 is secreted from breast cancer cells but not from normal breast epithelial cells. The addition of CM or rpBP1 to either breast cancer cells or normal cells increases cell viability and causes up-regulation of selected oncogenes. The amino acid sequence of pBP1 is homologous to consensus sequences of known homeotic proteins that are secreted and internalized. Conclusions. Our data suggest that secreted pBP1 stimulates tumor cell proliferation, consistent with immunostaining data from breast tumors. rpBP1 alone added to the media of breast cancer or normal cells can stimulate cell proliferation as well as expression of several oncogenes known to be targets of BP1.

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Developing an In Vivo Model for Amylin Toxicity

Type II Diabetes Mellitus (DM) is a prevalent metabolic disease that affects over 25 million people in the U.S. alone. The disease is characterized by the body's inability to regulate glucose levels in the blood. Normally, blood glucose is regulated via the pancreatic hormones, insulin and amylin, which are cosecreted. However, in patients with Type II DM, the body becomes resistant to the regulatory effects of insulin. In addition, the pancreatic cells which produce amylin and insulin die off. This process of cell death is largely influenced by amylin derivatives, or amyloids. Amyloids are also found to have toxic effects in the central nervous system where a mechanism of pathology is not defined. The goal of this research is to produce an in vivo model for amylin toxicity in the nervous system using a transgenic strain of Caenorhabditis elegans.

The first step of this project was to create the transgenic strain of C. elegans. This was achieved by injecting the C. elegans germ-line with a plasmid carrying the human amylin gene. The plasmid was made so that the human amylin gene would be expressed via a heat-inducible promoter. To demonstrate that the strain expresses the human amylin gene, western blots were performed after heat induction. The next step in the proteomic analysis of this strain is to perform western blots for the detection of amyloids and also to use Amplex® Red reagent to stain amyloids in living nematodes. Behavioral and anatomical characterization of any possible defects due to human amylin expression is another major aspect of this project. By performing behavioral assays and examining neuronal patterning we can quantify the effect of amylin toxicity in the nervous system of C. elegans. Thus far, western blotting has revealed that the transgenic C. elegans strain was successfully made to express the human amylin protein upon heat induction. With the strain now developed, behavioral and anatomical assays are underway. It is our goal that this transgenic line of C.elegans could serve as a high throughput platform to screen drugs to reduce the toxic effects of amylin in the nervous system.

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The striatum in the evolution of learned vocalizations: understanding the neurobiological precursors to human speech using a chimpanzee model

Speech is the 'default' mode of language. Despite its significance, the origins of the neural specializations underlying the human capacity to speak remain poorly understood. Research in songbirds, which, similar to humans, acquire their species-specific vocalizations through exposure to conspecifics, suggests that a striatum-forebrain circuit is implicated in vocal learning. The striatum is also a key site of expression of FOXP2, a gene associated with the evolution of speech and language, and appears structurally and functionally abnormal in individuals with a mutated form of this gene. While a role of the striatum in the evolution of speech has been proposed, support to this hypothesis chiefly comes from experimental species (i.e., birds, mice), which are evolutionarily distant from humans. However, increasing evidence indicates that non-human primates may exhibit some vocal learning capacities and can modulate the production and usage of vocal signals according to social experience. To explore the role of the striatum in the evolution of primate vocalizations, we examined differences in neuronal microstructure (i.e., neuropil fraction), and the expression of FOXP2 and synaptophysin (a protein associated with presynaptic functions) in the caudate nucleus and putamen of captive chimpanzees, who vary in their capacity to produce learned, voluntarily controlled vocalizations to attract the attention of an otherwise inattentive human experimenter (attention-getting vocalizations, AGVs). Results show a trend towards increased neuropil fraction in the caudate nucleus of the individuals who produce the attention-getting vocalizations (AGV+), compared to those who did not display this behavior (AGV-). Differences in FOXP2 and synaptophysin expression between AGV+ and AGV-individuals were also found in the putamen, although results fell short of significance. These findings suggest possible modifications in striatal microstructure for increased synaptic plasticity that may have been important in the emergence of motor and cognitive control for speech in humans.

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FTO Genotype is Associated with ALT Levels in Obese Adults

BACKGROUND

Non-alcoholic fatty liver disease (NAFLD) affects ~30% of the population in the United States and is often a co-morbidity of obesity. Risk factors for NAFLD include age, sex, ethnicity, obesity, insulin resistance, and metabolic syndrome. The hepatic enzymes aspartate aminotransferase (AST) and alanine aminotransferase (ALT) provide indirect biomarkers of liver health. The Fat Mass and Obesity Associated (FTO) gene is associated with obesity and codes for a nuclear dioxygenase that repairs alkylated nucleic acids through oxidative demethylation. Specific variants influence obesity-related metabolic and neuronal pathways and may also predispose some people to develop NAFLD.

OBJECTIVE

We tested for genetic associations between the FTO rs9939609 genotype and AST, ALT, and the AST/ALT ratio in severe to morbidly obese adults.

METHODS

Fasted blood samples were collected through venipuncture prior to bariatric surgery from 234 adults (32% male, 68% female; 79% White, 11% African American, 6% Hispanic, 1% Asian, and 3% Other) with a mean age of 40.1±13.7 and mean BMI of 44.3±6.8. Baseline levels of AST, ALT, and AST/ALT were measured using standard laboratory assays. DNA was purified from whole blood according to manufacturer protocol (Qiagen DNA Purification kit). Allelic discrimination of rs9939609 (T/A–ancestral) was performed using TaqMan® SNP genotyping assays (Applied Biosystems), with appropriate controls. Statistical analyses were completed on SNP genotypes using ANOVA modeling, adjusted for sex.

RESULTS/CONCLUSIONS

ALT was significantly associated with rs9939609 genotype using either a co-dominant (p=0.049) or recessive (p=0.013) model, with the recessive model providing a better statistical fit. TT individuals exhibited higher mean ALT (N=69; adjusted mean=0.168±0.004) than AA/AT individuals (N=165; adjusted mean=0.157±0.003), suggesting a protective effect of the ancestral A allele that resists hepatic injury in obese adults. Further investigation into the biochemical and molecular effects of FTO variants will help elucidate the mechanism by which FTO genetic variation protects against NAFLD.

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Resource selection and ecological niche of *Temnothorax curvispinosus* in the acorn-dwelling ant community of Eastern oak forests

BACKGROUND

Eastern oak forests are home to diverse ant communities that nest in fallen acorns on the forest floor. The ease with which these resources can be collected, measured, and manipulated, provides a highly tractable system to ask fundamental questions about how resource partitioning can facilitate species coexistence, and thus the maintenance of biodiversity. Here, we take the first steps in developing this study system.

OBJECTIVES

To quantify the properties and arthropod occupants of fallen acorns, and test the resource preferences of the most common acorn-dwelling ant species.

METHODS

First, we surveyed the acorn resource base using transect sampling, neighborhood sampling around ant-occupied acorns, and direct sampling of ant-occupied acorns. A suite of acorn properties were quantified for each acorn, along with the arthropod occupants. Second, we examined experimentally the moisture preferences of the most common ant species. The initial experiment provided colonies with artificial acorns that had 0, 2, 4, 6, and 8ml of water. A second experiment tested preferences across fewer options that covered the full moisture range encountered in nature: dry, moist, and saturated.

RESULTS

Considerable variation in acorn properties was identified within the fallen acorn resource base. Temnothorax curvispinosus was the most abundant ant species, and it was consistently found in red oak acorns with a 1mm beetle-hole, a dry interior, and a largely absent acorn seed. Colonies did not display a consistent preference across moisture levels ranging from 0ml to 8ml of water. However, they consistently selected the dry option in experiments that captured the full natural moisture range, concordant with our survey data.

CONCLUSION

Our preliminary results suggest multiple potential axes for resource partitioning within the fallen acorn resource base. Our first focal species, T. curvispinosus, shows highly specialized resource preferences, consistent with coexistence via resource partitioning. Ongoing work will test these resource preferences in a natural community context.

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The CCX gene ncx-9 regulates axon guidance in motor neurons of Caenorhabditis elegans

Calcium/Cation Exchangers (CCX) belong to the family of Sodium Calcium Exchangers and are low affinity, high capacity transporters, which couple extrusion of one Ca2+ ion with the influx of three Na+ or three Li+ ions. Humans encode one CCX called NCLX, which localizes intracellularly to the mitochondria and is expressed in all tissues examined. NCLX is an important regulator of neuronal physiology as it adjusts cytosolic calcium levels in response to action potentials, neurotransmission and synaptic plasticity. Dynamic adjustment of cytosolic calcium levels is also required in the axon guidance of developing neurons, however little is known about the cellular mechanisms that regulate this function. Here we find a novel role for the Caenorhabditis elegans CCX gene ncx-9 as a regulator of axon guidance and P-cell migration in ventral (VD) motor neurons and D-type dorsal (DD) motor neurons. Mutants of ncx-9 exhibit axon guidance defects in the GABAergic VD and DD motor neurons. Furthermore, we characterize the turning behavior of ncx-9 mutants and show that ncx-9 mutants have locomotion defects. Through RNAi assays and genetic mutant analysis, we demonstrate that ncx-9 works through the Netrin-mediated RAC signaling pathway. Attractive guidance of axons in mammals is influenced by Netrin-1 and BDNF, which induce membrane depolarization via activation of voltage dependent calcium channels (VDCC) and transient receptor potential (TRP) calcium channels. Steep Ca2+ gradients in axon growth cones result in attractive turning, where as shallow Ca2+ gradients induce repulsive turning. Despite knowing the mechanisms that influence axon growth cone guidance through transient and prolonged calcium fluxes, the mechanisms that fine-tune and adjust intracellular calcium levels during this process are still unknown. Through our findings, we demonstrate that the CCX may be important regulators of maintaining Ca2+ hemostasis levels in the developing axons of neuronal cells.

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Metabolic Investigation of Volume-limited Specimens by Capillary Electrophoresis Electrospray Ionization Mass Spectrometry

Determining the metabolome, which encompasses all metabolites in a biological system, holds important implications in basic and applied life sciences, but this goal is largely dependent on the development of next-generation bioanalytical technologies. There is a high, yet unmet need to make measurements compatible with different volume regimes, especially with samples that are precious or rare such as patient biopsies or small populations of cells. In addition, detection should address the high chemical complexity and dynamic concentration range of metabolites (e.g., millimolar to picomolar) that are present in biological samples. Here we present a custom-built analytical platform that combines volume-limited sampling and label-free identification of diverse types of metabolites. This advance relies on the combination of capillary electrophoresis (CE) and electrospray ionization mass spectrometry (ESI MS) for their respective advantages in separation and detection. In this presentation, we first demonstrate that our CE ESI MS platform is compatible with less than 10 nL sample volume, and then apply the platform to investigate the metabolome of single eggs of Killifish, an emerging model for gerontology. A systematic series of experiments showed that the detection limit of the platform was 18 fmol for amino acids, which was sufficiently low to measure naturally abundant metabolites in the egg. High-efficiency separation by CE and favorable limits of detection in combination with tandem MS helped the identification of a number of endogenous metabolites in the egg. Our current efforts are aimed at improving the analytical figures of merits and to apply the technique to metabolomics investigations. We anticipate that this versatile platform will help illuminate metabolomic changes linked to development and aging as well as an array of other topics that have important implications to human health.

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Functional characterization of Thioester-containing proteins in the Drosophila immune response against entomopathogenic nematode

Drosophila melanogaster is an outstanding model to study innate immunity processes and host-pathogen interactions. Flies are known to elicit specific immune reactions against different microbes but very few studies have focused on immune mechanisms against parasitic nematodes, which constitute one of the major threats to human health, causing diseases of major socioeconomic importance worldwide. Recent studies on the nematode parasite Heterorhabditis bacteriophora and its mutualistic bacteria Photorhabdus luminescens have started to investigate the fly immune response to nematodes carrying the bacteria (symbiotic worms), nematode lacking the bacteria (axenic worms) and the bacteria alone. Thioester-containing proteins (TEPs) have been previously found to participate in the insect immune response to bacteria and protozoa parasites. In insects they act as opsonins, binding to the surface of microorganisms and promoting their phagocytosis or encapsulation. Although there is a plethora of information on the function of mosquito TEPs against Plasmodium parasites and some bacteria, there are only a few studies on the potential immune function of Drosophila TEPs. Here we discuss the potential role of TEPs in the immune response of Drosophila against infection with the bacterial pathogen P. luminescens. We have infected wild type and TEP mutant flies with P. luminescens and recorded the survival rate and bacterial load at several time-points after infection. We observed that specific TEP mutants survived longer the infection of P. luminescens compared to their wild type controls for the first few hours post infection. We propose that these proteins may participate in the Drosophila antibacterial defense through an unidentified mechanism. Further studies will focus on infection of flies with the nematode parasites. Results from this research will advance the field of invertebrate immunity because it will potentially unravel the molecular and functional basis of novel antibacterial and anti-nematode factors in insects.

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Comparison of electron and muon scattering on proton

In this paper, we compared elastic scattering of the electron and muon on proton. These reactions are very powerful tool to investigate proton because proton, as a hadron - particle of strong interaction, does not influence electron and muon properties in a very wide range of energies. Cross-sections for these scattering were obtained by introduction into the theory a hadron current as a phenomenological quantity. This quantity includes the concept of electromagnetic gauge invariant form-factors that describe the spatial distributions of electric charge and current inside the nucleon and thus are intimately related to its internal structure. The necessity to introduce these concepts is due to the fact that the hadron electromagnetic interaction cannot be described explicitly because of the lack of knowledge about the nature of the strong interaction. In the present paper, we considered the cross-section for the ultrarelativistic electron scattering - the case, when we could neglect the mass of electron. On the other hand, while considering the muon scattering, we had to take into account its mass. This analysis prepares us for future estimations of radiative corrections for the muon-proton scattering process. Finally, the reason we did this research is to get insight into the nature of a proton charge radius puzzle. Recent research on this problem provided different results. Two methods of measuring proton radius (by measuring its energy levels using hydrogen spectroscopy technique and by using electron scattering experiments) provided the result of 0.8768±0.0069 fm, whereas the experiment that used muonic hydrogen predicts the radius to be 5% smaller. Thus, a new MUSE experiment that is aimed to measure proton's radius by muon scattering was proposed. This experiment should provide data that can explain this puzzle.

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Gene Pathway selection using group lasso regularized logistic regression

Single nucleotide polymorphisms (SNPs) are the most frequent type of genetic variation between individuals, and represent a promising tool for finding genetic determinants of complex diseases. SNPs are commonly used in genome wide association studies (GWAS) where the goal is to find SNPs associated with the disease. However not the significant SNPs themselves, but their effect on the protein structure or their impact on functional sites at the protein or DNA level is a key factor for understanding the mechanisms underlying the disease. Hence, the functional consequences of SNPs are better appreciated if the evaluation is performed at the biological system level, for instance by determining their effect in the context of genes set or signaling pathways. In this study, we propose a new method to uncover the association between disease status and SNPs which are grouped into gene pathways.. Our method uses overlapping group lasso regularized logistic regression to model the joint effects of SNPs and to select key explanatory SNPs at the group level. We use resampling techniques to rank the pathways and then SNPs within pathways in the order of their significance. Our ranking approach allows the presence of overlapping groups. We use data collected as part of The Study of Addiction: Genetics and Environment (SAGE) to demonstrate the use of our methodology. The overarching goal of the data analysis is to identify novel genetic factors that contribute to addiction through a large-scale genome-wide association study of DSM-IV alcohol dependent cases and non-dependent, unrelated control subjects of European and African American descent.

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Did Tool Use Come Before Archaeology?

In this contribution, I review the latest results of a novel field of research, Primate Archaeology, and discuss its current directions. The discipline has already produced significant results, supporting the success of this approach (e.g. Carvalho et al. 2008, 2009, 2012, 2013). This is a highly interdisciplinary research: we study wild chimpanzees in West Africa that customarily use stone tools (hammer stones, anvils) via applying archaeological methods, and we compare these data with the earliest human stone tool assemblages in East Africa. Ultimately, we seek to understand how we, modern humans, evolved to depend so heavily on technology and what (if anything!) remains unique to human material culture. Presently, one human species uses tools (Homo sapiens) and, at least, four species of non-human primates are proficient tool-users (Pan troglodytes, Pongo pygmaeus, Sapajus spp., Macaca fascicularis). Some modern primates using tools are phylogenetically distant from our lineage (e.g. Sapajus, 35 Ma [million years ago]), suggesting that technology emerged in multiple species, across space and time. The oldest tools date from 2.6 Ma, when several species of human ancestors co-existed. However, until recently, we linked the advent of technology with the genus Homo, and did not investigate other possible tool-users or the presence of material records in Pliocene deposits (older than 2.6 Ma). Are we missing the earliest tools where otherwise we have an abundant fossil record? Can we make a collective sense of the information yield by human and non-human primates using stone tools? We predict that older technologies than the ones currently known are missing from the archaeological record due to a combination of lack of surveys, lack of analytical methods to recognize technologies of humans and non-humans, and little interdisciplinary research focusing on tool-use behavior in living apes as a proxy to identify the missing records.

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Inelastic Compton Scattering on the Deuteron in χEFT and Neutron Polarizabilities

The interaction of nucleons, of which most of everyday matter is made, cannot be described using fundamental particle physics theory - quantum chromodynamics (QCD). While QCD describes high energy phenomena explored at huge experimental facilities like LHC/CERN, for lower energy physics, where the nucleons are the relevant degrees of freedom, it becomes highly non-linear. Thus, effective theories that use differences in energy hierarchy as parameter of expansion are used to describe hadronic interactions perturbatively. In this work, we use χEFT to analyse inelastic Compton scattering on the deuteron, γd->γnp, for two reasons. Firstly, we will be able to extend the applicability of the theory to treat all Compton data - elastic and inelastic in a consistent and model independent framework that the theory is. Secondly, this channel provides access to γn->γn that is used to compute polarizability coefficients of the neutron. Polarizability coefficients are fundamental quantities of a particle, much like mass or charge, that describe how stiffly or loosely its charge distribution reacts when probed by external electromagnetic field. This presentation discusses current differential cross section results for initial photon energy ranging from 100-400MeV and the orders in χEFT that the computations are performed.

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Experimental Determination of Optical Band Gaps for Soot in Nitrogen-diluted, Ethylene/Air Non-premixed Flame

Visible light extinction was measured at the full range of heights in a nitrogen-diluted, ethylene/air, non-premixed flame and this data was used to determine the optical band gap, Egopt, as a function of radial position. This work builds on recent Raman and optical band gap studies in our lab, which provided experimental support to the model of soot formation where the transition from chemical to physical growth starts with species with molecular masses of only several hundred Daltons. In the current study, light from a SuperContinuum light source is collimated, expanded, and directed into a monochromator. The dispersed light is split into a power metering channel and a channel that is periscoped and focused into the flame. The transmitted light is then recollimated before the detector. After tomographic reconstruction of the radial extinction field, the optical band gap was derived from the near edge absorption feature using Tauc analysis. This approach was repeated at heights from 1.0 to 4.5cm above the burner, showing evolution in the optical band gap throughout the flame. Observed optical band gaps span the range from 1.96eV to 2.37eV, where lower band gaps are observed in regions of the flame with the largest soot concentration. Comparing these results to previously published computational results from our lab relating calculated HOMO-LUMO gaps for a variety of D2h PAH molecules to the number of aromatic rings in the structure, showed that the observed optical band gaps are consistent with PAHs between 10 and 17 rings in size or a conjugation length between 0.8 and 1nm. This result agrees with the lower edge of the PAH sizes reported in our recent Raman work that suggest 1.0 – 1.2nm conjugation lengths. These results are consistent with PAH condensation beginning with species about the size of circumpyrene.

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Species Measurements in a Nitrogen-Diluted, ethylene Air Diffusion Flame using Direct Sampling Mass Spectrometry and Tunable Diode Laser Absorption Spectroscopy

Tunable Diode Laser Absorption Spectroscopy combined with extractive sampling is used to quantify acetylene and fuel concentrations in a 32% ethylene diluted in nitrogen diffusion flame. Additional major species concentrations are determined using quartz microprobe, direct-sampling mass spectrometry. Quantification of these mass spectra used a multilinear regression technique anchored by computed nitrogen and ethylene concentration profiles from a simulation performed by collaborators at Yale University. Because of the overlap in mass spectra features for ethylene, nitrogen, and carbon monoxide, both optical and mass spectrometric techniques are required to determine the full suite of major species in this flame system. Good agreement is observed between these experimental measurements and the numerical simulation of this flame system. Probe clogging in these sooting flames remains a challenge for all probe techniques and additional non-intrusive optical diagnostics must be applied to characterize the sootier flame regions.

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Ambient Molecular Imaging by Laser Ablation Electrospray Ionization Mass Spectrometry with Ion Mobility Separation

Mass spectrometry imaging (MSI) by laser ablation electrospray ionization mass spectrometry (LAESI-MS) enables the spatial characterization of molecular distributions in untreated biological tissues. However, direct sampling and ionization in LAESI MSI limits the differentiation of isobaric ions (e.g., structural isomers) in a complex sample. Ion mobility separation (IMS) of LAESI-generated ions is sufficiently fast to be integrated with the MSI experiments. In this report, we present a new imaging technique by integrating LAESI-MSI with IMS. LAESI-IMS-MS imaging was performed with a three-component system, including the ionization source, the automated translation stage, and the data acquisition system. Ionized molecules produced at each pixel on the tissue were analyzed by a high performance quadrupole time-of-flight mass spectrometer. Plant tissues, e.g., Ivy-leaved geranium leaves, were imaged at a spatial resolution of 200 μm. In LAESI-IMS-MSI, a multidimensional dataset of m/z, drift time (DT), ion intensity, and spatial coordinates was collected. Figure 1 shows the imaging of metabolite distributions in an ivy-leaved geranium leaf. The flavonoid ion with m/z 625.185 is absent in the vein region. In addition, separation of isobaric ions over DT reduced the chemical interferences and allowed separate imaging of these ions.

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Determining the age of blood stains using reflectance spectroscopy

The objective of this study is to generate preliminary data for the development of a non-invasive device able to date bloodstains at crime scenes. Such a tool would greatly benefit crime scene investigators by enabling them to prioritize sample collection and further testing allowing for faster crime scene processing ultimately resulting in increased public safety. Prediction of the age of a bloodstain is based on the principle of reflectance spectroscopy, which identifies the change in the chemical composition of blood as it ages. Samples were prepared by spotting approximately 6 blood drops on a white 100% cotton cloth from a T-Shirt which created a stain of approximately 0.5 inch diameter. The spectral reflectance measurements were performed using an Ocean Optics spectrometer (USB 4000) with the reflection probe in a fixed position, under controlled conditions. The real time spectrum was visualized using the SpectraSuite software. The light source used to for illumination was an automated 60W LED light source that was software controlled for exposure times and synchronized with the data acquisition system to minimize light exposure. After processing the data, a normalized reflectance curve was computed by calculating the ratio of the sample spectra to the reference spectra. Results reveal that a sample set of 10 blood stains, run over a period for approximately 60 days shows a distinct time-dependent behavior supporting the assumption that inferring the age of a bloodstain is possible.

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Robust Small Area Estimation for the Annual Survey of Public Employment and Payroll

The Annual Survey of Public Employment and Payroll (ASPEP) is conducted by the U.S. Census Bureau to collect data on federal, state, and local government civilian employees and their gross payrolls. Small area methods are used to estimate local government totals for each combination of state and government function, where functions range from air transportation to water supply. The composite estimator used during the 2009 sample design is based on an implicit model and equals the weighted average of direct and ratio synthetic estimators. In this study, we examine ad hoc adjustments that were made to ensure final estimates met certain quality control checks and identify several areas for improving the overall small area methodology. We evaluate the performance of the composite estimator using a Monte Carlo simulation and investigate explicit area-level models fit using Bayesian methods that try to address the quality control checks in a more unified and generalizable way. These models consist of the well-known Fay-Herriot model and robust extensions involving t-distributed errors that provide limited translation. We present preliminary results for select states and outline future research. Public-use micro-data from the 2011 ASPEP and the 2007 and 2012 Censuses of Governments are used in this study.

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Testing for Gene-Environment Interaction in Gene-Environment-Wide Association Studies when Environmental factor is continuous

In the genome-wide association studies (GWAS), researchers have been mainly focusing on the main effects of the genetic variants, e.g.—single nucleotide polymorphisms (SNPs) on the disease. However, sometimes significant effects of SNPs are detectable only in subpopulations defined by environmental factors. Hence, in contrast to GWAS, the goal of gene-environment-wide association studies (GEWAS) is to provide means for better understanding of the gene-environment interplay leading to increased risk of disorders. The objective of our GEWAS study is to identify novel genetic factors whose contribution to addiction is modifiable by the amount of excess body fat through a large-scale genome-wide association study of DSM-IV alcohol dependent cases and non-dependent, unrelated control subjects of European and African American descent. When environmental variable is continuous as Body Mass Index (BMI) in our study, it is important to correctly specify the functional form of its relationship with the risk of disorder. Because the model misspecification may lead to a biased test statistic for interaction, loss of power and a dramatic inflation of Type 1 error rate. Here we modify the existing two-step approach for the presence of continuous environmental variable. Specifically, our testing procedure assumes a reasonable parametric conditional distribution of environmental variable and its functional relationship with the risk of the disorder. We apply our methods to the data collected as a part of The Study of Addiction: Genetics and Environment (SAGE).

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Extracts of M. charantia affect hookworm motility and mortality

Extracts of M. charantia affect hookworm motility and mortality Hookworm infections affect an estimated 740 million people worldwide in mostly Africa, Latin America, Southeast Asia, and China. Ingesting blood and other nutrients in the small intestines, hookworm infection contributes considerably to anemia from blood and protein loss and most severely affects pregnant women and children. There are several problems with current strategies of control and treatment of hookworm infections, including the cost of pharmaceutical anthelmintics, the effectiveness of the mass drug administration campaigns against constant reinfection, and the potential development of anthelmintic resistance. There is no current mass produced hookworm vaccine. It would be beneficial for those living in regions where hookworm is endemic to have access to an inexpensive, widespread anthelmintic for the treatment of infection. The bitter melon plant, Momordica charantia is well known for its many uses in folk medicine and is endemic everywhere hookworm is. Significant to this study, it has been shown to irreversibly inhibit feeding in hookworm larvae. Our objectives were to assess the effects of M. charantia on adult and larval motility and adult mortality using the xCELLigence system and mortality assays. Aqueous extracts were prepared from dried leaves of locally grown M. charantia. Mortality assays involved isolating adult hookworms from Syrian golden hamsters, and soaking the worms in an incubation medium infused with varying concentrations of M. charantia extract. Quantifiable motility assays were performed in the xCELLigence system, normally used for measuring cell growth using impedance. Raw cell index data was converted into a motility index that was used to compare levels of movement in the worms (adults and L3) treated with the plant extract and those not treated. Extracts of L. sativa (common lettuce) were used as a negative control. Larval motility assays showed significant difference in motility between treated and untreated worms (untreated worms moving faster and more frequently). Adult motility/mortality assays also showed difference in motility between treated and untreated adults, with treated adult worms dying within 24hr. Worms treated with L. sativa extract were unaffected. At working concentrations, M. charantia extract negatively affects motility in hookworm L3, and both motility and mortality in adult hookworm. Future research will include fractionating the plant extract and determining which compounds have activity on hookworm.

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The role of magnetic fields in producing nature's biggest explosions

My field of study is gamma-ray bursts, the brightest explosions in the universe. Gamma-ray bursts are born out of the collapsed inner core of massive stars or from the merged remnant of two neutron stars. These progenitors launch jets with speeds close to the speed of light and are testbeds for extreme physics relevant in the study gravitational waves, cosmology and the physics of shocked plasmas. A crucial question is in what form energy stored and released by these jets. Is it in ordinary matter or perhaps in strong, tangled magnetic fields? To understand this behavior, we use observations from space borne observatories together with the radio telescopes of the Very Large Array. We model the emission following the gamma-ray burst with electrons radiating in magnetic fields. We pay particular attention to the interaction of the jet with the matter around the parent star, which drives shock waves into the interstellar matter and the jet material. We are interested in the latter. During this ongoing project we will calculate the radiation properties of the shocked jet material at radio frequencies by which we will be be able to infer the extent to which the energy is carried by magnetic fields.

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LIGO GRB searches in the advanced detector era: A cross-correlation search for intermediate-duration GRBs

Gravitational Waves (GWs), ripples on space-time predicted by Einstein's theory of general relativity, have never been observed directly. But starting from 2015 the Laser Interferometer Gravitational wave Observatory (LIGO) will likely provide the first experimental evidence of these elusive signals. Searches for this evidence depend largely on the expected properties of the signals in question. For those GWs whose signal properties are believed to be well understood, we use highly sensitive but strictly model-dependent searches. For those that we lack any a priori knowledge, we employ less sensitive but more robust detection techniques. We report here on the ongoing development of a novel search method designed to look for GW signals that fall between these extremes. The resulting approach is one in which the sensitivity and robustness can be tuned based on how much we know about the signal. This technique is not beholden to a specific model and will provide a path to search for GW signals for which the traditional searches are not well suited, including those that may be emitted during some of the most energetic stellar explosions in the universe: Gamma-Ray Bursts (GRBs). The detection of these signals, besides proving directly Einstein's theory, would allow us to answer some of the most intriguing questions on the nature of GRB progenitors.

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Towards Green Synthetic Methods for Synthesis of Amine-based Drugs: Hartwig Amination with Recyclable Catalysts

The synthesis of many amine-based drugs relies on a critical coupling reaction between aryl halides and amines. The traditional catalyst is expensive and involves precious transition-metal complexes of palladium with air-sensitive ligands. We are interested in developing catalysts for this useful transformation that are air-stable, recyclable or do not use precious metals. We show progress towards the optimization of such catalysts using cheap clays (hydrotalcites) as catalyst supports, which are impregnated with silver nanoparticles or immobilized palladium chloride homogeneous metal complexes. This study focuses on reactions involving iodobenzene and p-anisidine and their reactivity with the modified hydrotalcite catalysts.

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Synthesis of Novel Iodoisohistamine as Potential Antimalarial

The human tragedy and adverse socioeconomic impact of malaria on developing countries is well documented and its treatment and eradication remain vital to the future of these countries. The advance of drug resistant pathogens is a threat to the successful eradication of malaria. Resistance to traditional quinolone medications has rendered them ineffective and the new generation of artemisinin medications is under threat of the same fate. The necessity of new antimalarials has driven our research into the synthesis of a novel iodinated isohistamine compound, which is believed to cripple proteins essential to the malarial parasite's survival. Our research has focused on constructing the compound by two routes. These routes are based on constructing either the imidazole ring with its side chain or adding the ethylamine portion of the compound to the heterocyclic ring. We have been successful in synthesizing intermediates along this path and we will evaluate the success of each path by the difficulty and product yield. The compound's antimalarial activity will be evaluated at the NIH.

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Reconstruction of ancestral genomes in presence of gene gain and loss

One of the key computational problems in comparative genomics is reconstruction of genomes of common ancestors for genomes of living species and the evolutionary history (sequence of genome rearrangements such as reversals, translocations, fusions, and fissions) between them. In rearrangement-based approaches (particularly employed by the MGRA tool earlier developed by Dr. Alekseyev), ancestral genomes are reconstructed by minimizing the number of rearrangements along the branches of the phylogenetic tree. Such methods are traditionarily restricted to genomes with equal gene content, i.e., each gene is present in every genome in exactly one copy. In reality, different genes may be missing in different lineages. In fact, as the number of genomes grows, the number of genes shared across all these genomes decreases substantially. On the other hand, genomes that share more genes are likely to be evolutionarily closer to each other. Thus, revealing gene insertion and deletion evolutionary events (indels) plays an important role in understanding relationship between multiple genomes. We present a tool MGRA2 that extends MGRA to support indel operations. MGRA2 not only organically incorporates indels into the rearrangement analysis of multiple genomes but also generalizes algorithms employed by MGRA and make them applicable to "hard" genomic datasets inaccessible for MGRA and similar tools. To evaluate the performance of MGRA2, we conducted two sets of experiments for real and simulated genomes and compared the results of MGRA2 with other existing methods, including GapAdj and PMAG+. These experiments demonstrated supremacy of MGRA2 in all comparisons.

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A recombineering approach to evaluate the cis regulatory region of a Sp185/333 gene from the purple sea urchin

Host-pathogen interactions drive the development and evolution of diverse immune systems. The purple sea urchin, Strongylocentrotus purpuratus, has a complex innate immune system in which expression from one large gene family, known as Sp185/333, is upregulated upon immune challenge in both larval and adult sea urchins. There is an estimate of 40 - 60 members of the Sp185/333 gene family, each of which is composed of two exons and show significant sequence variations. Little is known about how these genes are regulated or the elements responsible for this regulation. A cluster of six of these genes, named after the colors of the rainbow, are clustered within a bacterial artificial chromosome (BAC). We will target the purple gene in this cluster to address the question of how these genes are regulated and in what cells this gene regulation occurs during S. purpuratus development. Through BAC recombineering techniques, the first exon of the purple gene will be replaced with sequences encoding green fluorescent protein (GFP) and the second exon will be replaced with mCherry. To date, GFP constructs are being tested to determine whether it has been properly inserted into the first exon of the purple gene. Once the location of the GFP and mCherry insertions has been confirmed, the recombineered BACs will be injected into sea urchin eggs, which will develop into larvae and be immune challenged by co-culture with marine bacteria. Larval expression of GFP will indicate that the purple gene does in fact have a functional regulatory region that controls its expression. If the presence of a regulatory region is confirmed future work will focus on identifying the exact location of this regulatory region within the BAC and predict the transcription factors that are involved.

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Cluster Prediction: A Spatio-Temporal Model

Spatial formation of clusters in natural, physical and social sciences is a common phenomenon. Traditional spatial methods have predominantly focused on interpolating within space yet as computing power increases more comprehensive models include time-elements. The resulting constructions are non-trivial as significant computational and modelling problems arise; in particular, identifying appropriate time dynamics and their interaction with underlying spatial processes. To this end, our paper explores the construction of a dynamical spatio-temporal model which predicts formation of marked clusters over the short-term. Our current methodology combines Bayesian hierarchical methods and stochastic differential equations to identify latent intensity factors which govern the point generating process. The research is ongoing and preliminary analysis for the appropriate space-time correlation structures is being explored. We apply our methodology to predicting the time and place of neighborhood formation and demonstrate that their interaction along with marked point processes help identify socio-economic change across time. Additional areas of application within ecologically driven processes include epidemic and migratory pattern modelling.

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Comparing parasitism rates between social and solitary nests of the bee Megalopta genalis.

Bees are subject to attack by parasitoids that invade brood cells in the nest and consume the offspring developing in that cell. At the end of development, the mature parasitoid offspring, rather than the bees' own offspring, emerges from the nest cell. Protection from such parasitism may be a benefit driving the expression of social, rather than solitary, nesting behavior, and thus influence the evolution of cooperative social groups. Here we test this hypothesis for the first time using the facultatively solitary or social bee Megalopta genalis. We collected >800 nests from the forest of Barro Colorado Island, Panama, and reared the developing offspring and any parasites to maturity. Nests were parasitized by the mutilid wasp Lophostigma cincta, the Rhipiphorid beetle Macrosaigon gracilis, and the specialist congeneric parasitoid bee M. byroni. Overall parasitism rates were extremely low (< 5%) compared to other species of bees (typically ~20%). Social nests may be less susceptible to parasitism because they are never left unattended, whereas solitary nests are unguarded during foraging. We will test this prediction by comparing parasitism rates of offspring reared from social vs. solitary nests. If social nests suffer less parasitism, this will be the first demonstration of reduces parasitoid attacks on offspring as a selective benefit for living in cooperative groups rather than nesting solitarily.

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Computable Orders of Algebraic Structures

Orderable structures have been studied in mathematics since Dedekind, Hölder, and Hilbert, and are of great importance in algebra, geometry, and logic. A structure with a single binary operation is left-orderable (or right-orderable) if there is a strict linear order on its elements, which respects the algebraic structure. We use constructive methods to computably encode information about these orders into a natural geometric structure called a tree. Computable orders are those for which there exist algorithms requiring no external knowledge to compute them. Non-computable orders are further classified into an infinite hierarchy, based on the amount of external knowledge needed to perform the computation. This level of external knowledge is called the Turing degree. The method we use creates a correspondence between infinite paths in computable trees with orderings of an algebraic structure. By exploiting the tree geometry on the orderings of algebraic structures, we investigate the computability theoretic result that these orders can be found in every Turing degree above a certain fixed degree. This shows that there are, counterintuitively, computable trees without any computable paths, hence computable algebraic structures without any computable orderings.

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A Change of Pace: Evaluating the Effects of Trauma on Long Bone Strength

Living bone is a dynamic material, able to heal major injuries and respond to changes in demands with new growth. Traumas, which prohibit normal use of the effected limb, alter the gait and loading pressures exerted on long bones during locomotion. This research investigates the subsequent bilateral asymmetry in bone strength and organization. This study used peripheral quantitative computed tomography (pQCT) to scan the lower limb bones of lower limb amputees (n=3) and individuals (n=15) who had suffered severe fractures to the femur or tibia. The skeletons are part of the Robert J. Terry Anatomical Skeletal Collection of human remains at the Smithsonian Institution. The mid-shaft and femoral neck cross sectional shape for each individual's long bones (bilateral tibia, femur, and humerus as available) provide data for bone strength index of torsion and rigidity of the shaft, and cortical bone density. The scans of these individuals are compared to those of a control group of twenty individuals of the same sex and age. From this data we extrapolate the effect of the trauma and recovery on bone remodeling, demonstrating differences in load bearing use of the limbs. Although this research is still in progress the hypothesis predicts that the compromised limb bone will show decreased bone strength values compared to the whole bones, which may compensate with altered biomechanics during gait. Low bone density is also expected in the compromised side due to high rates of turnover, resorption, and remodeling. This research aims to promote a better understanding of bone remodeling and plasticity, as well as responses to trauma in human gait patterns and potentially open new avenues for investigation into recovery and rehabilitation research.

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Long-term observations of active-layer thickness and landforms in northern Alaska

Over the past 19 years (1995-2013) the Circumpolar Active Layer Monitoring (CALM) program has conducted extensive field observations at spatially oriented 1 km2 sites distributed across the Arctic Coastal Plain and Arctic Foothills physiographic provinces on the North Slope of Alaska. These data are used to examine the spatial and temporal variability of the active layer above the permafrost and its relationship to landscape-specific parameters including landforms, land cover, and organic layer thickness. Observational records indicate that active-layer thickness (ALT) exhibited a pronounced interannual variability without significant trends over the study period for all of the sites. However, each landscape unit is characterized by distinct sensitivity of the active layer to climatic forcing, resulting in different landcover-specific trends. This presentation demonstrates that there are significant differences in ALT in relation to characteristic tundra land cover units and landforms. The close correspondence of spatial variability in the ALT to that of different land cover units for the studied sites suggests that the spatial variation of vegetation can be used as a good indicator for ALT over larger areas. The methodology presented here can facilitate future spatially oriented CALM investigations in similar environments throughout the Arctic.

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CDK5-KLF4-Autophagy a Novel Pathway Compensating Proteosomal Inhibition in Multiple Myeloma

Kruppel-like factor 4 (KLF4) is a transcription regulator shown to act either as an oncogene or tumor suppressor in various cancers. The nature of its controversial behavior is not completely understood. KLF4 is involved in reprogramming e.g. the ectopic activation of stem cell phenotypes. We set to explore whether KLF4 contributes to the cancer stem cell-like phenotype particularly focusing on drug resistance, which is a major and well-characterized property of stem cells. In this study, we examine the role of KLF4 in multiple myeloma resistance to carfilzomib. Carfilzomib belongs to a class of drugs known as proteasome inhibitors, which kill cancer cells by blocking proteasomes that are responsible for protein turnover within the cell. Although this is currently the best treatment available, drug resistance is still seen in many patients. Expression profiles of myeloma samples have revealed high levels of KLF4 gene expression in samples with the worse prognosis suggesting the possible involvement of KLF4 in drug resistance. To test this hypothesis, we have generated carfilzomib resistant myeloma cell lines. We examine multiple isoforms of KLF4, which have not been previously studied and have found that RNA and protein levels of this gene are elevated in cells that exhibit carfilzomib resistance. Overexpression of KLF4 caused similar changes on expression levels indicating that KLF4 contributes to drug resistance on the molecular level. However, cell viability assays following carfilzomib treatment indicated that simply overexpression of the factor is not sufficient to provide drug resistance. Microarray profiling of the carfilzomib resistant derivatives indicated involvement of Cyclin-dependent kinase 5 (CDK5). Importantly, we found that small molecule inhibitors of CDK5 decrease drug resistance. Furthermore, in transient transfection experiments we found that CDK5 regulates KLF4 dependent transcription. In an attempt to understand the downstream mechanism of CDK5-KLF4 axis contributing to carfilzomib resistance we focused on bioinformatics analysis of KLF4 target genes. Among them we found important regulators of autophagy. Our current hypothesis is that CDK5-KLF4-mediated activation of autophagy is a potential compensatory mechanism for proteasomal overload in resistant cells. To support this, we have found that carfilzomib resistant cells show higher levels of autophagy and importantly, autophagy inhibitors decreased drug resistance. Resistance to chemotherapy is the main reason why multiple myeloma is currently incurable. The results of this study will provide insight into the role of KLF4 in multiple myeloma and contribute toward development of personalized treatment for patients with the worst form of this disease.

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Application of Anthropological and Biochemical Methodologies for Estimation of Age and Sex

In the analysis of forensic cases, a positive identification of an individual is critical to the investigation. In order to make a positive identification, several components such as age and sex are considered. In children, age estimation methodologies are based on dental formation and skeletal development. In adults, it is more difficult to determine the age because it can be affected by endogenous and exogenous factors as well as pathological conditions. However, there are several techniques to estimate age. One of these methodologies uses teeth because they are the most durable tissue in the body. The aim of this project is the estimation of the age from teeth using anthropological techniques based on Lamendin variables and biochemical techniques using mitochondrial mutations and to compare the accuracy of these two methodologies.

Samples of molar teeth from Madrid, Spain will be measured and analyzed on the factors of: root translucency, periodontosis height, and root length. These three variables will be included in a new anthropological formula for age estimation in molars.

The second step is the biochemical methodology. For that purpose, mutations in the mitochondrial DNA of dentin from these teeth will be analyzed. It is expected that adults will have more mutations than juveniles, leading to the development of a formula for age estimation in this population. In addition, genomic DNA and Amelogenin markers will be used to determine sex.

As stated above, it is required that forensic experts can prove beyond a shadow of a doubt that the person they have identified is who they are looking as it is a legal matter. This project assesses two different methodologies for age estimation to improve the chance of positive identification in forensic analysis. Although one method is more accurate, it is important to use a combination of methods, when possible, in order to best identify a person.

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The Nationalization of Local Campaigns and its Efficacy as a Campaign Strategy

This thesis examines the "nationalization" of non-federal political campaigns. Nationalization presents empirically when a campaign for a local or state office employs a messaging strategy which invokes the name or likeness of a federal politician or a particular federal policy. Nationalization can be either positive (supporting the national politician or policy) or negative (opposing the national politician or policy) and is delivered to voters through any of the common campaign messaging tactics such as direct mail or mass media advertisements. In order to analyze nationalization and its effectiveness in local campaigns, this thesis employs a mixed methodology of both qualitative and quantitative examination. The thesis introduces the strategy in an anecdotal fashion by providing a qualitative examination of four case studies. Following the case studies is a deep analysis of the nationalization of local campaigns through data collected from a directed survey in strument, which was developed in the Qualtrics Survey Software and deployed via e-mail to general political consultants across the nation. The qualitative analysis continued in depth utilizing the survey data to answer three questions: 1. Is nationalization in a trend?, 2. Is nationalization increasing?, 3. Why are local campaigns nationalizing? Survey data was also used to quantitatively determine the efficacy of nationalization in local campaigns; that is, to answer the question "Do campaigns increase their vote share by nationalizing?" To determine efficacy, known nationalized elections were compared to three historical elections for the same position and to contemporaneous elections for similar positions. The results from nationalized elections were compared to these other elections by two t-tests. Results of the data indicate that nationalization is, in fact, a growing national trend with campaigns in 36 states from every region being nationalized. It was also determined that nationalization has been on the rise in the past few years but will likely level off over the coming years. The leading reason for nationalization was the popularity or unpopularity of the federal politician or policy invoked. T-test results proved with statistical significance at the .01 level that nationalized races increased their vote share over both historical and contemporaneous elections. The research concludes that nationalization of local elections is a widely used and likely effective campaign strategy for non-federal races. These findings, while not generalizable, offer several implications for scholars and political practitioners. And because this thesis is the first to examine the phenomenon of nationalization, copious opportunities for future research exist.

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The Relationship between Chronotype, Conscientiousness, and Exercise Frequency

BACKGROUND AND PURPOSE

Interventions to increase physical activity have had limited success in promoting long-term maintenance. To improve interventions, it is important to study individual differences that may affect initiation and long-term maintenance of physical activity. We propose that chonotype, the time of day at which an individual's alertness and energy are greatest, may predict physical activity, because morning people have more energy in the morning, and it is likely that physical activity is easier to maintain in the morning due to relatively fewer barriers arising in the morning. We propose two hypotheses. One: a basic relationship exists between chronotype and exercise. Evidence of this in the literature is limited to one sample of adolescents (Schaal et al., 2010). Two: conscientiousness will explain the relationship between morningness and exercise frequency. Literature indicates that morningness is associated with conscientiousness (Tsaousis, 2010) and conscientiousness is associated with greater physical activity (Conner et al., 2007).

METHOD

University students and staff (n=126) completed online questionnaires measuring chronotype and conscientiousness and reported their physical activity (verified with daily diary entries and accelerometer readings) one month later. Chronotype was measured on the Composite Scale of Morningness. Conscientiousness was measured using the Big 5 Domain items from the International Personality Item Pool (Goldberg et al., 2006). Exercise frequency was measured with an item that assessed the number of weekly exercise sessions in the subsequent month.

RESULTS

Supporting the first hypothesis, morningness was positively related to exercise frequency in the first step of the hierarchical linear regression ($t(125)=3.46$, $p<0.01$). Counter to the second hypothesis, morningness remained a significant predictor when conscientiousness was added to the regression ($t(124)=2.671$, $p<0.01$). Interestingly, conscientiousness did not predict significant incremental variance in exercise frequency to morningness ($t(124)=1.18$, $p<0.24$).

DISCUSSION

As expected, morningness is significantly positively correlated to exercise frequency. This may be due to variance in energy levels throughout the day between morning and evening types. For the average person, mornings may be more ideal for exercise, so evening people may exercise less regularly than morning people. The results do not support the hypothesis that conscientiousness explains the relationship between exercise and chronotype. This suggests that morningness may be correlated to exercise due to energy levels rather than to personality types associated with morningness. These results may have significant implications for intervention design and implementation. For example, the time of day of exercise programs may influence participation rates as well as intervention effectiveness.

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An Exploration of How Social Network Sites (SNS) Moderate the Relationship Between Cross Cultural Low Context and High Context Communication

This study will initiate and expand on research about cross-cultural communication and examine how the use of Social Network Sites (SNS) impacts communication on a global scale. There is still a great deal of room for new research about SNS and communication styles. There are four main hypotheses that explore the variables of individualism/collectivism; high and low context communication and SNS site usage. The hypotheses are that SNS moderates the cultural context relationship such that the use of SNS in collectivist cultures makes communication styles stray away from the collectivist norm of HC communication and the same of individualist culture and LC communication. This research examines how SNS might play a role in a reflecting a greater understanding of the differences in global communication and explore of SNS allows people to be able to modify their own communication style to engage with others at a deeper level. A questionnaire will be administered to a sample size of 150 from Western and Eastern cultures, via Mechanical Turk (MTurk). The results will provide insight into how SNS impacts communication styles while considering the impact of national cultures.

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Impact of Autonomous Regulation on Relationship Between Psychological Well-Being and Exercise Frequency

Self-Determination Theory posits that autonomous regulation, as opposed to controlled regulation, is associated with positive affect, greater persistence and increased psychological well-being across a variety of behaviors, including medical adherence, educational engagement and sports (Deci and Ryan, 2008). Last year, researchers found that autonomous regulation associated with Physical Education and exercise engagement may positively predict health-related quality of life in secondary school students (Standage, Gillison, Ntoumanis, & Treasure, 2012). We hypothesized, more specifically, that increased psychological well-being and exercise frequency measured at Time 2 would be associated with more autonomous regulation measured at Time 1. Participants were college-aged students (n=83) recruited as part of a larger study on physical activity and daily schedules. At baseline, participants' motivation of exercise (BREQ2; Markland & Tobin, 2004) was assessed; one month later, participants' reported their exercise frequency for the previous month and completed the Flourishing Scale, measuring social and psychological well-being (Diener et al., 2010). Results indicated that, while exercise frequency and motivation alone do not predict psychological well-being, together they have a significant interaction ($t(79)=-2.000$, $p<.05$). Contrary to our hypotheses, findings revealed that as exercise frequency increased, those individuals with low autonomous regulation had increased psychological well-being and those individuals with high autonomous regulation had decreased psychological well-being. We suggest that these findings may be a result of problems associated with the calculation of the RAI and the position of 'introjected regulation' as more controlled than autonomous, within Self-Determination Theory. Further, our hypothesis may have been supported if more participants exhibited controlled regulation of exercise; that is, the observed range of autonomy scores was limited, with fewer individuals scoring towards 'controlled regulation'. Future research will be designed to test the theoretical explanation for our unexpected finding and to resolve the potential statistical reasons for the finding.

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"We Don't Need No Education:" The Effect of Students' Perceptions on their Future Income

The fair wage-effort hypothesis suggests that if a worker's wage is less than what the worker perceives to be a fair wage, the worker will supply a corresponding fraction of normal effort. This study examines whether there is a similar relationship between a student's perception of his or her school and the student's future income. To analyze this relationship, I regresses data from National Longitudinal Survey of Youth 1997. Data on individuals' perception of their school, as well as relevant control variables, are from 1997 when the individuals are between 13 and 17 years old. Data on individuals' income are from 2011 when the individuals are 27 to 31 years old. After controlling for commonly recognized determinants of income, and partially controlling for school quality, I find that negative perceptions of school quality are statistically significant and negatively correlated with greater future incomes. This relationship holds true for all perception variables included in the model: perception of teacher quality, perception of teacher interest, and perception of school safety. The effect of the perception of teacher quality is larger than the value-added effect of high quality teachers that is found by Chetty, Friedman, and Rockoff (2011), which suggests that even if the model does not perfectly control for actual teacher quality, it is likely that perception has an impact on students' future income. These findings indicate that it is not only important for schools and teachers to be high quality, but that it is also important to convince students of their schools' and teachers' worth. The intuition behind these findings suggests that this would lead to a higher time and energy investment by students and ultimately greater future income for individuals.

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What Dutch Law Says About Sexuality and Family In The Netherlands

This is a content analysis research project on Dutch immigration law and the rights of same-sex couples; specifically the Dutch integration exam and the new bill on lesbian parenthood. This research paper tracks Dutch immigration law from 2000-2010 and same-sex couples rights from 1997-2013. Throughout this research project, I examine the Dutch integration exam and the bill on lesbian parenthood through a sexuality and gender lens to determine how Dutch law has defined family. Five men and women were interviewed about how the law has affected their family, their thoughts on the law and their thoughts on discrimination in The Netherlands. The content data and the interview data determine how these laws have defined family and demonstrate a definition of sexual politics in The Netherlands that will also be discussed in this paper. The objective of this paper was to find the 'ideal family norm' in Dutch society and determine how sexuality and immigration status affected the ideal family norms. The conclusion of the research was clear while doing a side –by -side comparison of Dutch immigration law and Same-sex couple rights; immigration law is getting stricter as same sex couples rights are expanding. Through looking at a Dutch integration video, immigration and same sex couples laws and interviews with five men and women, I talk about what this says about Sexual Politics and family in the Dutch community.

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Evaluating the Revanchist Theory: The Spatial Politics of Homelessness in Washington, DC

Urban homelessness literature often describes cities in which the homeless are pushed into marginalized spaces away from prime space in city centers in what is sometimes known as the "Revanchist Theory." This research evaluated that Revanchist Theory within the context of Washington, D.C., where the largest groupings of homeless individuals are found within the public parks in the city center, excluding the National Mall. The purpose was to understand the contradiction between the popular Revanchist Theory and the reality of the spatial politics of homelessness in Washington, D.C., with the goal of finding recommendations for other cities which the Revanchist Theory adequately describes. Participant observation methodology was used among the homeless as well as data analysis of local newspapers and in-depth interviews with informants in institutional positions of power over the homeless in the city. It was found that the homeless in Washington D.C. have legitimately perceived claims to prime space largely due to historical advocacy movements in the city, but that those claims are highly regulated so as to fit them within a neoliberal conception of prime space. Thus, the Revanchist Theory does not adequately describe the reality of homelessness in Washington, D.C. but still represents one possible future outcome. Scale-able recommendations include further study of the Washington Legal Clinic for the Homeless' police training program, from which all Washington D.C. police officers have been educated about homeless' rights to public space, and implementation of this program in other cities.

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The Effect of Price Shocks on PES Re-enrollment Rates

Lessons from Previous Experience with Incentive-Based Mechanisms and Lessons Relearned: Can Previous Research on Incentive-Based Mechanisms Point the Way for Payments for Ecosystem Services? by B. Kelsey Jack, Carolyn Kousky, and Katharine R. E. Sims, suggests aspects of PES schemes that require additional research. One such aspect was how PES schemes responded to exogenous price shocks. A model of the effect of agricultural prices on the re-enrollment rate of the USDA Conservation Research Program is utilized to examine the effect of a short term price shock on re-enrollment to a long term contract PES program. We tested to see if the single year price variable will consistently yield a negative coefficient with regard to re-enrollment rates. This negative coefficient would signal that short term price shocks during contract expiration years, determined by either actual prices or expected prices, yields a decline in payment for ecosystem services (PES) program re-enrollment. Results from these regressions showed that while the CRP may illustrate varying degrees of resilience to average price increases and trend price increases, the models run within this thesis suggest that short term price shocks will impact the re-enrollment rate of the program. An additional question raised and tentatively answered during this experiment was the consistently negative rental rate coefficient that may have arisen from USDA CRP contract extensions. It is theorized that the effect of the extension is a time delay in contract expirations that reduces the number of contracts that should expire in the initial expiration period. This delay and reduction of total contracts expiring in the current and near term is hidden by the overall growth of the USDA CRP, so the re-enrollment rate appears to continue to increase.

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Framing the Poor: Does media coverage influence opinions towards economic inequality in Washington, D.C.?

This research examines the influence of media coverage on public opinion formation. I apply existing theories of media framing effects to the issue of economic inequality in Washington, D.C. Using a survey experiment, I explore the effect of media coverage of local poverty on public opinion towards that issue, and whether such effects are moderated by a viewer's economic background. More than fifty residents of Washington, D.C. were asked to read an article regarding an impoverished neighborhood using one of two frames: an "episodic" frame depicting poverty as a result of individual actions or a "thematic" frame casting poverty as a result of broader social patterns. One-third of participants were assigned to a control group, reading an article unrelated to economic inequality. To account for the influence of an individual's economic background, the sample included residents of both affluent and economically underprivileged areas. Early results support the hypothesis that media framing shapes public opinion. Those exposed to the thematic frame were more likely to identify thematic causes and treatments for the issue of economic inequality, while those in the episodic group were more likely to select episodic causes and treatments. Residency did not seem to have an effect on opinion formation, as those from affluent and underprivileged areas displayed similar vulnerability to framing effects. This suggests that framing effects have a homogenous influence on opinion formation and that they are not dependent upon an individual's economic circumstances. The value of these results of twofold: first, the application of framing theories at the local level highlights the practical implications of this research for real world instances of opinion formation. Second, exploring the moderating role of residency on framing effects adds to the growing literature on this topic, highlighting the power of framing effects over the formation of public opinion.

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The Reservation Wage of Unemployed Workers: An Empirical Test for Key Elasticities

In this paper, I construct and estimate a model for the reservation wages of the unemployed using a standard Ordinary Least Squares procedure. The reservation wage of a worker refers to the lowest wage the worker is willing to accept before beginning to work, such that he or she is indifferent between work and leisure. Understanding how a worker decides on his or her reservation wage is an important consideration for policymakers dealing with unemployment insurance programs and has implications in many other areas of economic policy. In order to estimate the key parameters of my model, I use the National Longitudinal Survey of Youth (1997) data set published by the Bureau of Labor Statistics which includes information on self-reported reservation wage among other variables of interest. Following the McCall Search Model (1970), I determine the influence of key variables on reservation wage. I find that the elasticity reservation wage with respect to unemployment benefits is positive but not statistically significant. I also find a positive elasticity for reservation wage with respect to unemployment duration which is also not statistically significant. Finally, I find that the most important factor in determining an individual's reservation wage is his or her last wage, which has a positive and statistically significant elasticity. These findings have important considerations for standard job search models and have clear implications for unemployment insurance policies.

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Executive function and the asymmetry between children's language production and comprehension

It is commonly observed that children's sentence production lags behind their sentence comprehension. While some explanations have been offered, the reason for this asymmetry remains disputed. We hypothesized that immature executive function, more specifically the lack of flexibility in word ordering, might limit children's production more than comprehension, thus leading to the observed asymmetry. In this study, five-to-seven-year-old children were tested in two closely matched comprehension and production tasks where we primed a noun in one phrasal position and asked children to subsequently comprehend or produce that noun in the same or different position. Reaction times that measured the "cost" of overriding a previous word order confirmed our predictions. Children showed a significant cost in the production but not the comprehension task. Further, the production cost decreased with age, suggesting that a growing ability to flexibly sequence words might underlie the observed development of language production skills. These results are a first step towards understanding why it is harder to talk than to listen.

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Latin American Black Gold: The effect of proven oil reserves on total oil production in Latin America

Emerging energy markets in Latin America have the potential for significant growth. Much of this potential is hinged on the future prospects of crude oil reserves; however, while a country may have a large amount of proven oil reserves this does not mean that the oil is immediately able to be produced. This paper seeks to determine what effect the growth of proven oil reserves has on the growth of total oil production in the 11 highest oil producing Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guatemala, Mexico, Peru, Trinidad and Tobago, and Venezuela.

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Effects of Trust in Leaders on Employee Engagement

Previous research has shown the positive effects of employee engagement on an organization's profitability, sales, employee retention, and overall survival. However, there is limited research on what leaders can do to increase employee engagement in their organization. While trust has been briefly discussed as a cause of engagement, no empirical research has looked at the relationship between leadership and trust with employee engagement in the United States. This study will test the hypothesis that authentic and transformational leadership styles mediated by trust in a leader will lead to increased levels of employee engagement. A sample of 150 American employees will participate in a questionnaire to test this hypothesis. Results revealed that…

Keywords: authentic leadership, transformational leadership, trust, employee engagement, leadership

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Examining the Relationship Between Pre-K Availability and Test Scores in New York City

As New York City plans to universalize pre-Kindergarten over the next few years, there continues to be much debate on the long-term impact of pre-K attendance on education and economic outcomes. Research has suggested that while Head Start—the only large-scale pre-K program in the country to date—might reduce crime rates among participants, its effects on test scores appear to dissipate before adolescence. Given the novelty and size of the NYC program, there is a dearth of conclusive research on the impacts of universalizing pre-K in public schools. This analysis, therefore, draws upon previous evaluations of Head Start, but instead focuses on the relationship between public pre-K availability in an area and test scores for grades 3 through 5. The data for this study consist of a panel of all NYC elementary schools over a range of 8 years, and contains math and English Language Arts (ELA) scores, race, gender, income and other demographic breakdowns as well. With this in mind, the regression analysis will examine cohorts over time using lags (e.g., the relative size of pre-K cohorts in 2005 with 3rd grade test performance in 2009, 4th grade performance in 2010, etc.) for all elementary schools. Preliminary results suggest that factors such as race and income account for a large portion of the differences in test scores across the city; however, much of the research is still being conducted. This question is of particular importance to New York, as the city has witnessed escalating levels of income inequality over the past several years and hopes universalization will mitigate this problem in the long run.

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Mandated Compulsory Education in China: Assessing the Impact of Public Education Expenditures on Primary School Enrollment

While China's post-1979 reform period resulted in rapid economic growth and modernizations, social and economic inequality remains prevalent, especially in education. Annual increases in government-appropriated public education funding and the adoption of the Compulsory Education Law (1986) have modestly improved access to education, yet regional disparities remain in both education investment and attainment. This paper analyzes the impact of government-appropriated education funding on primary school enrollment rates in mainland China from 1997-2010. By grouping China's provinces into four regions—northeast, coastal, central, and western—I identify local patterns regarding the effectiveness of public education funding. Additionally, the effective implementation date of the Compulsory Education Law has varied greatly by province. Modeled after the Fang et al 2012 study on returns to education in China, this paper uses the implementation dates as an instrumental variable to address the endogeneity of education development by region and isolate the impact of education funding on primary school enrollment. Initial results suggest that increases in education funding have primarily benefited China's coastal provinces and left the western and central regions' enrollment rates stagnant. When I account for gender, improvements in girls' primary school enrollments in the western, central, and northeastern regions are minimal. I also draw from my extensive field research in Yunnan Province as I look at county-level data in four provinces (one from each region) to assess intra-provincial education development. Finally, I conclude by connecting my findings to existing literature on this subject to consider the implications of long-term education inequality on China's development.

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Does hominid microstructure carry a phylogenetic signal?

Dental microstructure preserves a record of cellular events involved in the growth and development of teeth. Traditionally, this method has been used for reconstructing the evolution of life history, but the preserved growth record in teeth may also contain phylogenetic information that can be used to reconstruct evolutionary relationships between taxa. We propose that within the family Hominidae, dental microstructure is conserved and taxonomically distinctive. To test this hypothesis we investigated the dental microstructure of previously sectioned mandibular second molars from the following species: Pan troglodytes, Gorilla beringei, Pongo pygmaeus, Hylobates sp., and Homo sapiens. The variables we focused on were A) the daily enamel secretion rate, and B) a proxy for the rate of ameloblast differentiation. The former was quantified by measuring the spacing between cross striations. The latter by measuring the angle formed between the Striae of Retzius and the enamel-dentine junction; a narrow angle indicates a high extension rate, whereas a wide angle suggests a low extension rate. Preliminary results suggest these microstructural traits distinguish among taxa. They also suggest that Pongo appears to retain the presumed plesiomorphic condition while the African apes appear to be derived. These findings suggest that dental microstructure may have a role in systematic analysis as well as in life history studies.

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Examining the relationship between founder experience and performance in new, online ventures

It is estimated that three out of four new ventures fail. Therefore, entrepreneurs of these ventures have been a focal point of study to develop a framework of factors that may influence success. Of particular interest are the characteristics of the entrepreneur, specially the entrepreneur's previous experience that may impact the future of the firm's performance. Previous research, however, has found mixed results of the relationship between experience of the entrepreneur and their firms' performance. The advent of Internet services has dramatically changed the entrepreneurial environment with the introduction of new, online ventures. Internet based ventures are a new type of organizational phenomena that have not been widely studied. Therefore, this study investigates the relationship between the experience of a founder and the performance of a new, online venture. The study focuses on different types of experience measures to uncover if a relationship exists and to what extent the experience measures impact performance of the firm. The analyses are based on archival data collection of publicly traded companies comparing new, online ventures with founder-CEOs to new online ventures without founder-CEOs and to a benchmark performance metric of the S&P 500, respectively. Overall, this study has implications for venture capitalists, entrepreneurs, and future research in this budding field of study. By understanding the relationship between experience and performance across publicly traded companies we can better understand the characteristics to help more new ventures succeed.

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Educational Attainment and Entrepreneurship: an analysis across education levels

In this paper, we examine the relationship between educational attainment and the entrepreneurship rate, measured in terms of the number of new startups, within a given Metropolitan Statistical Area. This paper will break down educational attainment levels by high school, community college, 4-year college, masters, and post-doctorate programs and utilize regression analysis to determine the economic relationship between entrepreneurship and these distinct education levels.

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Communication Patterns in Military Families During Separation

Little is known about how, how much, and with what effects on the ability to maintain good relationships and adjustment, military spouses and especially their children communicate with a partner/parent who is deployed or away on assignment. In this study, 202 at-home parents/caregivers in families with a deployed service member were recruited through military family organizations (e.g., Blue Star Families) and responded to an online survey about their opportunities to communicate, frequency of use of ten communication methods, hours of communication per week, and emotional reaction to their communications. Caregiver parents reported separately on themselves and a randomly selected child (age 1-18) in the family. Opportunities to communicate were perceived as moderately satisfactory, with unreliability and undesirable times of the day as special concerns. Caregivers tended to rely most on asynchronous, text-based methods such as email and Facebook, whereas children most often communicated through synchronous methods such as videochat and phone that would provide more immediacy and enable young children especially to remain engaged with their missing parent. Caregivers reported approximately three times more communications and hours communicating per week for themselves than for their children. Correlational analyses indicated that satisfaction with opportunities to communicate was positively related to both quantity and emotional quality of communication. Moreover, parent and child quantity of communication measures were associated with each other, as were parent and child emotional quality of communication measures. In contrast, there were no significant correlations between communication quantity and quality measures. These findings provide needed descriptive data on how military families attempt to maintain their relationships during separations and suggest the need to consider both the amount and emotional quality of communications between family members in examining the implications of communication patterns for quality of relationships and levels of adjustment among military spouses and children.

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An Art Therapy Study of Cultural Differences in Normative Graphic Features of Artwork

The purpose of this replication study is to systematically observe cross-cultural stylistic differences in the artwork of children and adolescents. Examining such differences is vital to the development of culturally sensitive art-based, projective assessments in the professions of art therapy and psychology. Specifically, this study investigated a Hispanic sample of 75 children and adolescents in Costa Rica. All of the participants were required to complete a drawing in response to the following directive: Draw a person and/or a tree in a setting. Results of the study are derived from analyses of the drawings and corresponding socio-demographic data. The drawings were analyzed using a rating procedure adapted from established art therapy assessment tools, the Ulman Personality Assessment Procedure (Ulman, 1965) and the Formal Elements Art Therapy Scale (Gantt & Tabone, 1998). The results will be compared to previously collected child and adolescent samples derived from studies conducted in Canada (Mulholland, 2011); South Korea (Song, 2013), and the United States (Deaver, 2009). Results of this study will reflect the range of graphic features and key cultural stylistic differences observed in the art productions of children and adolescents from different countries. Additionally, outcomes of this study may demonstrate whether Lowenfeld's and Brittain's (1945) stages of normal development in artistic expression prove to be relevant cross-culturally.

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Mental Health as a Societal Process and Problem

Previous socio-demographic research placing mental health within the realm of social processes and systems suggests that mental health is associated with isolated and singular mechanisms of race, space, and socioeconomic status (SES). Relying on secondary 2012 population data collected by the Centers for Disease Control and Prevention and the US Bureau of Census, as well as Critical Race Theory and Social Space Theory, this study explores how mental health is affected by the imbrications and intersections of race, SES, and residential status/location at individual and neighborhood levels. A conceptual model indicates that although SES can directly affect mental health problems, SES can take an additional indirect route towards its association with mental health. That is, SES is impacted by race, and in turn relationally impacts residence. This relation imbues a sense of place, thereby affecting quality of life as a determinate of mental health. This model reveals, then, that race, space, and SES come to form mental health particularly through their amalgamated mechanisms and relations rather than through their respective singularities. The analytics of this study will yield conclusions pertaining to the relational and dialectical impacts of these social processes on mental health.

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What's All The Hollering About? Social Correlates of Long Distance Vocalizations in Wild Female Chimpanzees (Pan troglodytes)

Language is uniquely a human trait. Questions about the evolutionary foundations of human language have led to several studies on vocal communication in non-human primates, as they are our closest living relatives. Chimpanzee (Pan troglodytes) societies are characterized by fluid patterns of association and social structure that create diverse settings to study the different correlates of long distance vocalization. Chimpanzees produce a long distance vocalization called the pant hoot. Previous work has demonstrated that this vocalization is utilized to communicate within and between chimpanzee communities. Several studies have explored the social correlates of pant hoots in male chimpanzees and found that the social context influences pant hoot production. However, no comparable studies have been performed with female chimpanzees. Using twenty-five years of mother-infant data, we investigate the social correlates of pant hoot production in female chimpanzees (Pan troglodytes schweinfurthii) at Gombe National Park, Tanzania. We analyze the roles of group size and composition, female dominance rank and female reproductive state. Similar to males, we hypothesize that social dynamics influence female long-distance call production. We predict that females vary their pant hoot production to minimize competition and risk to vulnerable infants.

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Long-distance communication, relationship quality, and adjustment in military families

Deployments and other long term military assignments are hard on members of the family who stay behind. We examined how communicating with a deployed parent (DP) is related to (a) the relationship quality between the DP, his child and the child's mother/caregiver (M/C) and to (b) the adjustment of the child and his M/C during the separation period. A convenience sample of 202 M/C was recruited through military family support organizations. DPs served in the active duty or reserve component and came from all military services; they were of diverse rank and background and were in both combat and non-combat assignments. An online survey completed by M/C provided information about the amount of their communication; the frequency with which different communication methods were used; how communication with the DP made them feel; their marital satisfaction, marital intimacy, stress and days per month with health and mental health problems ("down days"). M/C also described communication between a child aged 1 to 18 and the DP, their relationship, and the child's adjustment. Correlational analyses controlled for child age and the M/C's perceived opportunities to communicate. Amount of communication with the DP related to child and M/C well-being differently. Hours of communication were associated with stress and "down days" for M/Cs, and warmth in the DP relationship and fewer externalizing behaviors for children. In contrast, frequency of communications was correlated with conflict in the child-DP relationship and child internalizing behaviors. Positive emotion following communication was associated with both child and M/C well-being. MCs' positive emotions correlated positively with marital satisfaction and intimacy, and negatively with stress and "down days." Children's positive emotions correlated negatively with their behavioral problems and conflict with the DP, and positively with their overall well being.

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Acoustic, Aerodynamic, and Glottal Measures of the Voice in Pregnancy

Known influences of sex hormones on the voice would suggest pregnancy hormones could have an effect, yet studies using acoustic measures have not indicated changes. Additionally, no examination of the voice prior to the third trimester has been reported. Effect of pregnancy on the voice is relatively unexplored yet could be quite relevant to female speakers and singers.

OBJECTIVES/HYPOTHESIS

It is possible that other measures, such as aerodynamic and glottal configuration, would be more sensitive to tissue-level changes caused by pregnancy hormones.

DESIGN/METHODS

In this first longitudinal study of 32-year old woman's pregnancy, weekly voice samples were analyzed for acoustic (fundamental frequency, perturbation ratios of shimmer and jitter, HNR, H1*-H2*, H1*-A1*, H1*-A3*, and maximum phonation time), aerodynamic (average airflow, peak low, AC/DC ratio), and glottal (Open Quotient, Speed Quotient) parameters. Results: All measures appeared generally stable during weeks 11-39 and compared to 21-weeks post-pregnancy. Conclusions: It is recommended that future studies monitor and test correlations among hormone levels, visual analyses of vocal fold mucosa, aerodynamic function, and glottal efficiency.

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From Weak to Strong Ties: Unraveling the Dynamic Network of Professional Dance

Dance professionals participated in a study extending the sociological model of strength of weak ties to address links between decision making styles (emotion-based, intuition-based, logic-based), frequency of network interactions, and connection duration among dance professionals (Granovetter, 1973). Participants include dancers, choreographers, technicians, dance teachers, students, company owners, artistic directors and administrators, dance photographers, dance musicians and other professionals in the field among whom robust ideas and opportunities can be shared.

INTRODUCTION

The post-modern era of contemporary movement brings with it a trend wherein professional dance artists split their time between multiple productions and companies (Banes, 2011). In fact, dance professionals now interact with significantly more individually commissioned projects, engage in elaborate dance artist networks, and strive towards maximizing their professional opportunities (Nieminen, 1998). The current study is one of the first of its kind to investigate the precise ways in which dance professionals use social networks to launch, maintain, and optimize their careers.

METHOD & PROCEDURE

Participants (N=51) completed a 48-item online survey of their decision making styles, career characteristics, and social networking behavior.

RESULTS & DISCUSSION

The results suggest the following pattern of correlations: (a) emotion-based decision making is positively correlated with frequency of network interactions ($r = .212$, $p = .067$); (b) intuition-based decision making is not correlated with frequency of network interactions ($r = .009$, $p = .475$); (c) logic-based decision making is positively correlated with frequency of network interactions ($r = .420$, $p = .001$); (d) emotion-based decision making is positively correlated with connection duration (years), ($r = .271$, $p = .027$); (e) intuition-based decision making is not correlated with connection duration (years), ($r = .065$, $p = .324$); and, in a surprisingly counterintuitive reversal of expectations, (f) logic-based decision making is positively correlated with connection duration (years), ($r = .257$, $p = .034$). In essence, the results support the notion that -- with respect to the link between frequency of network interactions and decision making style – logic has the most robust effect, followed by emotion, and lastly intuition. The results also support the assertion that -- with respect to the link between decision making style and connection duration -- emotion is the most pivotal, followed by logic, and lastly intuition. All of this suggests that, in the final analysis, dance artists seem to rely the most on logic and the least on intuition and—in this way—are dynamically strategic, and fully intentional in their networking decisions.

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Assessment of urban development and decline in Siberia: New measures of sustainability in the Arctic using satellite imagery

The Arctic is warming significantly faster than the rest of the globe. The opening of the Arctic Ocean and raising temperatures has garnered the attention of many as to the environmental, social, and economic concerns and possibilities surrounding arctic communities. A number of communities in the Russian Arctic are large urban centers – a product of soviet planned development. Assessing the environmental and urban sustainability of these communities is particularly difficult owning to their remote locations and the strict government controls on access. Remote sensing using satellite imagery presents a much easier and cost effective means of evaluation. However, using satellite imagery in the Arctic has been known to be extremely challenging due to consistent cloud cover, data gaps, landscape heterogeneity, and the small and scattered nature of these cities. A relatively new method known as dense time stack analysis has successfully dealt with similar issues in other regions of the world enabling them to map urban morphology. This methodology uses all available Landsat scenes for a given study area regardless of the season, cloud cover or data gaps. By including all available data, gaps are largely compensated for producing a more complete dataset for land cover and land use classification over time. The work presented here applied this "brute force" method of data compilation and classification to the two Siberian cities Igarka and Noril'sk that are visited by the GW Geography Department's summer field course in coordination with the Moscow State University. Examining these two cities from the 1980's to 2013 through Landsat imagery allows us to examine the general development trends and identify areas and specific infrastructure types changing fastest. These areas identifies will be further investigated with high resolution imagery in order to assess their local environmental impacts.

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Task-Dependency and Perspective Change in Motor Resonance

Motor resonance refers to the activation of mirror neurons in the premotor cortex while observing human action; it has been considered the basis of action understanding. To investigate the boundary conditions of motor resonance, we used a character-identification task. The pictures depicted two human characters (e.g., a doctor and a priest) engaged in an action (e.g., hitting). When participants were explicitly instructed to process the action (e.g., "Identify who is performing the action"), processing the same action twice in a row was faster than processing different actions. This action priming effect was greater when the same action perspective (e.g., identifying the recipient of the action) was maintained than not. However, the action priming effect disappeared when the processing of the action was implicit in the task instruction (i.e., "Is a doctor in the picture?"). These results suggest that motor resonance is task dependent and therefore only occurs when the observed action is relevant to the task. Motor resonance is also subject to the perspective of the action.

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Ordinal Regression Model to predict the job satisfaction for Doctoral Recipients by using Survey of Doctorate Recipients

The Survey of Doctorate Recipients is a longitudinal biennial survey conducted since 1973 that provides demographic and career history information about individuals with a research doctoral degree in a science, engineering, or health (SEH) field from a U.S. academic institution. The survey samples doctorate recipients from the year of their degree award until age 76. The panel is refreshed each survey cycle with a sample of new SEH doctoral degree earners. Results are used to make decisions related to the educational and occupational achievements and career movement of the nation's doctoral scientists and engineers.

OBJECTIVE

This paper exams the relationship between the job satisfactions of doctoral recipients with their demographic characteristics such as age, gender, ethnicity, marital status and salaries. Also we exam the relationship between the job satisfaction of doctoral recipients and their citizenship status, their majors and their working field (whether they work for research or not). By using statistical analysis, we want to get an idea about the relationships between the job satisfaction and its related factors and predict the job satisfaction.

METHODS

In this paper, we use the ordinal logistic Regression model (cumulative logit regression, generalize logit regression, partial proportion logit regression to do the prediction on job satisfaction. Because the job satisfaction is a category variable with 4 levels, it is not appropriate to use linear regression or binary logistic regression. The ordinal logistic regression is developed for response variables with more than two levels and is good for our data. In this paper, we specifically use partial proportion logit model to do the prediction.

RESULTS

We exam job satisfaction in three years which are 1997, 2003 and 2006 to find the tendency and all three years show similar results. That is variables salary, age , field of majors, marital status, research status, citizenship, children at home and Hispania status are all significant. However there is minor difference in different years, for example, in 1997, both gender and minority indicators are also significant in the model but not in 2006.

CONCLUSION

The results from the model in agree with the assumption. That is the higher salary, higher job satisfaction. Male feels more satisfied with their job than women. People married feel more satisfied than non-married and minorities feel more unsatisfied. People doing research feel more happier than those who do not and older people feel more satisfied with their job.

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A Virtual Past?: Accuracy of 3D Modeling in Archaeological Applications

Stone artifacts represent the most enduring record of human behavioral evolution currently known. Stone artifact form is a key feature to understanding the abilities of human ancestors. Over the past decade, digital reconstructions of artifacts made possible by advanced computer technology have greatly expanded our ability to quantify key features of human behavior. Increased standardization of analysis has also improved global comparisons of artifact morphology through time. Recently, lithic studies have begun to be based on measurements of 3D models instead of on the original artifacts. Despite the enthusiasm for these new techniques, little research has been conducted on the differences between digital reconstructions and actual artifacts. The objective of this project is to quantify the advantages and disadvantages of photogrammetry and laser scanning 3D modeling technology. Here, we capture 3D models of experimentally produced stone artifacts using two techniques: multiple image photogrammetry and 3D laser scanning. The accuracy of these two types of digital modeling is tested through comparisons with standard digital caliper measurements. The artifacts were made in two materials: basalt and obsidian, selected because they represent different degrees of surface reflectance. Results show that both techniques model equally well, with correlation coefficients ranging between 0.5 and 0.9 (r2) for comparisons between caliper measures and 3D modeled values, with some coefficients as low as 0.002. Pairwise comparisons between the two techniques also demonstrate significant differences for some measures. In particular, modeling technique and material chosen can have an impact on model accuracy: obsidian is slightly more accurately modeled by photogrammetry and basalt is slightly more accurately modeled by laser scanning, however both methods are imperfect. This calls into question some recent studies that have used 3D models. Here, we review the strengths of the different methodologies and provide recommendations for future use of 3D modeling in archaeology.

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Bus rapid transit network coverage in three Andean cities

Bus rapid transit, transportation infrastructure, peripheral areas, bus infrastructure, Latin American cities, service areas, catchment areas
Limited-stop bus services, including bus rapid transit (BRT), are increasingly popular in Latin American cities with almost twenty systems operating in South America today. BRT and other limited-stop services offer a regulated option which competes with often deregulated local and crosstown services. Existing literature has focused on BRT service quality and has spoken on a high level about catchment area measurement for BRT services. We analyze systems with aspects of BRT service in three cities (Guayaquil, Ecuador; Lima, Peru; and Santiago, Chile) and apply roadway and path network analysis to model pedestrian catchment areas using differentiated catchment proposals for trunk and feeder route stops. We then analyze coverage statistics aggregated at the urban district level and compare the results against socioeconomic data to determine if there is a statistically significant difference in catchment area (i.e., network) coverage between rich and poor districts.

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The Effect of Party Position Shifts on the Media's Portrayal of Immigration Reform

After the 2012 Presidential Election, the Republican Party began moving toward an immigration overhaul, primarily as a reaction to the low level of support from Hispanic and Latino voters. This research seeks, primarily, to answer the following question: how did this new environment surrounding the immigration debate affect media coverage of the debate? More specifically, given the Republican Party's position shift on immigration, did the prevalence of "welcoming" and "restrictive" frames in the news – for instance, those arguing for a path to citizenship vs. an increase in border security – change as well? Did the particular arguments made by the parties, especially the Republicans, also change? Have the sources utilized by the media for these various perspectives changed? And did coverage differ on broadcast and cable television outlets? To answer these questions, I use two sets of data analyzing media coverage of the immigration debate. First, I examined immigration-related communication frames on broadcast network (ABC, CBS, and NBC) and cable television news (Fox and MSNBC) from December 2012 through August 2013, which captured the most recent period of congressional debate on the issue. Initial analysis of this data shows that restrictive and welcoming frames were given nearly equal air time overall. MSNBC and Fox News, however, provided frames that fell more in line with their political base. Second, I use data from an earlier study of media coverage of the immigration reform debate in 2005-2007. This will allow me to determine whether the Republican Party's recent efforts to push for an immigration bill have altered the way the media have covered the debate.

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Excuses, Excuses: Attributions and Email Disclaimers in Mobile Communication

As of 2012, an estimated 145 billion emails are sent daily with an increasing amount of emails being sent from mobile devices (Radicati Group Inc.). When an individual opens an email from an unknown person, they may make an immediate judgment about the sender based on the context of an email, such as if the email was riddled with typos or grammatical errors. Not taking into account the situational constraints in which the sender composed the email, the recipient of an error-filled email may perceive the sender negatively (Carr & Stefaniak, 2012). This tendency to characterize an individual by overestimating the role of their personality in making an error while underestimating the situation is known as the Fundamental Attribution Error (Ross, 1977).

An email's signature is a way in which the sender can make the recipient more aware of the situational constraints in which the email was written. Many mobile phones contain a disclaimer in their signature that states "Sent from a mobile phone". A study conducted by Morgan (2012), however, discovered that participants judged a sender of an error-filled email the same whether or not they knew the email was sent from a mobile device. As suggested by Morgan, the disclaimer used ("Sent from my iPhone") may have been too implicit which may have affected participants' ratings of the sender. To make recipients of an email more aware of a potential situational constraint, some mobile email users include a disclaimer that apologizes for such errors ahead of time.

This study attempted to discover whether apologizing for errors ahead of time in an email disclaimer could mitigate or prevent potential negative dispositional attributions. We manipulated the type of error (typos, grammar, both errors, brevity) and type of disclaimer (none, "Sent from my mobile phone", "Sent from my mobile phone. Please excuse any typos or grammatical errors." to determine what types of combinations of errors and disclaimers would potentially be forgiven in a workplace email interaction.

Results demonstrated that use of an apology disclaimer mitigated negative attributions made about a sender's credibility, competence and writing/spelling ability. Further analysis demonstrated that while an apology disclaimer did not alleviate negative attributions about a sender's trustworthiness or consciousness, for example, there was a distinct patternof which types of errors were judged more negatively. Additional analysis was conducted on identifying trends among how participants responded to requests in these error-filled emails, and this analysis is in progress.

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Helpful or Harmful? The U.S. News Media's Framing of Organized Labor from 2009 to 2013

For nearly a century, labor and communication scholars have explored how the U.S. news media frame labor unions and how these frames might affect public opinion and organized labor. This study finds that past researchers have identified a dominant negative frame that defines unions as greedy, corrupt, conflict-based and lacking public interest. The study shows that although existing literature provides a deep understanding of major labor union events and activity, its focus on a few outlets, strike coverage, case studies and private sector unions restricts our understanding of how organized labor is portrayed, particularly in modern times when both labor and news media environments have changed dramatically. Through a systematic content analysis of the most-consumed news media outlets in the United States from 2009 through 2013 – a period that includes a series of high profile union-related events – the study tests whether the dominant negative framing of organized labor identified by past researchers persists. By analyzing coverage in a dozen outlets, across a period of time, and distinguishing between private and public sector unions, the study builds on the strength of existing literature while providing scholars, unions and workers a more comprehensive and contemporary understanding of an aspect of communication that can affect public opinion, the outcome of disputes, union membership and more.

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Team Homogeneity or Skill Diversity: Which is a Better Predictor of Short Term Success in New Ventures?

Research has established important positive relationships between skill diversity and new venture success, and prior relationships and new venture success. However, there is a paucity of evidence predicting which of these may be a stronger determinant. Building upon foundational work, this paper utilizes archival data and qualitative interviews to more clearly define skill diversity versus team homogeneity, as predictors of new venture team success. Recently, much attention has been paid to entrepreneurial firms both in popular media and in academic research. University entrepreneurship programs, start-up talent incubators, and venture capital (VC) competitions abound in order to identify "high-potential" ideas and teams and make them successful. Popular media has often painted the typical new venture team as a set of smart, young college roommates who knew one another before their business partnership. However, no study has definitively calculated whether team homogeneity or skill diversity is a more accurate predictor of success. This study aims to answer this question.

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Re-Entry Experience in Washington, D.C.

This qualitative research project focuses on the re-entry process of ex-criminals into society in the DC area, and looks to further analyze what factors prove to be effective in the process and what factors impede the transition period. In reviewing the literature, there is a gap in noting personal experiences of ex-convicts, and taking research a step further from common surveys. Data will come from 6-8 interviews of ex-convicts currently residing in Washington DC. Interviews last between 45-60 minutes, and consist of former inmates experiences, including their time before, during, and after incarceration. The purpose of these interviews is to collect data that when analyzed will inform theory. The results will show current practices that ex-convicts interact with on a regular basis. All interviews will be transcribed verbatim and then checked for accuracy. Data will be coded with themes that are situated in the literature. Finally, the results will be discussed and implications for future theory, research and practice will be presented.

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Field of Membership and Credit Union Growth, 2008-2013: A Post-Crisis Assessment

This paper examines the growth of US credit unions. Previous empirical research finds that credit unions with a Community Charter experience more rapid growth in assets, deposits, and members than other fields of membership. I first update and reproduce those results for the most recent five-year period for which data are available, 2008 to 2013. However, the apparent effect of allowing credit unions to attach multiple membership groups disappears controlling for the size and age of the institution, and the characteristics of the city in which the home office is located. Community chartered institutions grow more quickly than association and manufacturing group credit unions, for example, but more slowly than education group institutions. I then use a novel matched-pair approach to explain the differential growth rates by charter type. The results of this analysis show that differently chartered institutions grow at different rates depending on the relative growth rates in populations of potential members.

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The Psychological Well-Being of Ethnic-Minority Adolescent Fathers

Fatherhood can be a time of great stress for adolescents. They must navigate the challenges of parenting a child, often without sufficient financial and social resources. Consequently, young fathers are at relatively greater risk for developing anxious and depressive symptoms, particularly when compared to adult fathers. Additionally, rates of fatherhood have been found to be higher among African-American and Latino adolescent males (ranging from 2.9% to 20.4%) compared to an average rate of 1.4% among European-American adolescent males. Given this disparity, African-American and Latino adolescent fathers, who also experience challenges associated with their minority status (e.g., discrimination), may be at greater risk for developing psychological issues. However, research on the mental health of this population is limited. To address these gaps in the research, the present study seeks to 1) examine the psychological well-being of African-American and Latino adolescent fathers, specifically their experience, recognition, and expression of anxious and depressive symptoms; and 2) examine the resources that these fathers use to cope with the challenges of fatherhood. We will use data from the Young Dads and Children's Health Study (YDACH), which aims to examine the general emotional experiences of ethnic-minority adolescent fatherhood. The sample includes approximately 40 African American and Latino fathers, recruited through adolescent fathers-focused programs at the Children's National Medical Center and the New Heights Program of the Washington DC Public Schools. Qualitative interviews will explore topics such as depression, anxiety, stress, coping, father involvement, and the mother-father relationship. Quantitative measures of psychological well-being include the Hospital Anxiety and Depression Scale, the Beck Depression Inventory, and the Satisfaction with Life Scale. Interviews will be audio-recorded and transcribed. Data collection will be completed in March, 2014. Data will be analyzed using qualitative data software, NVivo, to explore the main themes that emerge from the interviews. Descriptive results of the three measures will be described. If sample sizes permit, comparisons will be made between the psychological experiences of African American and Latino fathers. The results from this study will increase our understanding of the mental health of young fathers from ethnic minority backgrounds. These results will also help to inform the development of culturally sensitive interventions that aim to treat and prevent mental health problems and augment resilience in this population.

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Predictors of Successful Bilingual Speech Acquisition at 48 Months

OBJECTIVES/BACKGROUND

When compared with monolingual children, dual language learners (DLLs) have weaker speech production skills in English (Gildersleeve et al, 1998) as they are learning two languages and have different linguistic experiences than monolinguals. Yet within the group of DLLs, some children develop better English speech skills than others. If we can understand what makes some bilingual children successful in producing some of their sounds in both of their languages, then we can help promote better skills in more bilingual children. Understanding typical bilingual development is important for the ability to diagnose children with speech or language delays.

METHODS

This project investigated the speech production abilities of 27 bilingual children exposed to both Spanish and English from birth living in South Florida. We used measures such as vocabulary size, amount of exposure to each language, and early speech abilities to predict children's speech accuracy in both languages at 48 months old. Data collection took place at ages 22-, 30-, and 48 months.

RESULTS TO DATE

At 48 months bilingual children attained a high degree of accuracy in English speech production. On average, production in English was more accurate than in Spanish. Early measures of speech and vocabulary were related for English but not for Spanish. The relative amount of input in English was related to children's vocabulary size but not their speech abilities. English speech and language abilities at 30 months were significant predictors of speech abilities at 48 months.

CONCLUSIONS

Our results can help educators and clinical practitioners develop accurate expectations for speech-language development in bilingual children and lead to improved early intervention practices.

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Infants' Social Assessment of Characters Through Eye Gaze

Social evaluation is crucial for determining the intentions of others. Humans distinguish between friends and foes by observing people's behaviors and actions. Previous studies, like Hamlin et al. (2007), have concluded that infants prefer individuals who help a neutral individual to individuals who hinder a neutral individual. This study was conducted to show that infants evaluate individuals' actions to determine whether an individual is helpful or harmful. Using eye-tracking technology, the gaze of infants was recorded to determine infants' character preferences. Infants between the ages of 3 and 12 months were presented with videos depicting helpful and unhelpful characters interacting with a neutral character. Their character preferences were measured through eye gaze. Infants between 6 and 12 months of age showed a slight preference for helpful characters than hindering characters. These infants also fixated longer on the helpful character when the neutral character moved towards the hindering character. This research shows the importance of social evaluation through infants' character preferences.

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It's Complicated: Racial Differences in College Dating Behavior

College dating behavior, while intrinsically complicated, becomes more complex when the different communities coexisting on campuses are brought into consideration. Research has shown that divides exist among dating attitudes between men and women (Bartoli, 2006), different social classes (Brimeyer & Smith, 2012) and different races (McClintock, 2010). Yet, under the category of race, it remains to be discovered what these differences entail. What are the differences in dating expectations and rituals between Black students and White students at a predominantly White institution (PWI)?

Although extensive research exists on college dating (Bartoli, 2006; Bogle, 2008; Reiter, Krause, & Stirlen, 2005; Riffer, Chin, 1988), the Black experience goes relatively ignored or misunderstood. Differences in experience between Black and White college students at PWIs have been established, yet the uniqueness of Black students' perspective remains relatively uninvestigated. Despite this knowledge, researchers continue to evaluate undergraduate dating behavior without acknowledging race (Bartoli, 2006), or with miniscule numbers of Black participants. While the percentage of White participants in studies on college dating behavior tends to be as high as 80 percent, Black participants can be considerably lower, even as low as 1% (Siebenbruner, 2013). These oversights prevent an understanding of the Black student's overall college experience at a PWI.

Qualitative research included small focus groups from both races on one college campus and compared their perspectives on dating behavior. Four groups were divided by race and gender, with one final heterogeneous group. Each of the segregated groups were transcribed and coded, comparing student experiences and opinion to previous literature surrounding three major dating behavior categories of "dating", "hooking-up" and "relationships". Recurring themes of discussion and differences in opinion between the four groups were then presented to a heterogeneous group. This allowed for community discussion and analysis of discovered differences. Additional findings to be reported after project completion.

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The Historiography of Our Time: Coming of Age in the Information Age

In this paper, I examine the phenomenon of coming of age in the Information Age. I delve into how this generation's stories are told on social media platforms, like Twitter, and the significance of these mediums to what will be chronicled in the historiography of our time. The restrictions of expression by the platform's format have an effect on not only how this generation's stories are told, but also what stories are told. Further, the medium has a definitive effect on the social education of members, as successful users learn what should be told and may behave accordingly. Similar to the YMCA of the 1880s, providing young men with the resources they needed to assimilate into urban culture, Twitter is an institution that has consequences on an individual's self presentation. By conducting a Twitter sentiment analysis by done by Crowdflower (funded by the GWU SURE Award) to demonstrate trends and attitudes amongst users, I explore the influence of the crowd on individual's behavior and polarizing consequences of the limit of 140 characters has on a generation's story.

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A Systematic Review of Cognitive-Behavioral Therapy Prevention Interventions for Depression in Adolescence

Adolescence can be a challenging period due to attempts to establish identity, individuate from caretakers, and maintain existing relationships, while trying to emphasize emotional autonomy. Because adolescence is a critical period for cognitive, social and emotional change, it is also an important time to address mental health care needs. In the United States, approximately 11% of adolescents will experience a depressive disorder by the age of 18, according to the National Institute of Mental Health. Adolescent depression is associated with negative consequences, including poor academic performance, impaired social relationships, suicide attempts and completed suicides and overall general negative health. These negative consequences suggest the importance of preventing the onset of major depression in this population. Cognitive-Behavioral Therapy (CBT) is an evidence-based treatment for major depression in adolescents and adults. However, much less is known about whether there are effective CBT interventions to prevent depression for adolescents. The purpose of this paper is to systematically review CBT-based interventions to prevent depression in adolescents. Interventions were identified though a targeted key-word search (e.g., adolescents, depression, prevention, cognitive-behavioral therapy, intervention) on the PsycInfo, PsycARTICLES, PubMed, Medline, and Academic Search Complete databases. The interventions will be evaluated in terms of the strength of evidence supporting them, according to the American Psychological Association's (APA) suggested criteria (APA, 2002), and subsequently classified as "Well Established", "Probably Efficacious" or "Experimental", according to APA Division 12's Task Force standards (Chambless et al., 1998). Since this research is underway, there are no results to date. However, results will contribute to the knowledge of the current state of the field of depression prevention in adolescents. This knowledge may be useful to researchers and clinicians interested in developing or implementing interventions to prevent depression in this population.

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Individual, Observational, and Imitation Learning in 3- and 5-Year-Old Children

Social learning is believed to be a special class of learning that results from exposure to others' actions. While social learning is evident in many other animals, the extent to which humans engage in and rely on it is unique. Are humans especially good social learners, or are they good learners who happen to have access to social sources of information? And how do social learning skills develop over time? This research examines the extent to which the channel of information (individual, social, or nonsocial) affects the retention and use of thatinformation. We utilized two similar touchscreen tasks that involve touching three pictures in a sequence: one uses a motor-spatial (action-based) rule, while the other uses a more abstract cognitive (object-based) rule. We gave 92 3- and 5-year-old children four ways to learn a new pattern in each task: by Trial-and-error, by Recall after a 30-second delay (using the same pattern as in the trial-and-error condition; together Trial-and-error and Recall are the individual learning conditions), by "Ghost" (computer-only or nonsocial) demonstration, and by a live human (Social) demonstration. Across tasks, three-year-olds learned equally well in the Recall condition but differed in how they learned in the Social condition (cognitive > motor-spatial task). Five-year-olds learned equally well across tasks and conditions. These results indicate that children's ability to learn information from both social and nonsocial channels improves during development. In addition, the channel by which information is transmitted (social or nonsocial) may be an important factor in children's ability to learn.

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Cosmopolitanism in Late Bronze Age Israel: A strontium and oxygen isotope study of individuals from Tel Megiddo

Thirteen human individuals dating to five Late Bronze Age (c.1550-1200 BCE) burials from Tel Megiddo, Israel were sampled to determine strontium and oxygen stable isotopic ratios in the enamel apatite of their teeth (RM1). These values, when compared to Tel Megiddo's estimated local ratios of these isotopes (δ18O=-5.9‰ and 87Sr/86Sr=0.708), can potentially reflect whether or not the sampled individuals recovered from Megiddo were present at the site during dental development or migrated to the site later in life. The presence of foreigners at the site would suggest that Megiddo proved an attractive population center during a time of intense international influence, probably due to commercial and political exchange. Meanwhile, local individuals found in tombs that display distinctly non-Canaanite burial traditions would attest to rising cosmopolitanism not only among material culture, but probably in the beliefs and traditions of the people of Late Bronze Age Megiddo.

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Listening to Music While Studying and its Effects on College Students

The purpose of this study is to investigate the effects of listening to music while studying on college students. Previous research and an informal poll have shown that it is common for college students of various majors to listen to music while studying. Yet, the question of how this activity affects students with previous music experience (playing an instrument, taking a music class, etc.) as compared to students who have not had previous active engagement with music has not been a focus in past research. This study will examine through surveys and a short experiment the types of assignments that students supplement with music, their preferred genre of music to listen to while studying, and how previous experience with music affects students' performance when listening to music and studying. There are two main objectives of this research. One is to investigate the perceived effects the students believe listening to music has on their studying. The other is to understand if listening to music while studying actually affects the students' performance and to determine if there is a distinction between its effects on students with previous music experience and students without previous music experience.

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Relationship Between Precipitation and Delivered Water to Downstream Water Pollution in DC

This seeks to identify, explain, and consolidate into one diagram the sources of pollution that contaminate the principal water bodies of the District of Columbia, i.e., the Potomac River, Anacostia River, and Rock Creek. It highlights the connection between precipitation and delivered water. The project illustrates how their interaction with pathway, land use, and infrastructure systems results in stormwater runoff and combined sewer overflow. In addition to explaining runoff and combined sewer overflow, it shows all other contributing sources of water pollution, including sources from jurisdictions outside of DC and non-urban sources. The project puts in context the systems that perpetuate water pollution and affect other related problems, including contaminant levels in water bodies, the cost of water treatment, the level of flooding, and environmental degradation of land and waterways. It sets the stage for a comparison with international cities and analysis of their stormwater management schemes and environmental policy. Straddling the fields of public health, public policy and environmental studies, the case study presents a useful model for developing sound policy measures with positive benefits and limited unintended consequences.

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OMBlog The Efficacy of Government Blogs: Exploring the Intentions of Internet-based PR, Its Audience, and its Future: A Case Study of The Office of Management and Budget's Web Presence

What follows is an investigation and evaluation of the Office of Management and Budget's (OMB's) public outreach efforts. Based exclusively on non-classified, publicly available information published and disseminated by the OMB, I assess the approachability of the OMB's presence online and compare the OMB's information to other organizations' similarly intended blogs and Web sites. I suggest ways in which the OMB is similar to and different from other organizations both within the federal government and unaffiliated with the government in terms of its ability to communicate effectively online. To substantiate the implications of my evaluation of the OMB, I draw from statistical publications as well as private and government web access data. The conclusions of this study are foregrounded by the research I conducted regarding the psychology of public relations—specifically the emerging field of study regarding the business and administrative challenges of incorporating modern technology in a personal and effective way—using Gelman Library's academic and professional journals and access to Library Consortium-held texts. In order to provide background for the paper's discussion of the logic and politics of the efforts made by the OMB to connect with and inform a public audience, I contextualize the government's effort to present an accessible venue for learning about the OMB online in terms of the other contemporary organizations' similar Internet-based initiatives.

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GW RESEARCH DAYS

— WEDNESDAY, APRIL 2, 2014

HEALTH & MEDICINE RESEARCH DAY

THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

GW RESEARCH DAYS 2014

HEALTH & MEDICINE RESEARCH DAY

WEDNESDAY, APRIL 2, 2014

MARVIN CENTER

800 21ST STREET, NW, 3RD FLOOR

8:00–9:00 a.m. **Posters Setup** *(Grand and Continental Ballrooms)*

MEDIA AND PUBLIC AFFAIRS BUILDING JACK MORTON AUDITORIUM

805 21ST STREET, NW

8:00–9:00 a.m. **Registration and breakfast**

9:00–9:05 a.m. **Welcome & Introduction of Keynote Address**

Jeffrey S. Akman, MD
Vice President for Health Affairs and Dean, School of Medicine and Health Sciences

9:10–10:00 a.m. **Keynote Address**

Elaine A. Ostrander, PhD
Chief and NIH Distinguished Investigator, Cancer Genetics Branch, National Human Genome Research Institute National Institutes of Health
"Genetics of complex traits: Understanding breed variation in the domestic dog"

10:00–10:05 a.m. **Introduction of Keynote Speaker**

Lynn Goldman, MD
Dean, School of Public Health and Health Services

10:05–10:55 a.m. **Keynote Address**

Lance Price, PhD
Professor, Department of Environmental and Occupational Health ***"Foodborne Urinary Tract Infections: a new paradigm for food associated illness"***

10:55–11:15 a.m. **Coffee break**

11:15 a.m–12:00 p.m. **Panel Discussion:** ***"Genomics in Health and Medicine"***

Moderator: **Vincent A. Chiappinelli, PhD**
Interim Associate Vice President for Health Affairs and Associate Dean, School of Medicine and Health Sciences

Dr. Elaine Ostrander, PhD

Lance Price, PhD

Tim McCaffrey, PhD
Professor of Medicine and Microbiology, Immunology, and Tropical Medicine, Director, Division of Genomic Medicine, The George Washington University School of Medicine

Kathleen Calzone, PhD, RN, APNG, FAAN
Senior Nurse Specialist, Research National Cancer Institute, Center for Cancer Research, Genetics Branch

MARVIN CENTER

800 21ST STREET, NW , 3RD FLOOR

12:30–2:00 p.m. **Distribution of Box Lunches** *(MC 309 and MC 310)*

12:30–3:00 p.m. **Poster Presentations and Judging**
(Grand and Continental Ballrooms)

3:00–4:30 p.m. **Award Ceremony and Oral Presentations**
(includes 10 min presentations by winners of oral competition awards from each School) (MC 310)

GW RESEARCH DAYS

APRIL 2, 2014

3:00–4:30 p.m.

AWARD CEREMONY

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Moderator: **Vincent A. Chiappinelli, PhD**
Associate Vice President for Health Affairs, Associate Dean of the School of Medicine and Health Sciences

Shawn Chawla:
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INSTITUTE FOR BIOMEDICAL SCIENCES

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Associate Dean for Graduate Education, School of Medicine and Health Sciences; Director, Institute for Biomedical Sciences

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Dean, School of Public Health and Health Services

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Maureen Banigan:
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2013 ELAINE H. SNYDER CANCER RESEARCH AWARD

Presenter: **Vincent A. Chiappinelli, PhD**

Wenge Zhu, PhD
Assistant Professor, Department of Biochemistry and Molecular Biology

2014 DISTINGUISHED RESEARCHER AWARD

Presenter: **Vincent A. Chiappinelli, PhD**

Dominic Raj, MD, DM, DNB, FASN
Professor of Medicine and of Epidemiology and Biostatistics and of Biochemistry and Molecular Biology

POSTER AWARD WINNERS ANNOUNCED

School of Medicine and Health Sciences

Institute for Biomedical Sciences

Biomedical Engineering

Milken Institute School of Public Health

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COLUMBIAN COLLEGE OF ARTS AND SCIENCES / CHILDREN'S NATIONAL MEDICAL CENTER

A Viral-vector Matching App for Gene Therapists: GTMATCH

Urea cycle disorders and muscular dystrophies are genetic disorders caused by mutations in genes. Gene therapy has been proposed as an approach for treatment of these types of genetic disorders. In general, a normal copy of the gene of interest is delivered in the cell such that the protein function is restored. Methods of gene therapy can be roughly classified into two categories, viral methods and non-viral methods. A collaborative effort between Children's National Medical Center and the University of Pennsylvania, Dr. Morizono's research group has been focusing on a viral approach, using adeno-associated virus as a vector to carry genes of interest to targeted cell(s). In the vector-selection process, packaging capacity, targeting tissue(s), toxicity, and various other properties of a virus are critical criteria; choosing an incompatible viral vector could mean harm. With the onset of affordable genomic sequencing and genetic testing, applying gene therapy to an ever-increasing number of disorders becomes possible. It is tremendously costly to perform the pre-clinical research followed by human clinical trials. Therefore, an objective approach to select potential gene delivery vectors and match them with genes of interest is essential. We have developed a web-based application GTMATCH to match genes with potentially appropriate viral vectors.

GTMATCH has three primary components, a database cataloging genes, mRNAs and proteins related to the two disorders mentioned above, a table of potential vector candidates, and a front-end web user interface so users can query the system in a self-serve manner to find matching viral vectors. GTMATCH is developed using Django and MySQL. Django is a high level framework for developing web applications. The administrative interface and an object-relational mapper are automated via the Django framework. Roles and rights are established so general users are differentiated from database administrators (DBA). The DBAs have additional permissions to check and update the back-end database using information extracted from NCBI, and to audit the system. The entire data model is based on Python, and accessing and managing the database via MySQL is possible. The application is under continual development and refinement. This newly designed application will allow researchers to find matching viral vectors via a web accessible automated interface instead of performing multiple searches and comparisons of the various properties of different gene therapy vectors manually. The application will be scalable to any available genome and/or proteome so that vector selection for almost any genetic disorder can be evaluated.

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Anterior Segment Enhanced-Depth Imaging Optical Coherence Tomography for Imaging the Lamina Cribrosa Ex Vivo

OBJECTIVE

To investigate the use of anterior segment enhanced-depth imaging optical coherence tomography (EDI OCT) in imaging the lamina cribrosa (LC) of ex vivo eyes.

METHODS

After removing the anterior segment and the vitreous from fresh enucleated pig eyes, posterior segment tissue containing the optic nerve head and peripapillary sclera (Fig A) was placed on a custom-designed eye holder (Fig 1B). To stabilize the eye holder on the OCT device, an eye holder frame was used (Fig 1C). Serial horizontal (15°x10°) and vertical (10°x15°) EDI OCT B-scans (distance between scans: ~32 µm) of the optic nerve head were obtained from the prepared tissue using the anterior segment module of spectral-domain OCT (Spectralis; Heidelberg Engineering GmbH, Heidelberg, Germany). Different conditions were tested to obtain better-quality OCT images of the LC. After EDI OCT, serial horizontal or vertical histological sections were obtained (distance between sections: ~5 µm), stained (Periodic Acid-Schiff) and photographed. Structures identified in the histological sections were compared with structures in the matched EDI OCT B-scans. 3-dimensional images of the LC were reconstructed using serial EDI OCT B-scans after manually delineating the LC beams.

RESULTS

Optic nerve heads of 3 enucleated pig eyes were imaged using EDI OCT and then examined histologically. The LC was more clearly visualized when the retina and part of prelaminar tissue were removed (Fig 1D, 1E) and when the tissue surface was kept moist during EDI OCT (Fig 1F, 1G). The LC image quality was similar between pre-fixation and post-fixation tissues (Fig 1H,1I). The LC was also visualized successfully using the OCT's posterior segment module when a +20-diopter lens was placed between the tissue and OCT using a custom-designed lens holder, to substitute for the refractive power of the anterior portion of the eyeball (Fig 1J, 1K). EDI OCT B-scans accurately matched serial histological sections and identified the LC beams and its continuity with the retrolaminar glial columns (Fig 2A-2F). 3-dimensional images of the LC were successfully reconstructed using EDI OCT B-scans (Fig 2G, 2H).

CONCLUSIONS

High-resolution cross-sectional images can be obtained using anterior segment EDI OCT when the retina and part of prelaminar tissue are removed. Anterior segment EDI OCT may be useful in evaluating the LC in ex vivo eyes for glaucoma research.

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The role of Poly (ADP) Ribose Polymerase (PARP) in the healing process of ischemic and diabetic wounds

BACKGROUND/OBJECTIVE

PARP over-activation is observed in ischemic/diabetic wounds, and the role of PARP in poor wound healing is not clearly understood.

METHODS

Diabetic and ischemic conditions were modeled in mice by injecting streptozocin and ligating femoral artery. An incisional wound was made on each leg and one group was treated with PARP inhibitor PJ34 while the other group acted as a control. A week after initial workup, the wound sample was excised and prepared for Optimal Compound Temperature (OCT) slides. Slides were immunostained with an antibody that recognizes Poly ADP ribose (PAR), which is the product of PARP, and imaged using a confocal microscope. Then, the fluorescent intensity in antibody staining between two groups was compared. To investigate the role of PARP inhibitor in vitro, two different experiments were performed: 1) human umbilical vein endothelial cells (HUVECs) were plated a day before and an area with no cells was made, and each group was given glucose, glucose with PJ34, or no treatment. Cells were observed under a light microscope after 24 hours. 2) HUVECs were plated on gel-coated plate and treated the same way, and cells were observed under a light microscope after 6 hours.

RESULTS

There was no distinguishable difference in immunofluorescence intensity between the control and treated group. Epidermis and dermis structures were not always well preserved in many OCT slides. PARP inhibitor-treated cells showed increased gap filling in scratch wound assay, and increased tubular formation in gel tubule assay.

CONCLUSION

These data suggest that while the effect of PARP inhibitor is well demonstrated in vitro, immunofluorescence may not be a good modality to demonstrate the effect of PARP inhibitor. However, PARP inhibition may be a promising method to treat poor wound healing in diabetic/ischemic conditions.

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Identifying splice-modulating SNPs from RNA-sequencing data

Identifying splice-modulating SNPs from RNA-sequencing data

BACKGROUND

Alternative splicing is a crucial regulatory mechanism controlling protein function in both health and disease. Alternative splicing results in different protein isoforms of a certain protein in different tissues. RNA splicing is specifically deregulated in different types of diseases such as cancer. With the emergence of the genomic era, efforts on developing new bioinformatics tools for identifying alternative splicing are ongoing.

OBJECTIVES

Our group has augmented the technique for identification of alternative splicing events by developing a computational approach, called SNPlice. The software mines results obtained from massively parallel RNA-sequencing datasets to discover reads crossing both SNPs and splice junctions, assessing the co-occurrence of variants and transcripts that remain unspliced at nearby exon-intron boundaries.

METHODS

RNA was extracted and libraries were prepared following standard protocols. Sequencing was performed on Illumina HiSeq 2000 platform. RNA-sequencing results were processed through read alignment, variant call, and SNP annotation. A computational pipeline developed the SNPlice software through consideration of an algorithm based on wild type and mutant sample nucleotide variants.

RESULTS

Five human transcriptomes were processed through SNPlice. Eighteen unique exonic SNPs bearing variant reads were more often mapped in the intron (FDR=0.05), and 47 additional SNPs were identified with a p-value below 0.05. Next, we extracted the SNP junction read counts across the five transcriptomes and analyzed the summed counts using the same procedure as in SNPlice. This revealed 115 SNPs with p-values below 0.05, thirty-three of which were significant after correction for multiple testing (FDR=0.05). The SNPlice co-allelic variant-junctions sites were confirmed through allele specific Sanger sequencing. The results obtained from SNPlice analysis were further compared with results produced from online public alternative splicing databases to validate data accuracy.

DISCUSSION

In the current genomic era, massive parallel sequencing is employed in most sequencing experiments. Using the best analyzing tool for DNA or RNA based results from exome or transcriptome analyses is crucial in order to get factual and useful results. SNPlice was developed through a computational pipeline. SNPlice is shown to be a robust tool in analyzing alternative splicing events obtained from RNA-sequencing. On going projects aim on developing (1) batch mode on SNPlice, (2) optimization for non-human transcriptomes, and (3) utilizing the information from paired-end reads for extending the SNPlice covered genomic regions.

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The role of glutamatergic modulation of VTA dopamine signaling in reward-motivated operant conditioning

Synaptic plasticity regulates the cellular mechanisms behind the cognitive processes of learning and memory. In reward-based learning tasks, the synaptic connections between excitatory glutamaterigc inputs and dopamine-producing neurons are particularly important for regulating behavioral patterns. By using an animal model in which the glutamate signaling is downregulated through genetic knockouts of receptor subunits, we have prevented the synaptic changes that typically occur with operant conditioning. Disrupted glutamate signaling then leads to subsequent dysregulation of normal firing patterns in the postsynaptic dopamine neurons. Phasic firing in those neurons, which is thought to be crucial for memory association and reward processing, can no longer occur normally, and behavioral learning patterns are affected. The results of this study suggest that glutamatergic signaling and expression of specific glutamate receptor subtypes may contribute to regulation of particular phases of the operant conditioning process.

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Genomic Characterization of the Lung Microbiome in Intensive Care Patients using Next Generation Sequencing of Bacterial 16S Rib

BACKGROUND

Ventilator-associated pneumonia (VAP) as a complication of endotracheal intubation is a frequently occurring nosocomial infection in intensive care units (ICU). Successful treatment depends on targeted antibiotic therapy, but identification of true pathogenic bacteria can be a clinical challenge. Bacterial culture (BC) on selective media is the current standard of practice for identifying pathogens that may cause VAP, but this process is slow, prone to false positive results due to colonizing bacteria, and fails to grow certain pathogens. Next generation sequencing (NGS) has the potential to rapidly and accurately ascertain bacterial diversity in various sites in the body, and can accurately identify the entire microbiome of patients.

OBJECTIVES

To examine the usefulness of NGS as a faster and more precise alternative to BC for characterizing VAP-associated pathogens.

METHODS

Procedure for extraction of bacterial genomic DNA directly from bronchial aspirates was optimized in the genomic medicine lab to ensure maximum yields of DNA from both Gram-positive and Gram-negative bacteria. Bacterial 16S ribosomal DNA genes were amplified from extracted genomic DNA using universal primers directed against the conserved 16S regions. The PCR products were purified, quantified, and subsequently prepared for SMRT sequencing according to the manufacturer's protocol. Raw SMRT reads were filtered for sequencing artifacts and quality metrics were calculated using PacBio SMRTPortal pipeline. Taxonomic assignments for each high quality read was made using PathoScope and RDP.

RESULTS

From a total of 61 lavage samples received for analysis, genomic DNA was extracted from 44 samples, and 16S ribosomal DNA was successfully amplified from 27 samples, which were ultimately sequenced on the PacBio RSII platform. The SMRTPortal alignment of four patient samples yielded an average 36947 post-filtered reads per sample out of possible 150292 wells with an average read length of 3356 (SD=0.21) and quality score of 0.81(SD=0.02). Deeper analysis of 5 individual samples revealed a range of 15 - 65 unique bacterial strains with more than 10X mean coverage, the vast majority of which were not identified in the clinical microbiology tests.

CONCLUSIONS

Pacific Biosciences SMRT sequencing technology precisely identified a robust microbiome community, including rarely diagnosed bacteria as predominant infectious organisms in some samples, suggesting a possibly superior sensitivity and specificity of this method. However, the process associated with sample preparation needs further logistical and experimental adjustments prior to clinical implementation. Future work will include identification of antibiotic resistant genes, directly from patient samples, for precisely targeted treatment of specific pathogens.

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Impact of Exocrine Tissue Maturation on Islet Isolation Success and Function

OBJECTIVE

Islet transplantation, including xenotransplantation, is a vital process in the treatment of T1DM and is a promising therapy for this increasingly prevalent disorder. The purpose of this study was to compare the changes in exocrine/endocrine structure, physiology, and function with increasing piglet donor age and weaning status, thus elucidating the effects on exocrine tissue maturity, islet function, and islet survival.

METHODS

Pancreata were harvested from neonatal aged landrace pigs (5-10 days old), pre-weaned young pigs (18-24 days old), weaned young pigs on solid food (45 days old, or 3 weeks after weaning) and young-adult pigs (4-5 months old), which served as the control group. Pancreases were rapidly procured, then minced, followed by partial enzymatic digestion for 15-19 minutes at 37oC. Islets tissue clusters obtained were cultured at 37oC/5%CO2 in Maturation Media for 7 days. During maturation, single cell islet suspensions were obtained after gentle enzymatic dissociation of isolated islets at 37oC using Accutase, following which they were stained with specific antibodies for cellular markers (Amylase for acinar cells, glucagon for β-cells and C-peptide for β-cells). They were then incubated with corresponding secondary antibodies and stained for viability using Propidium iodine. Cell populations were quantified using flow cytometry. Histological sections from the head and tail regions of the piglet pancreas were stained with Hematoxylin & Eosin using standard protocols and then evaluated under a light microscope to compare acinar size, structure, and morphology; they were also looked under a fluorescent microscope using laser-excitation (ex/em 488/540 nm) to quantify zymogen granule density by evaluating the fluorescent signal intensity using standard histomorphometric image analysis techniques. Selected histological sections were also examined under an electron microscope to study zymogen granule density.

RESULTS

Flow cytometry revealed an increase in β cell and α cell populations in the islet cells, with a corresponding decrease in acinar cells. Using our method, histological staining demonstrated that pancreata isolated from pre-weaned young pigs had a lower fluorescent signal than that found in weaned young pigs and in adult pigs. Ultramicroscopic analysis showed a granule density in pre-weaned young pigs lower than that found in adult pigs.

CONCLUSION

Pre-weaned young pigs, by virtue of their lower exocrine enzyme reserves, had better islet yield and viability and lower rates of apoptosis. Islets isolated from these donor animals would thus be better suited for clinical trials in islet xenotransplantation when compared to islets isolated from older, weaned, adult donor animals.

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Validation of Genetic Variants Associated with Physical Activity in a Young African American Cohort

OBJECTIVE

To explore whether six single nucleotide polymorphisms (SNPs) previously demonstrated to be associated with physical activity in an adult Caucasian population (mean age 45.9 years) – rs12405556 in the LEPR gene, rs10946904 in the PRSS16 gene, rs1766581 in the SIPA1L2 gene, rs2762527 in the PAPSS2 gene, rs9633417 in the SGIP1 gene, and rs667923 in the DNASE2 gene – are also associated with physical activity in a young African American cohort (mean age 7 years).

METHODS

We studied 142 African American children, aged 5 to 9 years, originally recruited for a study focusing on fracture risk and vitamin D levels. We looked for associations between the SNPs and total body bone mineral density (BMD), total body fat, total body lean mass, total percent body fat, total body BMD z-score, BMI, calcium level, phosphorous level, vitamin D level, outdoor playtime on weekdays, outdoor playtime on weekends, and total outdoor playtime per week. Weekly outdoor playtime was quantified using a questionnaire regarding outdoor activity, which was previously shown to correlate with physical activity levels in preschoolers3. The SNPs were genotyped using Taqman allelic discrimination assays (Life Technologies) and associations between SNPs and phenotypes were tested using a one-way ANOVA. All analyses used a dominant genetic model to compare homozygous common allele individuals to heterozygotes and homozygous rare allele individuals combined.

RESULTS

Rs9633417 was associated with outdoor playtime on weekdays. Additionally, we found two SNPs to be associated with other phenotypes closely linked to physical activity: rs10946904 was significantly associated with total body fat and total body percent fat, while rs12405556 was associated with total body BMD z-score. We also found rs9633417 and rs1766581 to be associated with blood calcium levels.

CONCLUSION

SNP rs9633417, shown to be associated with physical activity in Caucasian adults, is associated with physical activity in young African Americans. De Moor, et al. 2009, determined that the SGIP1 gene is related to exercise activity regardless of BMI. Our study supports the concept of this gene playing a significant role in physical activity across cohorts differing in both race and age. The remaining five studied SNPs are not directly associated with physical activity. These findings underscore the difficulties of defining genetic predictors of phenotypic traits across races. However, these SNPs are associated with various measures of body composition, which is often related to physical activity. Our results suggest there are different genetic predictors of physical activity level in African Americans.

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Regulation of BMI1 and cellular senescence by miR200c/141cluster

Polycomb group protein BMI1 is an important regulator of senescence, aging and cancer. It is overexpressed in several types of cancer including breast cancer. BMI1 is also required for self-renewal of normal and cancer stem cells. BMI1 silences important tumor suppressors such as p16INK4a. By repressing 16INK4a, BMI1 can regulate cellular senescence and ageing. Expression of BMI1 itself is downregulated during senescence and aging. MicroRNAs have emerged as major regulators of almost every gene associated with cancer, aging and related pathologies. At present, very little is known about the miRNAs that regulate the expression of BMI1. Here, we report that miR-141 and miR200c posttranscriptionally downregulates BMI1 expression in human diploid fibroblasts (HDFs) via their respective targeting sequences present in the 3'untranslated region of BMI1 mRNA. We also show that overexpression of miR-141 and miR-200c induces premature senescence in HDFs via downregulating BMI1 in normal but not in exogenously BMI1 overexpressing HDFs. Induction of premature senescence in HDFs resulted due the upregulation p16INK4a, an important downstream target of BMI1 and a major regulator of senescence. Our results also suggest that miR-200c and miR141 are upregulated by senescent inducing signals. We are studying the mechanism of induction of miR200c/miR141 by such signals including histone deacetylase inhibitors (HDACi). In summary our data suggest that miR200c/141 cluster based therapies could be developed to treat pathologies where BMI1 is deregulated.

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An Observsation of Bispectral Index Scores in Three Patients Undergoing Outpatient Ketamine Infusions

BACKGROUND/OBJECTIVE

Ketamine, an NMDA receptor antagonist, helps reduce severe debilitating neuropathic pain in patients unresponsive to conventional treatment [1]. Potential ketamine side effects include sedation, hallucinations, hypertension and tachycardia [2]. Bispectral Index (BIS) measures depth of anesthesia or level of sedation using information from processed EEG. A 4 electrode strip placed on the patient's forehead gives a score ranging from 0 to 99. Scores below 60 typically correlate with general anesthesia. We report the BIS values in three patients undergoing ketamine infusions at subanesthetic doses in an outpatient setting.

METHODS

With IRB approval, we enrolled patients undergoing outpatient ketamine infusions for intractable chronic neuropathic pain or generalized pain such as fibromyalgia. Each patient underwent 4 hour infusions on 3 consecutive days with increasing dosage each day. Patients received varying dose of Ketamine based on tolerance and efficacy. BIS scores were recorded every 5 minutes during the course of the 4 hour infusion and for 1 hour following conclusions of the infusion. We used descriptive statistics which are reported for sedation level (BIS score) by time (minutes from start of infusion). These scores were then stratified by sex, age (above or below the median), infusion day (1-3), and dose. Generalized estimating equations were used to test for significant effects of time (minutes from start of infusion), infusion day (1-3), sex, age, and dose on the BIS score. Interaction terms (sex x time, day x time) were then added to these models to determine whether the pattern of BIS scores by time differed by sex or infusion day. To reduce the impact of multiple testing, $p<.01$ was considered significant.

RESULTS

This is an ongoing prospective study. We report results on 30 patients all of whom tolerated the 3 daily infusions without significant side effects.

CONCLUSION

This is an observational study evaluating BIS values in thirty patients undergoing ketamine infusions at sub-anesthetic doses in an outpatient setting over a three-day period. There was no statistical significance in the relationships between BIS scores and time, sex, infusion day, or dose. There was a statistically significant inverse relationship between age and BIS score. Further analysis comparing nurse sedation scores and BIS sedation scores will be evaluated.

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Rhinovirus Infection and the Secretion of Th2 Airway Epithelial Cytokines (IL-25, IL-33) and Th2-related Chemokines (TARC & MDC)

Rhinovirus is a major cause of asthma exacerbations, and understanding the molecular pathway involved in the immune response is critical for the characterization and treatment of asthma. Previous studies done by the Airway Biology Group at Children's National Medical Center (CNMC) have shown that children with acute rhinovirus (RV) infection have increased nasal airway levels of thymic stromal lymphopoietin (TSLP), which is an epithelial-derived cytokine responsible for driving Th2-immune responses in asthma.1 These findings suggest a potential relationship between RV infection and a Th2-biased airway immune response in children. The generation of Th2 responses in the airways also requires the concomitant action of epithelial cytokines (IL-25, IL-33) and chemokines (TARC/CCL17 and MDC/CCL22).1-2 Although epithelial Th2 cytokines and chemokine levels have been associated with RV induced inflammation in mouse models of allergic airway disease, airway secretions of human subjects with natural RV infection have yet to be studied.3 Thus, the hypothesis of this study is that RV in vivo infection is associated with enhanced nasal airway secretion of Th2 epithelial cytokines (IL-25, IL-33) and Th2 chemokines (TARC and MDC) in young children (<3 years); in addition, this Th2 cytokine/chemokine epithelial secretion can be induced by TSLP in human bronchial epithelial cells (HBEC) in vitro.

Nasal airway secretions were obtained from 110 infants and toddlers (ranging from 3.5 days old to less than 3 years of age) during acute respiratory illnesses using standard nasal lavage technique. For a control comparison, nasal secretions were collected from 110 healthy children, who test negative for RV. Demographics and other clinical variables were obtained by electronic medical record review. Samples were analyzed with viral multiplex PCR to identify RV and other common respiratory viruses. Th2 cytokine/chemokine protein levels were measured by multiplex immunoassay in sample supernatants. Parallel experiments that were conducted in primary differentiated (air-liquid interface) HBEC evaluated whether TSLP elicits the apical and/or basolateral secretion of IL-25, IL-33, CCL17/TARC and CCL22/MDC. Our results identified that: 1) Children with acute RV infection have elevated nasal airway TSLP levels as well as CCL22/MDC ($p<0.05$) but not IL-25, IL-33 or TARC, 2) TSLP induces time-dependent apical and basolateral secretion of CCL22/MDC levels ($p<0.05$) but not IL-25, IL-33 or CCL17/TARC. In conclusion our current results suggest that CCL22/MDC may be a potential biomarker and therapeutic target for the Th2 pro-asthmatic effects of RV in children.

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Genetic variants located within genes involved in the vitamin D metabolic pathway are not associated with serum vitamin D levels in African American children

Vitamin D deficiency is a common finding among children in the United States and risk is high among African American children, as dark skin pigmentation limits its synthesis. Childhood vitamin D deficiency is associated with many disease states and also with increased odds of pediatric forearm fracture. Vitamin D deficiency may play a role in the increase in rates of pediatric forearm fracture seen in children of all races over the past 30 years. While most of the environmental factors influencing vitamin D levels have been delineated, the genetic determinants of vitamin D levels are poorly defined. Recent studies have identified genetic variants that are associated with circulating serum 25-hydroxyvitamin D [25(OH)D] levels in European populations. Fewer studies have focused on the genetics of vitamin D levels in African Americans. This study investigated the association between single nucleotide polymorphisms (SNPs) within five genes involved in the metabolism of vitamin D, including VDR, CYP24A1, CYP27B1 and CYP2R1. The purpose of this study was to determine whether genetic variants located within these genes are associated with vitamin D levels, bone mineral density (BMD), and fracture risk in African American children. We used Taqman genotyping assays to determine variant genotypes within genomic DNA isolated from blood samples of 142 African American children. Cases (n=71) had an isolated forearm fracture and age-matched control patients (n=71) had no history of fracture. SNPs were analyzed for association with total BMD, dietary vitamin D intake and 25(OH)D levels. The observed and expected frequencies of each genotype were in Hardy Weinberg equilibrium. ANCOVA models with gender as a covariate were used to determine associations. Associations between SNPs and fracture status were tested using logistic regression adjusted for gender.

None of the SNPs investigated in this study were associated with vitamin D level or vitamin D intake in African American children. The AG/GG alleles of a SNP located in the CYP24A1 gene, which encodes an enzyme that inactivates the biologically active form of vitamin D were associated with higher total BMD. These individuals may more slowly inactivate vitamin D, which may promote bone mineralization and bone health. The AG/AA alleles of a SNP located in CYP2R1 were associated with a higher incidence of fracture, but not with vitamin D levels or BMD. This reveals the complexity of the genetics of vitamin D deficiency and its relation to fracture risk. Future studies are needed to elucidate the extent to which genetic factors contribute to fracture risk and vitamin D deficiency and how risk differs among populations.

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The effect of insertion technique and surgeon experience on the pullout strength of orthopedic screws

PURPOSE

To test the null hypothesis that the manner of screw insertion (hand-driven vs. electrically-driven) and the experience of the screw inserter (orthopedic trainees vs. experienced orthopedic surgeons) have no effect on the pullout strength of orthopedic screws.

METHODS

Four fellowship-trained orthopedic surgeons and four orthopedic chief residents each inserted 10 cancellous bone screws into a polyurethane foam cancellous bone substitute. Five screws were inserted with a standard orthopedic screw driver, and five screws were inserted with a battery-powered electric driver. Samples were loaded to failure and pullout strength was measured using a electromechanical tensile tester. Analysis of variance analysis was used to compare experimental groups.

RESULTS

No significant difference was found between the pullout strengths of screws inserted by hand and the pullout strengths of screws inserted with an electric driver. Screws inserted by experienced orthopedic surgeons, however, demonstrated significantly higher pullout strengths than screws inserted by orthopedic trainees.

CONCLUSIONS

Hand-driven and electrically-driven screws demonstrate similar pullout strengths in a model for orthopedic screw insertion into bone. Screws inserted by experienced surgeons, however, did exhibit increased pullout strength. This suggests a technical nuance that allows experienced surgeons to better insert screws. If identified, this nuance would be of interest to orthopedists in general.

TYPE OF STUDY / LEVEL OF EVIDENCE

Decision Analysis- biomechanical investigation / V

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Intrinsic Complement Inhibitor Deficiency Worsens the Pathology of Mdx Mice

BACKGROUND

Duchenne muscular dystrophy is a muscle degenerative disease where muscle function is compromised due to the absence of dystrophin. Injury to the myofibers results in an increase in macrophage infiltration and centralized nuclei.

OBJECTIVE

The aim of this study is to evaluate complement system as a contributor to the immune process in mdx mice, a mouse model of Duchenne muscular dystrophy. Complement system is responsible for the local clearance of pathogens. We utilized mice deficient in intrinsic complement inhibitors, decay accelerator factor (DAF) and CD59, to determine whether the increased activity of the complement system would worsen the pathology of the mdx mouse.

METHODS

Mice (C57B1/6J black) were engineered with deficiencies in DAF1 and CD59ab (Daf1-/-CD59ab-/-). The complement inhibitor deficient mice were crossed with the mdx mouse to produce MdxDAF/CD59 mice (MdxDaf1-/-CD59ab-/-). The animals were weighed weekly. After exercised with paw grips, the strength of the animal was measured. At three months of age, the animals were sacrificed and diaphragm tissue was procured for analysis. Western blot analysis was performed on protein isolated from diaphragm to evaluate the amount of the complement protein C3. Cryosections were taken from the diaphragms of the mice. Hematoxylin/Eosin stain was performed to visualize centralized nuclei. An anti-F4/80 stain was used to quantify the infiltration of macrophage in diaphragm tissue. Complement was assessed by immunohistochemistry utilizing the anti-C5b-9 antibody and detected with anti-rabbit HRP.

RESULTS

The MdxDAF/CD59 mice demonstrated a significant decrease in weight compared to the mdx mice at 9 wks. (P=0.034, t-test). Grip strength analysis of the experimental groups did not exhibit a significant alteration over a long period of time. The western blot analysis demonstrated that complement protein C3 was present. The percent of centralized nuclei was found to be higher in diaphragm tissues of MdxDaf1-/ CD59ab-/- mice than Mdx mice ($P < 0.01$). The anti-F4/80 stain illustrated that the diaphragms of Mdx and MdxDaf1-/-CD59ab-/- mice were markedly affected by macrophages of the immune system. Membrane attack complex contributes to widespread destruction of the muscle fibers of Mdx and MdxDaf1-/-CD59ab-/-.

CONCLUSIONS

The complement system plays a role in the pathology of the mdx mouse as seen by the increase in centralized nuclei in the complement deficient mdx mouse. Modification to the complement system or intrinsic complement inhibitors may alter the immune response of the skeletal muscle to injury.

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Innate Immune Mediated Deficiency of AMPD1 in Myositis Muscle

Skeletal muscle inflammation of unknown cause is referred to as idiopathic inflammatory myopathy, or myositis. Muscle weakness is one of the characteristic features of myositis. In some patients, the number of infiltrating cells can be attenuated yet the weakness persists. Therefore, we hypothesize that deficits in energy generating pathways contribute to weakness and that innate immune-mediated inflammation worsens weakness by down-regulating metabolic enzymes through TLR and cytokine signaling. We have recently observed an acquired deficiency of the metabolic enzyme adenosine monophosphate deaminase 1 (AMPD1) in myositis muscle. AMPD1 is a purine nucleotide cycle enzyme that is utilized in skeletal muscle during short-term, high-intensity exercise. To assess the effect of decreased AMPD1 expression on muscle weakness, we compared the force generation of isolated muscles from AMPD1 deficient and sufficient mice. We then investigated the effect of innate immune cytokines, TLR agonists, and an ER stress inducer on AMPD1 expression by using an in vitro luciferase reporter system. To identify chemicals that increase AMPD1 transcription, we have created an AMPD1 promoter-driven dual reporter cell line that will be used in a high-throughput chemical screen. We found that mouse muscle deficient in AMPD1 exhibited increased fatigability and weakness compared to those in wild-type mice. In vitro experiments showed that IL-1β increased AMPD1 expression whereas Tunicamycin (ER stress inducer) and the combination of Gardiquimid (TLR7 agonist) and IFN-γ decreased AMPD1 expression, thus identifying possible innate immune mechanisms by which AMPD1 is regulated in myositis. The dual reporter cell line has been created and has shown an increase in reporter expression in response to IL-1β treatment. These results indicate that innate immune mechanisms regulate AMPD1 expression, interfere with energy production, and contribute to weakness in myositis.

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IBSP genotype as a novel genetic modifier locus affecting disease progression in DMD and its interaction with SPP1 genotype.

BACKGROUND

Duchenne muscular dystrophy (DMD); the most common monogenetic disease shows marked heterogeneity in disease onset and progression. This inter-patient variability observed in DMD is attributed to the presence of genetic modifiers. Single nucleotide polymorphisms in SPP1 (serum phosphoprotein/osteopontin; rs28357094) and LTBP4 (latent transforming growth factor beta binding protein 4; rs10880) genes have been previously associated with rapid progression of the disease. Given that SPP1 and LTBP4 are members of TGFβ-related pathways, we hypothesized that other SNPs known to modulate or be associated with this same pathway were strong candidates for genetic modifiers of DMD. Successful identification of genetic modifiers can be used to identify key players in transition from successful to unsuccessful remodeling in muscular dystrophy.

OBJECTIVE

The objective of this research is to identify novel genetic modifiers playing a role in disease progression of DMD and study interactions between genetic modifiers in the TGFβ pathway to shed light on the clinical heterogeneity and pathophysiology of DMD.

METHODS

We genotyped key loci in the four TGFβ pathway- related genes (SPP1, LTBP4, TGFBR2, and IBSP) in a large cohort of DMD patients followed longitudinally for 5-8 yrs (CINRG natural history cohort). We tested whether these loci associated with phenotypic markers representative of DMD disease progression; i.e. grip strength and time to run/walk test (TTRW). Loci were tested singly (single locus effects) and in combination (SNP interactions). We validated microarray gene expression profiling results (previously unpublished data from our lab) using the nanostring gene expression analysis system to help understand DMD pathophysiology.

RESULTS

We have identified a novel SNP rs2616262 located in the integrin-binding sialoprotein (IBSP) gene that significantly associated with grip strength and TTRW (time to run/walk) velocity in DMD patients within the CINRG natural history cohort. Preliminary data for SNP interaction studies between SPP1 and IBSP polymorphisms show evidence for interaction of the two loci. For identification of key players responsible for the switch between successful to unsuccessful remodeling in DMD, we classified patients into mild and severe groups based on tissue pathology. Unsupervised clustering of only severe patients (microarray data) showed spontaneous stratification by SPP1 genotype. However, due to inadequate subjects of rare genotype we were unable to validate differences due to SPP1 genotype.

CONCLUSION

We have been able to successfully identify a novel genetic modifier locus in DMD (IBSP). Further analyses of multi-locus modifier approaches and expression profiling data will help explain the clinical variation observed between DMD patients.

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Nodal Cilia Functions to Robust Nodal Activation During Left-Right Axis Formation

Visceral organ asymmetry is established early in development by a cascade of signaling events initiated by motile cilia. In the mouse, motile cilia of the node generate a flow from right to left, causing downregulation of Cerl2, a Nodal antagonist, on the left side and subsequent increase in Nodal expression on the left side. This signal transfers to left lateral plate mesoderm (L-LPM) where Nodal induces expression of itself and its antagonists Lefty1 and Lefty2 and also Lefty1 in the midline. While ciliary defects are known to create an abnormal left-right axis, how this signaling cascade is affected remains unclear. To study this relationship, the Ccdc40lnks/lnks mouse model was used. Unlike other models, mutation of Ccdc40 does not affect Shh signaling which can complicate analysis of laterality defects since Shh is required for establishing Lefty1 expression in the midline. Our results demonstrate that in Ccdc40lnks/lnks embryos, downregulation of Cerl2 on the left side of the node was randomized. Consequently, upregulation of Nodal on the left side was randomized and possibly delayed. Expression of mwhere leftw e e eard fluid flow across the node is necessary to induce a robust Nodal signal around the node and then in the LPM and midline to properly establish the left-right axis.

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Nuclear envelope is important for myogenic epigenomic developmental programs and normal cell fate

Mutations of nuclear envelope genes cause a wide range of phenotypes, and specific mutations of lamin A/C cause distinct tissue-restricted pathologies. Emerin and lamin A/C, together with other nuclear envelope components, participate in formation of transcriptionally repressive environment by integrating and promoting heterochromatin formation. We have previously presented a model where lamin A/C and emerin gene mutations disrupt developmentally appropriate interactions between chromatin and the nuclear envelope and lead to poor temporal coordination of E2F cell cycle pathways and terminal differentiation pathways. Here we show that emerin is needed for establishing appropriate myogenic epigenomic patterns and cell fate. Using ChIP-Seq we show that loss of emerin from myogenic cells leads to decrease in, and/or absent heterochromatin enrichment on key cell fate regulators and re-activation of signaling pathways involved in stem cell differentiation. We validated these results on transcriptional level using myogenic mouse cells, MYOD covered human myoblasts from patients with EDMD LMNA mutation and human muscle biopsies from patients. Members of SOX2-NANOG-OCT4 signaling pathways show inappropriate upregulation in EMD myogenic cells following myogenic induction. Furthermore, we show that promoters of the same genes (gata6, hoxb1) show decreased heterochromatic enrichment in human myod converted myotubes bearing H222P LMNA mutation (EDMD-AD) and transcriptional upregulation relative to control and disease control (FPLD) myotubes. Finally, we show that gata 6 shows upregulation in EDMD human muscle biopsies relative to normal and disease control (FKRP). In conclusion, we show that adult stem cells with nuclear envelope mutations acquire new epigenomic differentiation programs characteristic of inappropriate cell types.

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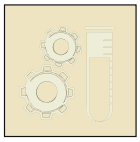

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Establishing a phenotype of early cortical activity disruption in a rodent model of Fragile X Syndrome

Fragile X Syndrome (FXS) is a single-gene disorder in the FMR1 gene on the X chromosome which causes reduced levels of FMR protein (FMRP) and results in mental retardation. It is the largest single genetic cause of autism. Several lines of evidence from humans and mouse models lacking FMRP suggest that hyper-excitability of cortical circuits is a primary feature of this disease, but the age of onset and nature of the circuit defects in specific cortical systems is unknown. We have addressed the question of when and how during development FMRP deletion affects cortical circuits using an awake (non-anesthetized) preparation to record cortical activity patterns at ages equivalent to human third trimester through 6 years of age. The objective was to establish a phenotype of the earliest cortical electrographic changes in developing rats lacking FMRP. Depth electroencephalography was collected in vivo in the visual cortex of head-fixed awake rats from post-natal day 4 to 36. The spontaneous network activity was analyzed for changes in the frequency content of background and sensory evoked activity using spectral analysis techniques. Our results show that FMR animals as young as post-natal day 14 (after eye-opening in rats and equivalent to birth in humans) have increased gamma-range oscillations and decreased theta-range oscillations as compared to wild-type animals. This change in cortical activity persists into the oldest ages examined. The increased gamma oscillations result from increased time spent in a highly alert state, as well as increased gamma power during alertness. Our results are consistent with cortical hyper-excitability in rats following FMRP deletion that appears as early as the time of birth in humans, and suggest that EEG analysis may be a viable pre-symptomatic assay for autism risk in newborns.

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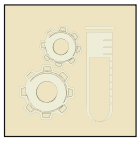

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Enhanced Mechanical and Cytocompatibility Properties of Novel 3D Printed Osteochondral Scaffolds

As modern medicine advances, new and novel methodologies have been explored and developed in order to solve and improve current medical problems. One of the areas of investigation that has thus far proven to be very promising is tissue engineering. For many years, creating polymer scaffolds as a foundation for tissue growth has been one of the most popular approaches to tissue regeneration. The ultimate goal of a scaffold is to provide a framework that provides structural support for growing cells, as well as promoting cell growth and possible directing cell differentiation. In recent years research has been moving in the direction of seeding scaffolds with stem cells and attempting to direct their differentiation and proliferation to a desired tissue type. The objective of the current work is to create novel 3D printed osteochondral scaffolds with both excellent interfacial mechanical properties and biocompatibility for facilitating human bone marrow mesenchymal stem cell (MSC) differentiation. A series of novel 3D osteochondral computer aided models were designed including a homogenous cross-hatched structure, a bi-phasic structure consisting of a cross hatched pattern and an intersecting rings structure, and a biphasic key model. Our mechanical testing results showed that the novel designed biphasic osteochondral structures have enhanced mechanical characteristics in compression and sheer when compared to traditional designs. In order to improve scaffolds' biocompatibility, two additional sample groups were also coated in acetylated collagen and poly-l-lysine coated multi-walled carbon nanotubes (MWCNTs).The proliferation study showed an increase on all samples on day one, with greater cellular activity on bi-phasic scaffolds when compared to control groups in vitro. Furthermore, the scaffolds with acetylated collagen and MWCNTs outperformed all other groups, which show that these nano surface modifications can further increase MSC growth. MSC chondrogenic differentiation results showed enhanced glycosaminoglycan, collagen type II and total protein synthesis on bi-phasic key and nanomaterial coated scaffolds after two weeks of culture.

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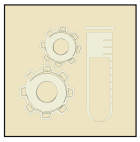

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Optically Mapping the Effects of Light-Activated Norepinephrine Release from Cardiac Sympathetic Neurons

Release of NE from sympathetic neurons enhances heart rate (HR) and contractility through β receptors, but may also be a key player in the formation of cardiac arrhythmias. β-blockers, which target the β-adrenergic receptors in cardiac cells, are often prescribed as treatment for cardiac arrhythmias. Although the connection between β-adrenergic stimulation and cardiac arrhythmias has been made, exact mechanisms are unclear. Previous studies of β–adrenergic activation typically involve the administration of exogenous drugs to achieve a global sympathetic response. This research is therefore important because it utilizes a novel method of light-activated endogenous NE release in order to explore and characterize arrhythmic events that arise from local β-adrenergic stimulation. In these studies, mice were crossbred to selectively express the light-gated membrane channel protein channelrhodopsin-2 (ChR2) in catecholaminergic neurons. It was hypothesized that stimulation with blue light would cause release of NE from these neurons in mouse hearts, and that this localized release of intrinsic NE could lead to a better understanding of arrhythmic events. To test this hypothesis, ChR2 mouse hearts (n=25) were Langendorff-perfused and the epicardium was exposed to sequences of pulsed blue light from a high powered blue LED. ECG electrodes captured signals for HR measurements during all studies. To measure the effects of light on contractile force, a force transducer was attached to the apex of each heart. In separate studies, both calcium transients and transmembrane voltage potential of hearts were optically mapped. A rapid pacing protocol was also implemented during a subset of studies to compare incidence of arrhythmia either with or without blue light stimulation. An increase in HR (23±3 bpm) as well as contractile force (32.2%) was observed in mouse hearts after stimulation with blue light. Propranolol successfully blocked light-induced release of NE, so that stimulation with blue light after administration of propranolol resulted in no change of force or HR. Optical mapping of calcium transients did not show statistically significant results. Diastolic intervals were analyzed from optical action potentials and typically decreased an average of 6.5% due to light as compared to 13.0% due to isoproterenol. During burst pacing protocols, 6/8 hearts showed incidence of arrhythmia (at least one or more premature ventricular contractions) with blue light, compared to just 3/8 incidences of arrhythmia with burst pacing alone. Furthermore, hearts that were stimulated with blue light during burst pacing demonstrated more severe types of arrhythmia. These studies explore a physiologically relevant model for the study of cardiac arrhythmias that arise from the activation of intrinsic sympathetic fibers and local β-adrenergic stimulation.

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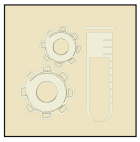

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Effects of Acetylcholine and Dichloroacetate on Cardiac AV Conduction

QUESTION

Determine the effects of acetylcholine (ACh) and dicholoracetate (DCA) on the atrioventricular (AV) delay and heart rate of a Langendorff-perfused rat heart.

MOTIVATION

The AV delay allows the atria to contract and empty blood into the ventricles before ventricular contraction. The AV delay behavior provides insight into cardiac performance and with knowledge about the precise effects of these substances, an approach to diminish adverse conditions could be determined.

METHODOLOGY

Hearts from adult Sprague-Dawley rats were excised and cannulated in a Langendorff system with oxygenated modified Krebs-Henseleit (KH) solution. An electrocardiogram (ECG) was used to record the electrophysiological response. Two bipolar electrodes, on the left atrium and left ventricle, respectively, acquired the individual electrical activities. A control recording was taken. 1 μM ACh or 5 mM DCA was administered to the KH media. The AV delay was quantified by calculating the time between atrial and ventricular depolarization from the bipolar electrode recordings.

RESULTS

Administration of ACh increased AV delay and decreased heart rate. DCA did not considerably affect either variable. Before ACh, the mean AV delay was 73 ± 6 ms. After ACh, the mean AV delay was 83 ± 8 ms ($p = 0.0012$), a percent difference of 13.18%. Additionally, the average heart rate before Ach was 145.63 ± 34.4 bpm and the average heart rate after ACh was 97.62 ± 9.23 bpm ($p=0.00056$). The heart rate was delayed by 24.97%. Before the addition of DCA, the mean AV delay was 102 ± 40 ms. After DCA, the mean AV delay was 96 ± 32 ms ($p = 0.2293$), a 2.88% difference. The heart rate prior to the addition of DCA was 108.44 ± 39.56 bpm. The heart rate was 104.36 ± 44.49 bpm ($p = 0.6732$) after DCA, a 1.13% difference. After the addition of ACh to the media with DCA, the average AV delay was 90 ± 30 ms ($p = 0.4613$) and the average heart rate was 70.72 ± 27.61 bpm ($p = 0.4558$). There was a 1.00% difference in AV delay and 14.88% decrease in heart rate after ACh compared with the control value.

CONCLUSION

AV delay increased with ACh, suggesting a possible method for treating conditions such as tachycardia, atrial flutter or fibrillation. However, there is no significant AV delay or heart rate decrease with DCA, suggesting that it does not cause any considerable effect in the cardiac electrophysiology.

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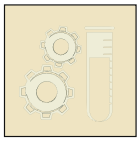

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Computer-Aided Characterization of Normal and Irregular Motor Functions In the Sit-to-Stand Movement as Observed by the Xbox

BACKGROUND

The sit-to-stand (STS) motion has been shown to play a vital role in the modulation of the parameters that define various movement disorders such as Parkinson's disease and holds significant implications for earlier diagnosis. Furthermore, the Sit-to-Stand movement is a skill that has been used to determine the functional level of a person and can be used to assess the success of prosthetic device use by a subject. Currently, the Vicon systems are considered to hold the golden standard for sit to-stand movement analysis. However, with their steep price tag (roughly $10,000), difficult calibration, and requirement of a full body suit--the Vicon provides a challenge for both clinicians and subjects alike. Marketed at a tenth of the cost of a Vicon, the Xbox Kinect holds the specifications to replicate the accuracy of the Vicon systems for sit-to-stand motion analysis.

PURPOSE

The aim of this study is to present an alternative design for the Vicon system that will emphasize low-price, easy calibration, and ease in clinical use. The design aims to use the Xbox Kinect system hardware to present a motion detection system comparable in specifications to the Vicon systems. The design supplements the hardware with MATLAB-based characterization software with an explicit focus on detecting irregular STS movement patterns as related to motion disorders and prosthetic use.

METHODS

The study presents a three-module design to meet its aim. The first module implements the Xbox Kinect hardware to obtain the positional data of specified locations on the human body as the user goes from sitting to standing. This is accomplished through the software Processing and Java, in conjunction with the infrared grid projected by the Xbox Kinect to accurately track the subject movement and export data for further analysis. The second module generates a graphical user interface (GUI) in MATLAB, implementing Taylor expansion to formulate kinematic information such as velocity and acceleration. The data is used to assess the subject's potential risk of falling. The module presents the data in an animated construction of the subjected over all recorded position data, allowing for a qualitative evaluation of the subject's movement data. The last module utilizes MATLAB to present a clinically friendly GUI that allows clinicians to easily view any suspected abnormalities in the subject's sit-to-stand movement analysis. The algorithm of this module relies on statistical analysis to isolate and indicate any points of abnormal movement by systematically comparing intervals of the trajectory movement to previously determined perimeters of expected motion. The graphical display of the interface presents the analysis by highlighting in red any areas of irregular movement.

RESULTS

Simulated data was used to test the functionality and accuracy of the various algorithms within the MATLAB modules. The simulated data was able to validate the functionality of the two-tailed feature of the t-test algorithm as well as confirming the sensitivity of the abnormality detection algorithm to be to the tenth degree. The completed system testing involved validation of inter-module communication and functionality. To assess the comparability of this design to the Vicon System, the prototype will be used to carry out multiple side-by-side studies with Vicon System.

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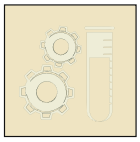

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Electrospun Nanocomposite Nerve Guidance Conduits for Peripheral Nerve Regeneration

Neural degeneration resulted from various traumas and diseases, represents a preponderance of health problem all over the world. Although various cell therapies and implants have been investigated, repairing damaged nerves and achieving full functional recovery are still challenging. For instance, autografts are usually difficult to collect sufficient donor nerves from patients in addition to impairment of donor site nerve function. Given the limited self-regeneration of neural system and defective clinical therapeutics at present, the development of novel strategies to improve and guide neural regeneration is desirable. Neural tissue engineering based on implantable constructs offers a promising avenue in repairing neural injuries and recovering nerve functions. Advancement in nanotechnology and neural scaffold manufacturing strategies has shed new light on this field. In this study, a novel tissue engineered nano neural scaffold was fabricated by electrospinning and electrospraying techniques, which possesses highly aligned poly-ϵ-caprolactone (PCL) microfibrous framework and adjustable neurotropic factor embedded poly (D, L-lactide-co-glycolide) (PLGA) core shell nanospheres. Rat pheochromocytoma (PC-12) cells were used as a model neural cell to evaluate the scaffolds. Our results show that the neural scaffold has highly aligned morphology, excellent cytocompatibility properties and sustained therapeutic release nanosphere system. PC-12 cell proliferation was significantly promoted on the nano scaffold. In addition, confocal microscope images illustrated the aligned scaffold directed the neurites extension along the fibers, which makes the scaffold promising for guiding new neural tissue growth. In summary, our studies demonstrate the potential of a novel highly aligned nano scaffolds with bioactive neural therapeutics embedded PLGA nanospheres for improved nerve regeneration.

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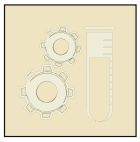

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Phase Sensitive Optical Coherence Tomography System

Optical Coherence Tomography is a interferometric technique, primarily used in ophthalmology, can be applied for the use of processing of medical images for cancer detection. Interferometry utilizes near-infra-red broadband light to record the optical path length of reflected protons. A sample arm, containing the item to be analyzed, and reference arm, containing a mirror, are used to create the interference pattern. Interference will only occur if light travels the same optical pathlength. Depending on the pathlength and light properties of the tissue sample, the areas that reflect back the most amount of light create a greater interference. The A-scan represents the spatial locations, of objects in the tissue, with an imaging depth of 2 millimeters. In accordance with Fourier's theorem, the time domain OCT system can be translated to the Frequency domain which increases the scanning speed and allows for the reference arm to remain stationary. The phase sensitivity of the Frequency domain OCT system was analyzed by introducing a series of gratings and lenses into the reference arm to purposely induce dispersion. Since the tissue being analyzed undergoes dispersion in the sample arm, the reference arm can match the dispersion of the tissue.

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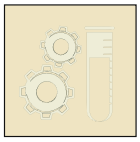

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

A Comparison of the Effects of Acetylcholine and Bisphenol A on the Left Ventricular Pressure and Contractility of the Heart

OBJECTIVE

Our project aimed to investigate the adverse effects of Bisphenol A (BPA) on electrical and mechanical function, using excised hearts from adult rats. BPA is one of the most widely used chemicals worldwide and recent studies have shown associations between BPA exposure and cardiovascular disorders. Specifically, we examined the effects of BPA exposure on electrocardiogram (ECG) traces, atrioventricular (AV) conduction time, heart rate, left ventricular (LV) pressure and contractility. Acetylcholine (ACh) was used as a positive control for electrical conduction experiments, since its activation of muscarinic receptors in the atria is known to cause AV delay and decreased heart rate.

METHOD

Experiments were performed using excised hearts from adult female Sprague-Dawley rats using a Langendorff setup. Hearts were placed in a temperature controlled chamber with ECG electrodes. For conduction experiments, epicardial recording electrodes were positioned on the atria and apex of the heart. For pressure measurements, a balloon catheter was inserted into the left ventricle. Electrodes were amplified and digitized to a computer, which allowed for recording of heart rate, ECG, atria and ventricular electrical activity, and pressures. Signals were collected and analyzed using LabChart. Measurements were recorded during control media perfusion, and again after adding either Ach [1 μM] or BPA [100 μM] to the perfusate media.

RESULTS

Exposure to 1 μM ACh significantly reduced the intrinsic heart rate by 47.3% and increased AV delay by 9% compared with control. Within 1 minute of adding ACh, 1st degree AV block quickly progressed to 2nd degree block. Similarly, exposure to 100 μM BPA significantly decreased heart rate by 23.3% and increased AV delay by 89.3%. 100 μM BPA exposure also resulted in 2nd degree AV block within 4 minutes, and 3rd degree within 5 minutes. We detected a 7.8% decrease in LV pressure and a 5.2% decrease in contractility following exposure to 1 μM Ach, compared to a dramatic drop of 92.9% in LV pressure and a 61.8% decrease in contractility following BPA exposure.

CONCLUSION

As expected, exposure to ACh decreased heart rate and increased AV delay in excised Langendorff-perfused hearts. ACh also resulted in a modest reduction in LV pressure and contractility. BPA exposure decreased heart rate, increased AV delay, decreased LV pressure, and reduced contractility. This finding emphasizes the importance of examining BPA's effect on heart electrical and mechanical function. Future studies will investigate the dose-response of BPA exposure on electrical conduction, LV pressure and calcium handling.

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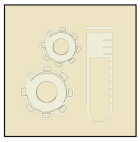

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

High-fidelity CFD Simulation of Hemodynamic Effect of Peripheral Arterial Stenoses

The areas of stenoses are often used as parameters for identifying peripheral arterial occlusive diseases.The current clinical practice usually recommends simple balloon angioplasty to treat critical stenotic lesion, i.e. >60% luminal area reduction. However, the decision to treat multiple sub-critical stenoses, i.e. <50% luminal area reduction, is difficult to make. This is partially because of the lack of existing method to measure how multiple sequential subcritical stenoses affect blood flow at downstream of the stenotic lesions. The pressure drop across blood vessels which is typically viewed as an important parameter for marking the severity of stenotic segments. However, it is clinically very difficult to quantify. And other quantities, such as wall stress, are even more difficult to measure. To assist the clinical decision for treating multiple stenoses, a scientifically quantitative method ,such as computational fluid dynamics(CFD) method, is urgently needed to predict the pressure and velocity field of stenotic arteries. The study of fluid dynamics associated with multiple stenoses is far less than that of a single stenosis. These stenotic arteries consist of patient-specific geometries which are challenging to define computationally. In this study, we present CFD simulations of the blood flow in stenotic arteries with idealized geometries. These arteries are typically simplified as axisymmetric constriction in straight tubes. The hydrodynamics of blood flow in these arteries are modeled using unsteady incompressible Navier-Stokes equations. The 3D computational domain is represented by unstructured meshes with all hexahedral cells. An efficient pressure-based Finite Volume Method(FVM) was implemented to solve these equations. Our simulations include computational geometries with a wide range of narrowing degrees of stenoses, from 40\% to 80\% luminal area reduction. The number of stenoses ranges from 1 to 5. Several different spatial intervals were considered between adjacent stenoses. The upstream flow condition was implemented by using measured peripheral artery flow which at the Reynolds number of 500. Our simulation results revealed several unprecedented discoveries(D1-D5) for the fluid dynamics of stenotic arteries, especially with respect to multiple sequential stenoses. We observed that, when the stenosis narrowing degree increased from subcritical to critical regime, the flow of post-stenotic area turned from laminar flow into transition or even turbulent flow. We found that five sub-critical stenoses of 50\% degree cause higher pressure drop than a single critical stenosis of 60\% degree. For the subcritical stenoses, the pressure drop which introduced by stenotic lesions is linearly correlated with the number of stenoses increasing. The spatial interval distance is increased, the total pressure drop across the entire vessel also increases. Our computational results also support that the varying shape of individual stenosis does not affect the overall pressure drop much as demonstrated stretching. A novel high-fidelity simulation approach to multiple sequential stenoses can be effectively used to provide quantitative data assists the decision making process of doctors to treat peripheral arterial occlusive diseases.

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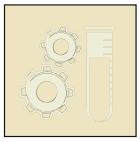

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Sensing and Force-Feedback Exoskeleton (SAFE) Robotic-Assisted Device with Applications to Rehabilitation

Medical events that affect the hand and wrist can range from catastrophic, in the case of a cerebrovascular accident (CVA), more commonly known as a stroke, to non-life threatening such as a fracture. In many cases patients are left with at least temporary loss of function in their extremities. When a condition debilitates the hand and wrist, it affects the ability to function normally in daily activities. Much of the use of our upper extremities involves using our hands in grasping and manipulation achieved through a combination of wrist and finger movements. Consequently, any condition that reduces activity of the hand and wrist can lead to weakness and atrophy of the upper extremities. These issues motivate the ongoing activities presented in this research. Therefore, this research proposes a robotic-assisted device with the ability to augment function for those with long-term or permanent loss of normal joint function. This research presents the design, implementation, and experimental validation of a novel robotic haptic exoskeleton device to augment a patient's remaining function and strength while remaining portable and lightweight. The device consists of a five-finger mechanism actuated with miniature DC motors through antagonistically routed cables at each finger as both active and passive force actuators. The SAFE Glove is a wireless and self-contained mechatronic system that mounts over the dorsum of a bare hand and provides haptic force feedback to each finger. The glove is adaptable to a wide variety of finger sizes, without constraining the range of motion which makes it possible to accurately and comfortably track the complex motion of the finger and thumb joints associated with common movements of hand function including grip and release patterns. The glove can be wirelessly linked to a computer for displaying and recording the hand status through 3D Graphical User Interface in real-time. The experimental results demonstrate that the SAFE Glove is capable of reliably modeling hand kinematics and measuring fingers' motion. To experimentally validate the preliminary prototype developed, a group of eight volunteers performed a teleportation experiment with this glove to navigate a mobile robot through a maze. By comparing teleportation experiments with and without force feedback, the results show that this new device with force feedback can provide effective force feedback to the user and augment telepresence. Simulation and experimental results show the potential of the proposed system in virtual reality and rehabilitation therapy applications.

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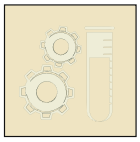

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Evaluation of Synthetic Self-Oscillating Models of the Vocal Folds

BACKGROUND/MOTIVATION

Approximately 30% of people will suffer from a voice disorder at some point in their lives with this probability doubling for those who rely heavily on their voice for work, such as teachers and singers. Additionally, voice disorders have been shown to have a huge economic impact of $2.5 billion annually.

OBJECTIVES

The objective of this research is to study and improve synthetic vocal fold (VF) models by evaluating the ability of the models to replicate physiological VF motion and characteristic parameters of human speech within a life-size experimental setup, and compare the experimental results with clinical results from the GWU Department of Speech and Hearing Sciences. This study integrates speech science with engineering and flow physics to overcome current limitations of synthetic VF models to properly replicate normal phonation in order to advance the understanding of resulting flow features, progression of pathological conditions, and medical techniques.

METHODS

Synthetic VF models are fabricated to exhibit material properties representative of the different layers of human VFs. These VF models are evaluated experimentally in a vocal tract simulator to replicate physiological conditions. Pressure measurements are acquired along the vocal tract, and high-speed images are captured at varying flow rates during VF oscillation to facilitate understanding of the characteristics of healthy and damaged VFs. Clinically relevant parameters calculated from the volume-velocity output of a circumferentially-vented (CV) mask (Rothenberg mask) are compared to clinical patient data in order to advance the state-of-the-art for synthetic VF models.

RESULTS

Using a custom MATLAB algorithm, the homogeneous, 2 layer, and wool-additive VF models were found to oscillate at a fundamental frequencies ranging between 224 Hz and 240 Hz, all within the range of physiological values. The high-speed images were analyzed using a videokymography line-scan technique that has been used to examine VF motion and mucosal wave dynamics in vivo. The homogeneous VF models were found to be symmetric with full closure, the 2 layer models were found to be asymmetric with a mucosal wave, and the wool additive models were found to be asymmetric with a slight mucosal wave. Another MATLAB code was developed to calculate various clinically relevant parameters according to the glottal airflow waveforms collected with the CV mask from normal and aging male patients as well as the CV mask data collected from our experimental setup.

CONCLUSIONS

The silicone sample ratios used to generate our synthetic VF models resulted in modulus of elasticity values within the range of physiological values, and allowed for repeatable use in our experiments; therefore, we concluded that silicone is effective for modeling physiological VFs. This conclusion is further supported with our fundamental frequency, kymograph, and clinical speech parameter results. The kymograph and CV mask results show that the 2 layer and wool additive VF models more accurately replicate physiological characteristics of vocal folds.

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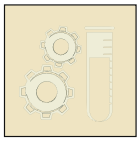

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Non-invasive local blood pressure estimation using subharmonic response from contrast microbubbles

RESEARCH QUESTION

The objective of work is to develop a non-invasive method to measure the local blood pressure.

MOTIVATION FOR THE RESEARCH

Sphygmomanometer provides pulse pressure measurements at the level of the brachial artery but it cannot give the local pressure at heart which may differ markedly, as in case of pulmonary hypertension. Pulmonary hypertension (PH) refers to high blood pressure in the vessel that carries blood from the heart to the lungs. The right heart catheterization (RHC) is considered as one of the best diagnostic modality of PH. In a RHC test, a catheter is inserted through the groin to the right side of the heart to measure the local blood pressure in the right side of the heart. However, this technique is invasive and can cause infection. Apart from being invasive, the RHC technique is expensive also. The interstitial fluid pressure (IFP) in cancer tumors is generally 20-30 mmHg higher than the IFP of a normal tissue. As the tumor volume grows IFP also increases. The measurement of IFP can aid to early detection of cancer. Therefore exploration of a non-invasive method to predict local blood pressure/ fluid pressure for accurate diagnostic is required.

RESEARCH METHOD/APPROACH

Microbubbles with a stabilizing encapsulation of lipids/proteins/polymers are widely used as ultrasound contrast agents (UCA). Such microbubbles generates a subharmonic response, which were found to be sensitive to the ambient pressure change. The goal of project is to generate a correlation between change in ambient pressure and change in subharmonic response from the UCA. In the present study, the ambient pressure dependence of subharmonic response scattered from the UCA is studied both numerically and experimentally at different excitation frequencies and excitation pressures, when excited by ultrasound pulse. In numerical simulation, the Navier-Stokes equation is solved for the microbubble to calculate radial oscillations. An airtight chamber made of polycarbonate is used for the pressurized in vitro experiments. The experimental setup employs two spherically focused immersion transducers.

RESEARCH RESULTS

The results show that the subharmonic response is sensitive to ambient pressure variation. For low excitation frequencies it was observed that the UCA shows non-monotonic variation with the change of ambient pressure. For high frequency ratio values, the subharmonic response demonstrates monotonic increase with increase of ambient pressure. At an excitation frequency of 10 MHz and excitation pressure of 670 kPa, the subharmonic response from UCA shows monotonic increase.

RESEARCH CONCLUSION

The encapsulated microbubble (UCA) can be used to estimate the local blood pressure in a non-invasive way.

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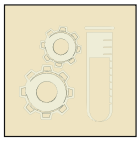

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Pyruvate Dehydrogenase Complex Activation in Normxic Heart

While DCA improves ventricular function in the context of ischemia, the impact of DCA on mitochondrial NADH, cardiac function, and calcium release in the normoxic heart has not been explicitly demonstrated. To do so, changes in NADH caused by DCA must be differentiated from changes caused by ischemia and/or reperfusion. The goal of the present study was to study the effects of PDH activation by DCA when O2 and ATP are not limiting and compare them to the effects of an exogenous elevation of pyruvate.

While there have been few studies of measuring calcium release with exogenous pyruvate administration to isolated cardiac myocytes, there hasn't been any reported literature on these effects in the isolated heart. The published work on isolated myocytes has also had conflicting results. We have shown that with 5 mM pyruvate in the isolated heart, the maximum departure velocity of calcium release increased significantly by 13.1±0.5%. The time to peak however, did not change significantly from baseline (-0.4 ± 1 %). This is indicative that the calcium peak amplitude was higher and the departure velocity was increased significantly enough to maintain similar achieved peak time. Duration of calcium transients (CaD90) increased significantly by 10.6 ± 0.62 %. Time to 90% recovery lengthened by 13.9 ± 0.8 %. This could be a result from either the SERCA pump not increasing in function to compensate for the potentially increased calcium transient amplitude, or simply decreased SERCA activity. SERCA activity is governed by protein kinase A (PKA) activity which could be inhibited by the same compounds that also inhibit PDH kinase: pyruvate and DCA. RyR activity is also governed by PKA activity. If there was a down regulation of PKA by pyruvate and/or DCA, this should have also resulted in not only decreased calcium re-uptake function, but decreased calcium release function as well. We have also developed methods to monitor the redox potential of each state of the electron transport chain in order to better determine if our hearts are truly normoxic using spectral decomposition of transmitted light through the cardiac tissue. We have evidence suggesting that the Langendorff model may indeed be hypoxic, which would skew the effects of DCA and pyruvate that would not normally be seen in the normoxic heart.

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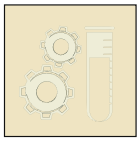

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Ultrasound Stimulation of Insulin Release from Pancreatic Beta Cells

INTRODUCTION

Type 2 diabetes mellitus is a complex metabolic disease that has reached epidemic proportions in the United States and around the world. Controlling type 2 diabetes is often difficult. Many patients are poorly compliant with lifestyle change recommendations, and pharmacological management routinely requires complex therapy with multiple medications, and loses its effectiveness over time. Thus, new modes of therapy are needed that will target directly the underlying causes of abnormal glucose metabolism. The objective of this study is to explore a novel, non-pharmacological approach that utilizes the application of ultrasound energy to augment insulin release from pancreatic β-cells.

METHODS

Our experiments focus on determination of effectiveness and safety of ultrasound application in stimulation of insulin release from pancreatic β-cells. ELISA insulin release assay was used to determine and quantify the effects of ultrasound on basal and glucose-evoked insulin release in cultured pancreatic β-cells. Effects of ultrasound on cell viability were assessed by employing MTT, Caspase-3, LDH release and Annexin-apoptotic cytotoxic assays. Ultrasound exposure was generated using a commercial ultrasound device (Sonicator 740, Mettler Electronics) and a planar ultrasound transducer with center frequency of 1 MHz and intensity of 0.8 W/cm2 was used to treat the cells for 5 minutes. Insulin has been shown to be released in a calcium-dependent manner in response to changes in blood sugar levels. Therefore, our study also looked to evaluate extracellular calcium influx as a potential mechanism for enhanced ultrasound induced insulin release. Thus, calcium transients were measured and quantified by ratiometric calcium-imaging assay.

RESULTS

Our preliminary data indicated that application of therapeutic ultrasound may lead to increase of insulin secretion from β-cells in a calcium dependent manner while maintaining cell viability. ELISA results showed a 25% increase in insulin release from β-cells after ultrasound exposure for 5 minutes. Cell viability was not significantly affected during and for up to one hour after treatment. Insulin release and cell viability results will be correlated as a function of temperature increase and cavitation activity to demonstrate the potential mechanical and thermal effects of ultrasound on pancreatic β-cells.

CONCLUSION

If shown successful our approach may eventually lead to new methods in the treatment of diabetes and other secretory diseases. Our future studies will focus on application of ultrasound to the pancreas in an in vivo animal model to determine whether it would be possible to stimulate β-cells without stimulating other endocrine and exocrine cells of the pancreas.

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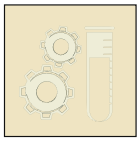

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Hyperspectral imaging of atrial radiofrequency ablation lesions

BACKGROUND

Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia and is projected to affect over 10 million people in the United States by 2050. The main cause of AF is abnormal electrical activity originating in the muscle sleeves of the pulmonary veins. AF is most commonly treated by radiofrequency ablation lesions placed on the endocardial surface of the left atrium using a percutaneous catheter. Two major limitations of the procedure are the inability to visualize in real time the degree of tissue damage or any functional gaps between the ablation lesions. A solution using hyperspectral imaging (HSI), an optical imaging modality that can capture the complete reflectance spectrum across the UV-Vis-NIR for each pixel in an image, has recently become feasible for laboratory and biomedical applications.

OBJECTIVE

To evaluate the applicability and efficacy of hyperspectral imaging as a modality for the visualization of radiofrequency ablation lesions in the left atrium.

METHODS

The hyperspectral data cubes were acquired using three different HSI systems: a custom pushbroom hyperspectral imager comprised of a Specim imaging spectrograph and an Andor high performance CCD camera, courtesy of Middleton Research; a custom hyperspectral imager based on an acousto-optic tunable filter from Brimrose Technology Corporation; and the Nuance FX system, a commercial microscope-mountable multispectral imager that employs a liquid crystal tunable filter. Radiofrequency ablation lesions were placed on the endocardial surface of excised left atrial tissue from porcine hearts.

RESULTS

Temperatures reached during the RF ablation procedure cause the endocardial collagen and muscle tissue layer beneath to denature. As a result, the surface of the atrium appears more opaque and has a slightly yellow hue. Normalized white-light reflectance spectra confirm significant spectral differences between ablated and unablated areas of atrial tissue. HIS detects slight changes in endogenous tissue spectra, and by creating a pseudocolor composite image it provides clear lesion delineation in absence of dyes. HSI of endocardial atrial tissue also reveals information about how deep the lesions reaches because increased depth results in increased tissue opacity.

CONCLUSIONS

The results confirmed feasibility of visualization of radiofrequency lesions through a novel biomedical application of hyperspectral imaging.

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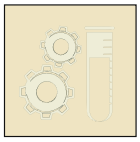

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Computer-based Quantitative Assessment of Learner Performance during Neonatal Endotracheal Intubation: A Pilot Study

BACKGROUND

Success of neonatal endotracheal intubation (ETI) is measured by the ability of the operator to place the endotracheal tube in the correct position within 30 seconds.1 Although it is a critical skill, pediatric trainees often are unsuccessful at its performance.2, 3 Task trainers and animal models coupled with instructor feedback have been traditionally used to teach neonatal intubation to residents. The small size of the neonatal airway and the large class size and limited time available during training sessions, however, hinder instructors' ability to detect specific causes of procedural failure that can be used as feedback to direct individual learning. Smart tools that enable rapid detection of learner deficits can enhance the learning process by facilitating immediate feedback.

OBJECTIVES

The objectives of this pilot study were to: 1. develop a computer based quantitative assessment tool capable of recording and measuring learner performance during simulated neonatal ETI; and 2. Compare novice ETI performance to expert performance.

METHODS

A standard neonatal resuscitation mannequin head, laryngoscope and 3.0 endotracheal tube (ETT) were fitted with electromagnetic trackers to capture mannequin head motion and the motion of the laryngoscope and ETT with 6 degrees of freedom. Replica 3D computer models of the head, laryngoscope and endotracheal tube were then developed and registered to align completely with their physical counterparts. All motions were captured and mirrored by the 3D model. Following a warm up period, participants were recorded performing endotracheal intubation three times. Participants recruited included expert neonatology attendings (> 60 patient intubations), novice nurse practitioners and novice pediatric residents (< 25 intubations). Data was processed and simultaneously sent to a laptop screen for continuous, real-time display of the mannequin, laryngoscope and ETT position and orientation. The software recorded each procedure allowing later review by the instructor.

RESULTS

3D quantitative assessment software was developed. Both 3D and sagittal sections allowed detailed review of operator motion and orientation. The number of attempts, time to intubation (from placement of the laryngoscope to its removal after tube placement), time in each phase, number of corrections, 3D trajectory, geometry, and approximate forces applied were measured and analyzed. Four experts and five novices were recorded performing 28 intubations. Experts were more frequently able to intubate in one attempt (92%) than novices (73%). Experts had smoother motions as noted by fewer corrections of the laryngoscope to obtain optimal views, less rocking on the gums (pitch peak median 7 vs. 8 count), less side to side motion (yaw peak median 7 vs. 8 count), and shallower depth of penetration (median 62.4 mm vs. 72.4 mm). Experts more often moved the mannequin head than novice learners (head pitch median 16.28 vs. 11.87 degrees). Both experts and novices had similar time to intubation (median 12.2 vs. 13 seconds). All measurements of performance with the exception of force were higher for experts than novices. While the differences between experts and novices did not reach statistical significance, these preliminary data support the feasibility of measuring performance in a larger panel of expert and novice users.

CONCLUSIONS

In this pilot study, computer based quantitative analysis of endotracheal intubation was developed to allow instructors to record and review trainees' intubation attempts. Preliminary results suggest that our approaches can show differences between expert and novice performance in a larger study. Computerized performance analysis may serve as a valuable tool that will aid instructors in providing directive feedback to learners during neonatal ETI.

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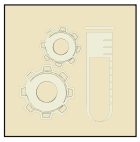

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Identification and Enumeration of Lymphocytes Expressing Human CD4 Antigen in Whole Blood Using A Microfluidic Device

RESEARCH QUESTION

Can hydrodynamic trapping microfluidics and optical imaging be used to measure CD4 concentration in small whole blood samples?

MOTIVATION FOR THE RESEARCH

Counting the reduction in CD4 expressing lymphocytes has been the accepted method of determining the clinical stage of an HIV/AIDS infection. Flow cytometry is currently the standard technology for determining the number of CD4 cells; however, there are drawbacks such as high costs, bulky instrument, complexity and large blood samples (>100 µL). Microfluidic devices have been used to capture microspheres which are of a similar shape and size to CD4 cells. Such devices were validated by simulation, which are not directly applicable to biologic cell capture. Creating simulations to test the applicability of existing microsphere designs will simplify future design processes. The proposed device consists of a microfluidic chip that captures lymphocytes for microscopic imaging, and an image processing algorithm to count those that express CD4. It requires a smaller volume of blood and reduces equipment required to perform tests, making it simpler and cheaper to perform CD4 counts potentially with a portable system.

RESEARCH METHOD/APPROACH

The microfluidic device was made of poly-di-methyl-siloxane (PDMS) from a silicon mold and captures lymphocytes based on size. Whole blood is processed such that CD4 expressing cells are fluorescently labeled with FITC conjugated monoclonal antibody to CD4, and then pushed through the device. A 10 µL sample requires less than 1 hour to pass completely through a single channel. Images are taken of the device holding the captured cells and these are input into an algorithm to count the fluorescing CD4 cells. The design was also simulated in COMSOL Multiphysics to recreate the observed phenomena of using microsphere capture designs for biological cell trapping. A segment of our device geometry was input to the simulation profile and the cell was modeled as a viscous droplet in another flowing fluid. The droplet and interface parameters were manipulated such that they represented a lymphocyte. Parameters such as droplet radius and carrier fluid velocity were then manipulated to observe cell deformation, capture and slippage through a trap.

RESEARCH RESULTS

Our device has shown that it is possible to capture and count CD4 Cells. Using 10 µL of blood and pressures under 2 lb/in^2 it has successfully captured cells which were then counted. 2D simulation resulted in observed biological cell deformation and slippage based on fluid velocity and cell size.

RESEARCH CONCLUSION

This technique can be further modified to include the blood sampling and processing procedure on the device itself to create a lab-on-a-chip portable HIV/AIDS test. The adaptation of existing microsphere simulation models for biological cell capture appears promising. Future work will include validation of trap sizes relative to size varying CD4 cells and implementation of channels with trap size gradients, in addition to full channel imaging and enumeration. These results are promising for using microfluidics for cell counting of not only CD4 cells but others as well such as tumor cells and stem cells.

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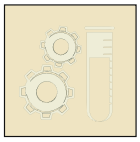

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

3D Printed Bioactive Nanostructured Scaffolds for Osteochondral Regeneration

Osteoarthritis (OA) is clinically defined as the progressive degeneration of hyaline cartilage within articulating joints leading to structural and functional failure at the interface. Over 48 million Americans are currently afflicted with OA or some form of degenerative joint disease. Reduced joint mobility and severe pain due to articular cartilage and subchondral bone (collectively known as osteochondral tissue) damage is common to patients suffering from OA. Current treatment methods used to address these defects include autografts, allografts, and mosaicplasties which contain their own inherent limitations, including donor site morbidity, infection, poor tissue integration, and insufficient neovascularization. Osteochondral tissue, like all other tissues, is composed of ordered and random biological nanostructures and can, in principal, be classified as a nanocomposite material. The objective of this work is focused on the manufacture of three-dimensional (3D) bioactive graded nanocomposite scaffolds for osteochondral tissue regeneration. For this purpose, a porous and highly interconnected poly(ethylene glycol) diacrylate (PEG-Da) hydrogel scaffold containing a gradient of nanocrystalline hydroxyapatite (nHA) was fabricated via our novel table-top stereolithography (SL) 3D printing system. In addition to the osteoconductive nHA nanomaterial, transforming growth-factor β1 (TGF-β1) was incorporated within the smooth articulating cartilage layer. We postulate that sustained growth factor release in combination with a more biomimetic graded 3D printed nanostructured construct will yield a more clinically relevant tissue-engineered construct for improved osteochondral tissue regeneration. For this purpose, human bone marrow-derived mesenchymal stem cells were seeded onto control, homogeneous, and graded scaffolds and evaluated for adhesion, proliferation and osteochondral differentiation in vitro. Preliminary results illustrated the feasibility of printing highly-ordered graded nanocomposite scaffolds as well as improved stem cell function in vitro. Our current 3D printing technology allows for efficient phototcrosslinking of the novel nanocomposite hydrogel materials for the manufacture of osteochondral constructs, which have good spatiotemporal control of morphogenetic nanomaterial incorporation as well as exhibit similar mechanical properties to that of the native tissue.

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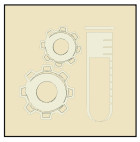
BIOMEDICAL ENGINEERING



SCHOOL OF ENGINEERING AND APPLIED SCIENCE
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3D Bioprinting of Functionalized Graphene Nanoplatelet Doped Hydrogel for Neural Tissue Regeneration

RESEARCH QUESTION

Can functionalized graphene nanoplatelets be successfully incorporated into a biocompatible neural scaffold in a way that promotes neural cell behavior and has the capability to be implemented in patient-specific applications?

MOTIVATION FOR THE RESEARCH

Peripheral nerve injuries affect more than 20 million Americans, leaving them in pain and with restricted mobility. Additionally, ~250000 Americans annually suffer spinal cord injuries that can induce paralysis and cause the loss of autonomic functionality. Although various cell therapies and implants have been investigated, repairing damaged nerves and achieving full functional recovery are still challenging considering the complexity of the nervous system. Since neural cells directly interact with nanostructured extra-cellular matrices, the biomimetic features and excellent physiochemical properties of nanomaterials play a key role in guiding neural regeneration. Traditional neural constructs still lack the ability to incorporate well-controlled 3D geometry, biomimetic nano features, and suitable mechanical properties in a single scaffold. Furthermore, most current available scaffolds lack adequate conductive properties that are essential for neuron development. To combat these problems, this work aims to harness stereolithography based 3D bioprinting and graphene nanoplatelets to create a biomimetic, conductive nanocomposite scaffold for successful neural tissue regeneration. We expect the graphene nanoplatelets will not only improve the young's modulus of the hydrogel scaffolds, but also increase conductivity, and provide biochemical cues via attached functional groups to better induce neuronal growth and differentiation in a more clinically relevant tissue engineered nerve graft.

RESEARCH METHOD/APPROACH

First, a series of highly aligned 3D computer models were created via CAD software, and printed using our lab's novel stereolithography based bioprinter. Briefly, A hydrogel solution is created by mixing Poly (ethelene) glycol (PEG), Poly-(ethelene) glycol di-acrylate (PEG-DA) graphene nanoplatelets, and a photoinitiator appropriate for the wavelength and energy of the laser used. This solution is then added layer by layer into a vat, and subsequently cured via UV laser radiation into a biocompatible, 3D hydrogel scaffold. Similar hydrogel constructs with both COOH or NH2 functionalized graphene nanoplatelets were successfully fabricated. The scaffolds were compared with the pure hydrogel construct through scanning electron microscopy imaging, PC-12 cell proliferation and differentiation studies in vitro. Cell number was obtained via MTS assay at 2, 4, and 6 days of PC12 rat adrenal pheochromocytoma cell culture.

RESEARCH RESULTS

Preliminary results show excellent morphological accuracy of 3D printed hydrogel with incorporated graphene nanoplatelets. Graphene nanoplatelets can be seen embedded in the hydrogel surface, indicating high probability of interaction with cells. PC 12 cell response was evaluated on COOH, NH2 and control hydrogel scaffolds, and cell number was obtained via MTS assay at 2, 4, and 6 days. The graphene incorporated scaffolds did not exhibit a detrimental cell response when compared to controls. Mechanical properties, confocal micrographs, and addiditional cell studies are currently in progress.

DISCUSSION

This experiment showcased the unique ability of the custom stereolithography bioprinter to fabricate 3D hydrogel scaffolds with incorporated graphene nanoplatelets in precisely defined geometries. This capability is unique to the tissue engineering world, and provides great promise for incorporating graphene nanoplatelets, and other nanomaterials in 3D bioprinted constructs for tissue engineering applications.

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Modeling the Cold Plasma Therapy on a Tumor Area

The interaction of plasma and tumor cells is becoming a rapidly growing topic in the plasma medicine field with new findings every day that further the understanding of the mechanism behind this phenomenon. With this newly discovered information, though, the question arises of whether this mechanism can be modelled for the cancer therapy purposes. These models would have to take into account all of the mechanisms for tumor death and tumor growth within cancer cells to create a program that can be verified with experimental data. Simulations and modelling are important in medicine and research, and new findings on the effects of cold plasma on tumor cells create an opportunity to create a new form of therapy that involves personalized medicine and personalized treatment plans for any given tumor. Personalized treatment plans, based upon computer simulations, are the future of medicine and have the ability to create more effective and efficiently targeted cancer therapies for use in the medical field. The primary approach to this research involves creating a computer simulation of plasma effects on a tumor area. The simulation utilizes Fick's Second Law of Diffusion to model particle concentration as a function of distance and time. This determines the concentration of reactive oxygen/nitrogen species (RONS) in a cell – which serves as a factor in programmed cell death - at any time located a certain distance away from the point of treatment. The simulation is programmed to allow for a variety of inputs for tumor size, tumor shape and treatment time. By factoring in the mechanisms for tumor cell death, tumor cell growth, and normal cell growth, the program can accurately model the growth and death of a tumor based on the tumor's shape and the amount of time the tumor is treated with cold plasma. This simulation will be validated by comparing the results to in vitro experiments that are currently being conducted. The cellular experiment was conducted by exposing U87 glioblastoma cells to cold atmospheric plasma for a varying amount of time. Cell death was measured using an MTT assay to check for cell viability and also a fluorescent ROS detection assay. Treatment time was varied to show that with increasing treatment time, ROS and cell death would also increase. Preliminary results show that cold atmospheric plasma therapy can be modeled effectively as compared to in vitro models. Also, the model can effectively simulate the growth and death of cancer cells to an appreciable extent. With these two results, the tool can be utilized to create personalized simulations for cancer patients to more effectively treat their cancer. The in silico results from the simulation follow the same trends as displayed by the in vitro results in terms of cell proliferation and cell death, proving the simulation to be a confident model of plasma-cancer interaction.

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The effect of prophylactic antibiotics on infectious episodes, bacteremia, and bacterial colonization patterns in children with acute myeloid leukemia

BACKGROUND

Alpha hemolytic streptococci (alpha-strep) is the major cause of treatment related morbidity and mortality in pediatric acute myeloid leukemia. Structured supportive care measures are needed to reduce the incidence of infection and bacteremia. The aim of this study was to evaluate the prevalence, etiology, and pathogenic antibiotic resistance patterns for infectious episodes and bacteremia, and the bacterial colonization patterns by surveillance cultures among patients who did and did not receive antibacterial prophylactic treatment.

METHODS

A retrospective longitudinal study was conducted for 103 patients enrolled on the AML02 protocol from October 2002 to October 2008 at St. Jude Children's Research Hospital. Several prophylactic treatment regimens were evaluated. All culture results and drug sensitivity data were obtained by charts review of patients.

RESULTS

For each phase of treatment, prophylactic treatment regimens reduced the episodes of infection or fever (all $P<0.05$ except consolidation III) and bacteremia (all $P<0.003$) when compared to patients who received no prophylactic treatment. A decrease in alpha-strep bacteremia (from 35 isolates to 10), but an increase in vancomycin resistant enterococcus (VRE) (from 0 isolate to 5) was observed in patients receiving prophylactic treatment. Rectal surveillance cultures detected VRE in 8 patients, while nares surveillance cultures were found ineffective in detecting resistant pathogens.

DISCUSSION

Prophylactic treatment is effective in reducing the episodes of fever and bacteremia in pediatric AML patients, however routine continuous monitoring of resistant clones is necessary.

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The 21-gene Recurrence Score Influences Treatment Recommendations for Patients with Node-positive Breast Cancer

OBJECTIVE

Oncotype DX is a PCR-based test that analyzes 21 genes related to tumor growth, invasion, and hormone receptor sensitivity on invasive breast tumors. The derived Recurrence Score (RS) estimates the probability of breast cancer recurrence within 10 years. Its influence on clinical decision-making regarding the need for adjuvant chemotherapy in patients with node-negative breast cancer is well-established. The extent to which RS changes management in node-positive patients is unknown. The aim of this study is to determine the effect of RS on treatment recommendations for breast cancer patients with positive lymph nodes.

METHODS

Clinical cases including patient age, race, tumor size, nuclear grade, histopathology, ER, PR and Her2/NEU receptor status as well as the presence and size of axillary metastasis were presented to breast cancer specialists (3 surgical and 2 medical oncologists) at a weekly tumor board. Participants were asked to estimate the RS range (low, low intermediate, high intermediate, or high) based on the clinical information provided in each case. Participants then came to a consensus for appropriate adjuvant therapy for each patient. The group was then informed of the RS, and a new consensus was reached regarding recommended adjuvant therapy. The ability to estimate RS range and changes in treatment recommendations were evaluated.

RESULTS

Based on clinic and laboratory variables, breast cancer specialists estimated RS correctly 59% of the time. Adjuvant therapy recommendations changed in 16 out of 25 (66.7%) cases once the RS was revealed. In eleven (45.8%) cases the recommendation was changed to hormonal therapy alone after the RS was revealed. In four (16.7%) cases for which chemotherapy was initially recommended, the recommendation was changed to a less intensive regimen or referral to a clinical trial.

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Evaluation of Surgical Re-excision Rates with Bioptics Biovision Imaging

OBJECTIVE

Specimen radiography is necessary in patients undergoing breast excisions by wire localization to confirm adequate removal of the area of concern. The Bioptics Biovision (BB) dedicated specimen imaging system (Faxitron Bioptics, Tuscon, AZ) is a mobile imaging unit located in the operating room that allows immediate specimen radiography with high-resolution digital imaging. Our goal is to assess the efficacy of examining specimen margins with Bioptics Biovision imaging intraoperatively to potentially reduce re-excisions for patients undergoing breast surgical excision by wire localization.

METHODS

A retrospective chart review of patients who had BB imaging between November 2011 and 2012 was performed. Charts were analyzed to determine if margins appeared adequate on imaging and whether additional margins needed excision at the time of initial surgery. The margins assessed included the superior, medial, lateral, and inferior margins relative to the area of concern. Anterior and posterior margins were not assessed. The number of secondary procedures for re-excisions due to inadequate pathological margins was determined, and which margins were positive. Pre-operative diagnosis re-excision rates were determined to assess the difference between breast cancer and other proliferative pathologies such as cellular atypia or papillomas. Addition margins taken intraoperatively were compared to the positive margins found that required re-excision.

RESULTS

A total of 48 of 127 patients (38%) required a re-excision. Of those 48 patients, 28 (58%) had inadequate anterior or posterior margins. During the initial operation 68 additional margins were excised in 51 patients after intraoperative specimen verification, of which 30 (59%) patients did not require re-excision. Pathology in additional tissue excised showed carcinoma in 15 (22%) of the specimens. Ductal carcinoma in situ was present in 10 if the 15 (67%) margins that showed carcinoma. In the remaining 21 patients who had additional margins excised intraoperatively but still required re-excision, 12 (57%) were due to inadequate anterior or posterior margins and 3 margins (14%) were re-excisions of the congruent margins. Of 109 patients with a known diagnosis of breast cancer prior to surgery, 37 (34%) required re-excision. Of 18 patients without a known cancer diagnosis prior to surgery, 10 (55%) required re-excisions.

CONCLUSIONS

Intraoperative digital mammography is an excellent addition to the surgeon's armamentarium, providing both convenience and efficiency by allowing immediate specimen digital imaging and reducing secondary re-excision rates. Rates may be further reduced by imaging all margins.

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Down-regulation of miR-200b in atypical ductal hyperplasia (ADH) of the breast

BACKGROUND

Improving our understanding of early stage cancers as well as preneoplastic processes in the breast is crucial to improving therapy and survival for women with breast cancer. Atypical ductal hyperplasia (ADH) is considered a risk factor for developing invasive carcinoma because it is associated with a 4-5 times increased risk for breast cancer. ADH diagnosed by core needle biopsy (CNB) is clinically significant for its frequent (20-50% of cases) association with DCIS or invasive carcinoma upon surgical excision. MicroRNAs (miRNAs) are short, non-coding RNAs involved in post-translational regulation of gene expression. We and others have demonstrated the aberrant expression of miRNAs during the developmental stages of breast cancer. Interestingly, our prior miRNA profiling study using microdissected FFPE tissue showed that miR-200b is one of the significantly deregulated miRNAs. miR-200b has also been reported to be a tumor suppressor and promising therapeutic target in cancer.

OBJECTIVE

We aim to identify potential miRNA markers that, in association with clinical, pathological, and radiological findings, to be used in predicting whether an ADH diagnosis is associated with more advanced lesions on subsequent surgical excision. The goal is to minimize unnecessary surgical excision following ADH diagnosis.

METHODS

Following IRB approval, ADH cases with archived CNB tissue samples from GW's pathology tissue bank along with corresponding clinical, pathological, and radiological data were retrospectively examined. ADH lesions and adjacent normal tissue from CNB were microdissected for isolation of total RNA. Quantitative real-time PCR (qRT-PCR) was performed to detect miR-200b expression in ADH in comparison to adjacent normal breast tissue, and relative miRNA expressions were calculated and statistically analyzed by paired t-test analysis. In addition, we detected miR200b expression in a series of breast cancer cell lines in comparison with normal breast epithelial cells.

RESULTS

miR-200b was downregulated in 8 out of 10 (80%) ADH specimens compared to adjacent normal breast tissue from archived CNB samples. Among cell lines, miR200b expression was downregulated in ER+ lines compared with MCF10A, and further downregulated in ER- lines. Downstream targets of miR-200b, and its associated molecular pathways have been identified.

CONCLUSIONS

Our study for the first time provides evidence that miR-200b may be a predictive marker for ADH diagnosis. Downregulation of miR-200b in breast cancer cell lines and in ADH samples support its role as a tumor suppressor. A prospective clinical trial evaluating the utility of expression of miR200b and other miRNAs as predictors for ADH diagnosis is currently underway.

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miR-638 Mediated Regulation of BRCA1 Affects DNA Repair and Sensitivity to UV and Cisplatin in Triple Negative Breast Cancer

BACKGROUND

Triple negative breast cancer (TNBC) represents 15-20% of all types of breast cancer, however, it accounts for a large number of metastatic cases and deaths. TNBC is defined as estrogen receptors (ER) -, progesterone receptors (PR) - and human epidermal growth factor receptor 2 (HER2) - negative cancer type. Despite extensive research, there is still no effective treatment. The dysregulation of microRNAs (miRNAs) in breast cancer have been widely reported. Our previous miRNA expression profiling analysis found that miR-638 was one of the most deregulated miRNAs in breast cancer progression. Bioinformatics analysis revealed that miR-638 directly targets BRCA1, a well-known tumor suppressor involving DNA damage repair in breast cancer.

OBJECTIVES

The aim of this study was to decipher the regulatory mechanism of miR-638 in BRCA1 modulation in TNBC.

METHODS

Formalin-Fixed, Paraffin-Embedded (FFPE) breast cancer samples were microdissected into the following components, normal epithelial cells, atypical ductal hyperplasia (ADH), ductal carcinoma in situ (DCIS) and invasive ductal carcinoma (IDC). Total RNA was isolated from these tissues using the ABI RecoverAll™ Total Nucleic Acid Isolation Kit for FFPE Tissues kits. A list of miR-638 target genes was identified using the TARGETSCAN-VERT 6.2 and the miRanda programs. The expression of miR-638 and their target genes were analyzed by real-time qRT-PCR. Western blot analysis was performed to verify some of the target genes. Dual luciferase reporter assay was employed to confirm the specificity of miR-638 target gene(s). The biological function of miR-638 was assayed by Matrigel invasion assays, MTT Chemo-sensitivity assays and host cell reactivation assay (HCR).

RESULTS

Expression of miR-638 was low in breast cancer cell lines compared to normal-like/claudin-low breast cell lines; and was significantly down-regulated in ADH, DCIS and IDC compared to normal breast tissues. TargetScan identified that BRCA1 is one of miR-638's direct target, which is subsequently confirmed by luciferase assay. Overexpression of miR-638 resulted in significantly reduced proliferation rate and inhibited invasive ability in TNBC cells. Furthermore, miR-638 overexpression increased sensitivity to UV and cisplatin exposure in TNBC cells. HCR assay showed that miR-638 reduces DNA repair capability in post-UV/cisplatin exposed TNBC cells. The reduced proliferation, invasive ability and DNA repair capabilities associated with down-regulated BRCA1 expression.

CONCLUSIONS

These findings suggest that miR-638 plays important roles in breast carcinogenesis and cancer progression. miR-638 might serve as a potential therapeutic target for TNBC.

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Incidence of patient-reported urinary incontinence after stereotactic body radiation therapy for clinically localized prostate

BACKGROUND

Urinary incontinence (UI) following prostate radiotherapy is a rare toxicity that adversely affects a patient's quality of life. The potential for hypofractionated radiotherapy to increase the risk of UI was investigated. This study sought to evaluate the incidence and severity of UI following stereotactic body radiation therapy (SBRT) for prostate cancer.

METHODS

Between February 2008 and August 2011, 216 men with clinically localized prostate cancer were treated definitively with SBRT at Georgetown University Hospital. Patients were treated to 35 to 36.25Gy in five fractions delivered with the CyberKnife (Accuray). UI was defined as self-reported involuntary urine loss and was assessed via the UI domain of the Expanded Prostate Index Composite (EPIC)-26 at baseline and at months 1, 3, 6, 9, 12, 18, and 24. EPIC scores range from 0 to 100 with lower values representing worsening incontinence. The minimally important difference (MID) was defined as a change of one-half standard deviation from the baseline.

RESULTS

The median age was 66 with a median prostate volume of 38 cc. The median follow-up was 3.2 years. Baseline UI was common with 22.0%, 26.2%, and 3.3% of patients reporting leaking, dribbling and pad usage, respectively. At two year post treatment, 31.1%, 34.7%, and 7.1% of patients reported some degree of incontinence based on leaking, dribbling and pad usage, respectively. Average EPIC UI domain scores showed a slow decline over the first two years following treatment. At two year post treatment, the median decreased from a baseline of 92.1 to 88.0. This change was statistically ($p < 0.001$) but not clinically significant (MID=6.7). The proportion of men feeling that their UI was a moderate to big problem increased from 1% at baseline to 6% at two years post treatment.

CONCLUSIONS

SBRT for clinically localized prostate cancer was well tolerated with UI rates comparable to conventionally fractionated radiotherapy and brachytherapy. Greater than 90% of men who were pad-free prior to treatment remained pad-free two years following treatment. Less than 10% of men felt posttreatment UI was a moderate to big problem.

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Regulation of cell proliferation and senescence by microRNA-4436

BACKGROUND

The microRNAs (miRNAs) negatively regulate gene expression by degrading mRNA and inhibiting translation of proteins. Recent studies have demonstrated critical role of miRNAs in pathological processes such as aging and cancer. The miRNAs target various genes that are involved in cell proliferation, senescence, differentiation and apoptosis. We have been studying regulation of cell proliferation and senescence by the Polycomb group protein BMI1. We have identified several miRNAs that are regulated by BMI1. Here we report that BMI1 induces miR-4436, which regulates cell proliferation and senescence in human cells. We also report that miR-4436 targets a methyltransferase family member, HEMK1, which methylates glutamine residue in the GGQ tri-peptide motif of human mitochondrial release factor (HMRF1L), and possibly other proteins.

METHODS

To study the role of miR-4436 in regulating proliferation and senescence, we generated miR-4436 overexpressing MRC5 cells. We also overexpressed a miR-4436 inhibitor in MRC5 cells. Using these cells, we performed cell proliferation and senescence assays to establish the role of miR-4436 in senescence. Next, we performed 3'UTR reporter assays to define HEMK1 as bona fide target of miR-4436. The role of HEMK1 in senescence and proliferation was also studied by proliferation and senescence assays, which include SA-β-gal EdU uptake and H2AX foci formation assays, and Western blot analysis of various senescence-related proteins such as p21, p53, p16 and pRB.

RESULTS AND CONCLUSIONS

Our data show that miR-4436 promotes cell proliferation and inhibits senescence in human diploid fibroblasts. The miR-4436 inhibited HEMK1 expression and conversely, miR-4436 inhibitor upregulated HEMK1 expression. We further show that miR-4436 posttranscriptionally downregulated HEMK1 expression via miR-4436 targeting sequences present in the 3'UTR of HEMK1 mRNA. Our results suggest that miR-4436 may regulate proliferation and senescence by inhibiting expression of HEMK1. In summary our data suggest that miR-4436 and its target HEMK1 are important for cellular senescence and pathological processes that involve senescence such as aging. In addition, HEMK1 may be a candidate tumor suppressor. We are further determining the mechanism of regulation of senescence by HEMK1, and examining the role of miR-4436 and HEMK1 in breast cancer.

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High Dose Alkylator Therapy for Extracranial Malignant Rhabdoid Tumors in Children

BACKGROUND

Extracranial malignant rhabdoid tumor (MRT) is a rare pediatric cancer with a poor prognosis. The kidney is the most common site. Isolated reports have shown improvements in patient survival, but no specific treatment regimen has shown efficacy over others.

PROCEDURE

Retrospective review of patients diagnosed with extracranial MRT at Children's Hospital Los Angeles between 1983 and 2012.

RESULTS

The median age at presentation for the 21 patients was 13 months (range, 0-108 months). Ten patients had renal primary tumors. The median time to progression was 4 months (range 0.4-7 months). The five year event free survival (EFS) and overall survival (OS) of the entire cohort was 38 ± 10.6%. After 2002, patients diagnosed with extracranial MRT were administered a chemotherapy regimen of vincristine, doxorubicin and high dose cyclophosphamide (VDC). The OS for the patients diagnosed before and after 2002 were 20 ± 12% and 54 ± 15% respectively. Of the 13 patients who received VDC containing regimen, eight patients achieved a complete radiological remission; five of these patients are long term survivors. Four patients who received autologous bone marrow transplantation were alive at last follow-up. All patients with unresectable primary tumors died. Patients who had disease progression or relapse did not survive.

CONCLUSIONS

Patients with extracranial MRT have a poor prognosis. Treatment with high dose alkylator therapy followed by consolidation with high dose chemotherapy and autologous bone marrow transplant for those patients in radiographic complete remission appears to have a beneficial effect on survival.

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Histochemical detection of tissue thiols; a clinically applicable protocol and its application as a novel tumor biomarker

BACKGROUND

Methods for the histochemical detection of tissue thiols have been described in the literature. These methods are incompatible with routine histology given their complex chemistries and need for specialized microscopy. Further, there is scant data evaluating the in-situ distribution and concentration of free protein thiols (i.e. -SH or sulfhydrals) and reducible protein thiols (i.e. disulfides, mixed disulfides, nitrosothiols, and sulfenic acids) in human tissues.

DESIGN

Contemporary literature has recently likened post-translational protein thiol oxidation to O-phosphorylation, with regard to its role in cell signal transduction, enzyme function, protein structure, and disease pathogenesis. We therefore sought to explore the distribution and concentration of free and reducible protein thiols, by developing a staining technique using modern histochemical reagents that allow for the visualization of tissue protein thiols in-situ, under bright field microscopy.

RESULTS

The thiol staining technique was developed and validated using routinely available control tissue. The thiol staining technique was then used to assess benign tonsillectomy specimens, benign surgical lymph node specimens, and excisional lymph node biopsy specimens diagnosed as involved by diffuse large B-cell lymphoma (DLBCL). In both the tonsils and lymph nodes, we observed a robust presence of free protein thiols. Germinal center cells contained appreciably more free protein thiols than the surrounding small lymphocytes. When we examined the localization and concentration of reducible protein thiols, staining was exclusive to germinal center macrophages and sinus histiocytes. When we applied this technique to excisional lymph node biopsies diagnosed as involved by DLBCL, we observed a robust concentration of free protein thiols within the malignant cells that was comparable to the staining observed in benign germinal center cells. When we examined the localization and concentration of reducible protein thiols, we observed that in contrast to the benign tissue, the malignant cells demonstrated pronounced and diffuse staining.

CONCLUSIONS

We describe a novel and reproducible histochemical method for detecting protein thiols in-situ. In addition, we present the first in-situ data examining the distribution and concentration of free and reversibly oxidized protein thiols in high grade lymphoma specimens. Taken together, our findings demonstrate tissue thiols as a novel biomarker for further defining tumor histopathology.

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Urinary obstruction following stereotactic body radiation therapy (SBRT) for clinically localized prostate cancer

BACKGROUND

Obstructive voiding symptoms are common following prostate cancer treatment with conventionally-fractionated radiation therapy and/or brachytherapy. The risk of urinary retention following hypofractionated radiotherapy has yet to be fully elucidated. This study sought to evaluate obstructive voiding symptoms and urinary retention requiring catheterization following SBRT for prostate cancer.

METHODS

Patients treated with SBRT monotherapy for localized prostate cancer from February 2008 to July 2011 at Georgetown University Hospital with a minimum of two years of follow-up were included in this study. Treatment was delivered using the CyberKnife® with doses of 35 Gy-36.25 Gy in 5 fractions. Urinary retention (UR) was prospectively scored and recorded using the CTCAE v.3 at baseline and at each follow-up. Patient-reported obstructive voiding symptoms were assessed using the International Prostate Symptom Score (IPSS)-obstructive subdomain at baseline and at 1, 3, 6, 9, 12, 18 and 24 months. Associated bother was evaluated via Question 4d of the Expanded Prostate Index Composite (EPIC)-26.

RESULTS

269 patients (99 low-, 143- intermediate- and 27- high-risk) at a median age of 69 years received SBRT with a median follow-up of 3 years. The mean prostate volume was 39 cc and 10% had prior procedures for benign prostatic hyperplasia (BPH). Prior to treatment, 50.6% of patients reported moderate to severe lower urinary track symptoms and 6.7% felt that weak urine stream and/or incomplete emptying were a moderate to big problem. The 2-year actuarial incidence rates of acute and late UR ≥ grade 2 were 39.5% and 41.4%. Alpha-antagonist utilization rose at one month (58%) and 18 months (48%) post-treatment. However, Grade 3 UR was low with only 4 men (1.5%) requiring catheterization and/or TURP. A mean baseline IPSS-obstructive score of 3.6 significantly increased to 5.0 at 1 month ($p < 0.0001$); however, it returned to baseline in 92.6% within a median time of 3 months. Late increases in obstructive voiding symptoms were common, but transient. Only 7.1% of patients felt that weak urine stream and/or incomplete emptying was a moderate to big problem at two years post-SBRT ($p = 0.6854$).

CONCLUSIONS

SBRT for clinically localized prostate cancer was well tolerated with obstructive voiding symptoms comparable to conventionally fractionated radiotherapy and brachytherapy. SBRT treatment caused an acute increase in obstructive voiding symptoms which peaked at 1 month post-treatment, though acute urinary retention requiring catheterization was rare. Obstructive voiding symptoms returned to baseline in > 90% by 2 years.

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Potency preservation following stereotactic body radiation therapy for prostate cancer

BACKGROUND

Erectile dysfunction after prostate radiation therapy remains an ongoing challenge and critical quality of life issue. Given the higher dose of radiation per fraction using stereotactic body radiation therapy (SBRT) there is concern that post-SBRT impotency would be higher than conventional radiation therapy approaches. This study sought to evaluate potency preservation and sexual function following SBRT for prostate cancer.

METHODS

Between February 2008 and March 2011, 216 men with clinically localized prostate cancer were treated definitively with SBRT monotherapy at Georgetown University Hospital. Potency was defined as the ability to have an erection firm enough for intercourse with or without sexual aids while sexual activity was defined as the ability to have an erection firm enough for masturbation and foreplay. Patients who received androgen deprivation therapy (ADT) were excluded from this study. Ninety-seven hormone-naïve men were identified as being potent at the initiation of therapy and were included in this review. All patients were treated to 35–36.25 Gy in 5 fractions delivered with the CyberKnife Radiosurgical System (Accuray). Prostate specific antigen (PSA) and total testosterone levels were obtained pre-treatment, every 3 months for the first year and every 6 months for the subsequent year. Sexual function was assessed with the Sexual Health Inventory for Men (SHIM), the Expanded Prostate Index Composite (EPIC)-26 and Utilization of Sexual Medication/Device questionnaires at baseline and all follow-up visits.

RESULTS

Ninety-seven men (43 low-, 50 intermediate- and 4 high-risk) at a median age of 68 years (range, 48–82 years) received SBRT. The median pre-treatment PSA was 5.9 ng/ml and the minimum follow-up was 24 months. The median pre-treatment total serum testosterone level was 11.4 nmol/L (range, 4.4-27.9 nmol/L). The median baseline SHIM was 22 and 36% of patients utilized sexual aids prior to treatment. Although potency rates declined following treatment: 100% (baseline); 68% (6 months); 62% (12 months); 57% (18 months) and 54.4% (24 months), 78% of previously potent patients had erections sufficient for sexual activity at 24 months post-treatment. Overall sexual aid utilization increased from 36% at baseline to 49% at 24 months. Average EPIC sexual scores showed a slow decline over the first two years following treatment: 77.6 (baseline); 68.7 (6 months); 63.2 (12 months); 61.9 (18 months); 59.3 (24 months). All sexual functions including orgasm declined with time. Prior to treatment, 13.4% of men felt their sexual function was a moderate to big problem which increased to 26.7% two years post treatment. Post-treatment testosterone levels gradually decreased with a median value at two year follow-up of 10.7 nmol/L. However, the average EPIC hormonal scores did not illustrate a statistically significant difference two years post-treatment. Review of the radiation doses to the penile bulb in this study, a potential marker of post-treatment sexual function, revealed that the dose was relatively low and at these low doses the percentage of the penile bulb receiving 29.5 Gy did not correlate with the development of ED.

CONCLUSIONS

Men undergoing SBRT monotherapy for prostate cancer report sexual outcomes comparable to those reported for conventional radiation modalities within the first 24 months after treatment. Longer follow-up is required to confirm the durability of these findings.

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Association of Progesterone Receptor Status with Oncotype DX Scores In Patients with Breast Cancer

BACKGROUND

Oncotype DX Breast Cancer Assay is a 21-gene diagnostic test that is designed for patients with early-stage, estrogen-receptor positive breast cancer. Physicians use Recurrence Scores to determine benefit of chemotherapy in order to guide treatment recommendations. Since 2008 quantitative scores for estrogen receptor (ER) and progesterone receptor (PR) have been included in the reports. This study investigates whether PR status has an association with Oncotype DX Recurrence Scores, specifically whether there are higher levels of intermediate or high Recurrence Scores associated with negative PR status. While PR status is included in the panel of genes that make up the Oncotype DX Recurrence Score, this study aims to establish the degree to which the PR level impacts the Recurrence Score.

METHODS

Oncotype DX and pathology reports were gathered for breast cancer patients who had undergone surgery at the George Washington University Hospital and had Oncotype DX testing from March 2008 to October 2013. The PR status was recorded as positive or negative based on the Oncotype DX quantitative analysis with negative defined as PR score < 5.5 units. PR status by pathology was considered negative if ≤ 5% of cells stained positive for PR. The rates of intermediate or high Recurrence Scores were compared based on Oncotype DX PR status. Also, PR status based on Oncotype DX result was compared to final pathology.

RESULTS

There were 325 Oncotype DX tests performed on 291 patients. There were 27 patients with more than one tumor and therefore multiple Recurrence Scores. Of the 325 tests, 283 (87.1%) had positive PR status and 42 (12.9%) were negative. There were 65 (23.3%) intermediate and 8 (2.8%) high Recurrence Scores in the PR positive group for a total of 73 out of 283 (25.8%). There were 25 (59.5%) intermediate and 9 (21.4%) high Recurrence Scores in the PR negative group, for a total of 34 out of 42 (80.8%, $p < 0.01$ for PR positive vs. PR negative by Chi square). Of the 27 patients with more than one tumor, 6 (22.2%) had at least one tumor with a low Recurrence Score and one tumor with an intermediate or high score. There were 7 tumors with PR negative status by Oncotype DX that were PR positive on pathology. All 7 (100%) had intermediate or high Recurrence Scores. There were 20 tumors with PR positive status by Oncotype DX that were PR negative on pathology, of which 7 (35%) had intermediate or high scores.

CONCLUSIONS

Oncotype DX PR negative status strongly correlates with intermediate or high Recurrence Scores. This was found even in patients who had PR positive results on pathology. This study also found that 22% of patients with multiple tumors had a combination of low and intermediate or high Recurrence Scores, supporting the use of Oncotype DX testing for all tumors.

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Outcomes Following Radiofrequency Ablation of Primary Renal Tumors: Response of 40 Tumors after CT-Guided Percutaneous rRFA

OBJECTIVE

The purpose of this study was to analyze outcomes in a single-center cohort of patients undergoing CT-guided percutaneous renal radiofrequency ablation (rRFA), to determine if lesion size was a differentiator of outcomes, and to describe the temporal changes in lesion size following rRFA.

MATERIALS & METHODS

Forty lesions in 37 patients (27 males, 10 females; mean age, 70 + 13 years) were treated with rRFA from 2006 to 2013. Patient, tumor, and treatment characteristics were analyzed. Statistical analysis included the entire treated cohort, with particular attention paid to subgroupings based on (a) whether patients had a renal mass <3 cm or >3 cm, and (b) whether or not the lesion was biopsy-proven RCC. To evaluate lesion changes after ablation, a mixed effects ANOVA model was fit to lesion size values over time.

RESULTS TO DATE

Kaplan-Meier survival curves showed trends toward worse primary recurrence and overall survival in lesions > 3 cm, but these were not statistically significant (p=.13 and p=.27 respectively). Secondary recurrences were the same in both groups. The rate of change over time in lesion size following rRFA did not differ significantly either by initial lesion size (p=0.65), or between biopsy-proven and non-biopsy proven RCC (p=0.46).

CONCLUSION

rRFA is safe and effective in treating kidney tumors. Overall success of tumor ablation was unrelated to initial size. Serial changes in tumor size after ablation are similar regardless of original size and regardless of whether the lesion had been biopsy proven RCC.

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GPU-Accelerated Scalable Solver for Banded Linear System

Solving a banded linear system efficiently is important to many scientific and engineering applications. Current solvers achieve good scalability only on the linear systems that can be partitioned into independent subsystems. In this paper, we present a GPU based, scalable Bi-Conjugate Gradient Stabilized solver that can be used to solve a wide range of banded linear systems. We utilize a row-oriented matrix decomposition method to divide the banded linear system into several correlated sub- linear systems and solve them on multiple GPUs collaboratively. We design a number of GPU and MPI optimizations to speed up inter-GPU and inter-machine communications. We evaluate the solver on Poisson equation and advection diffusion equation as well as several other banded linear systems. The solver achieves a speedup of more than 21 times running from 6 to 192 GPUs on the XSEDE's Keeneland supercomputer and because of small communication overhead, can scale upto 32 GPUs on Amazon EC2 with relatively slow ethernet network. Related to our two papers in SC and cluster conferences

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Measurements of mechanical and electrical activity of isolated perfused mouse hearts

RESEARCH QUESTION

There are many challenges involved with performing measurements in isolated perfused hearts. This research poses the questions, how can we quantify contractile force generation by an isolated heart while also measuring electrical activity?

MOTIVATION FOR THE RESEARCH

This research is important because it addresses instrumentation and methodological challenges that many researchers face. Used in these experiments were genetically modified mice that express light-activated ion channel proteins in cardiac sympathetic neurons, so that stimulation with light would release norepinephrine from these neurons. This model has clinical relevance in studying possible arrhythmia mechanisms. As such, investigators wanted a way to measure and quantify changes before and after cardiac sympathetic stimulation with light.

RESEARCH METHOD/APPROACH

There were several approaches to the research question. First, mouse hearts were excised and perfused on a Langendorff system. To measure contractile force, a pulley system was attached to both the apex of the heart and a force transducer to measure contraction strength. To measure electrical activity, investigators had to come up with a way to place ECG electrodes on a hanging heart. This was achieved by fashioning special silver electrodes that could be fed through the heart atria and into the ventricles. Additionally, investigators had to keep in mind that attachments to the heart should induce as little damage as possible to the heart tissue.

RESEARCH RESULTS

Investigators were able to measure increases in contractile force, heart rate, and changes in electrical activity after photostimulation. However, several obstacles occurred during the research approach. One such issue was with regards to the measurement hub, PowerLab. There was a necessity to record the LED light pulses on PowerLab in conjunction to the other measurements. However, the PowerLab terminal could only handle a maximum voltage before sustaining damage, so a voltage reduction circuit had to be designed and implemented. A second issue was related to the electrodes used in the measurement of ECG signals. Light penetrating through the tissue of the heart created a light artifact on the ECG readings because the electrodes were photosensitive. Solutions to the issue were to wrap the ends with a small opening and to coat exposed wire with non-photosensitive materials.

RESEARCH RESULTS/CONCLUSION

Observed measurable changes in contraction strength, heart rate, and electrical activity support the initial hypothesis that light is able to stimulate cardiac sympathetic neurons in genetically modified mice. Additionally, investigators discovered important solutions to instrumentation problems throughout the experiments. Future studies will try to further observe the effects of light-induced sympathetic stimulation to try and gain a better understanding of this experimental model.

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Experimental paradigms for in plastico hemodynamic secondary flows

BACKGROUND

Arterial network consists of branches and curvatures that are present ubiquitously in the human vasculature. Several cardiovascular-related pathophysiological phenomena have been linked to "spiral blood flow structures", clinical parlance for secondary flow (vortical) structures, that arisedue to imbalances in pressure gradients and centrifugal forces [1]. In the aortic arch, for example, the presence of such vortical flow structures tends to have beneficial effects on aortic endothelial layer [2]. The loss of spiral blood motion in the abdominal aorta has been linked to renal artery stenosis and rapid deterioration of renal functions [3]. Pulsatility of blood flow and shear stress distribution are closely linked to the onset of atherosclerosis, thrombosis, restinosis and activation of sensitized platelets.

MOTIVATION AND OBJECTIVE

The motivation for this study began from our experimental observation of multiplicity of secondary flow structures in curved arteries possessing a variety of scales, strengths and morphologies. The overarching goal of this study was to understand driving mechanism that governs this loss in coherence in arterial secondary flow structures. Under physiological (pulsatile) inflow conditions, complicated effects, such as asymmetry and spatio-temporal distributions arise, that cannot be predicted from simple theories [4].

METHODS

A rigorous in plastico experimental investigation of secondary flow structures in a bent tube model of a curved artery under physiological inflow conditions was performed using

1. Phase-averaged, two-component, two-dimensional, particle image velocimetry (2C-2D PIV) technique, supplemented by
2. Two-dimensional laser Doppler velocimetry (2D-LDV) technique,
3. Ultrasonic flow rate sensor and
4. MEMS-based pressure catheter measurements.

Coherent secondary flow detection was achieved through a novel continuous wavelet transform algorithm and inertial effects in the flow were predicted using dynamic modeling techniques.

RESULTS

Results suggest that D-L-W vortices evolved during the systolic acceleration phase, followed by the predominant loss in coherence during systolic deceleration phase. The loss of coherence of these structures is attributed to inertial effects that symbolized by the phase shifts and amplitude variations between flow rate and pressure measurements (Figure 1.). Ultimately, the strength and persistence of secondary flow structures is expected to influence pathophysiological conditions in arteries.

CONCLUSION

Our experimental investigation provides paradigms toward understanding the hemodynamics and influence of arterial secondary flow structures in the human vasculature. These will stimulate fresh insights into onset of atherosclerosis, thrombosis, restinosis and activation of sensitized platelets.

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Dynamical Systems Characterization of Fluid Flow In A Curved Artery Model Under Pulsatile Forcing

BACKGROUND

The relationship between flow rate and pressure of blood flow in the human vasculature is being hypothesized as an indicator of hydrodynamic complexities in flow behavior such as persistence of vortical (secondary flow) structures, concomitant changes in near wall conditions such shear stresses and residence time of blood borne particulates. This study addresses an important research question pertaining to the causal effect of blood flow rate - pressure characteristics and pathophysiological conditions. Experimental measurements in a model curved artery test-section coupled with system identification methodologies provided a framework for dynamic (mathematical) modeling of flow rate and pressure under physiological and non-physiological inflow conditions.

MOTIVATION AND OBJECTIVE

There are several biological conditions such as atrial fibrillation and atherosclerosis that can locally alter the frequency response characteristics and lead to flow rate - pressure phase changes in the human vasculature. Hence, the motivation for this study was to characterize the dynamical behavior of a curved artery model so that system responses to atypical waveforms may be understood a priori.

METHODS

Starting with a canonical carotid artery flow rate waveform by Holdworth et al. (1995 ?) , several multi-harmonic waveforms waveform were introduced into an "ideal" curved artery [1]. A pressure catheter mounted on a hemostasis valve and an ultrasound flow rate sensor, simultaneously monitored flow conditions in the curved artery model. Particle image velocimetery (PIV) measurements were made at various cross-sectional planes where multi-scale secondary flow (vortical) patterns were detected [2]. MATLAB's System Identification Toolbox was used to model the dynamic behavior under single input (flow rate) and single output (pressure) system description [3].

RESULTS

An Autoregressive with eXogenous input model (Figure 1a) led to a key result in this study. Systemic frequency response of the curved artery experiment with inflow harmonic frequencies of 1 Hz and above, indicate the presence of significant gains and phase shifts between the flow rate and pressure signals, attributed to the inertial effects of the fluid flow (Figure 1b).

CONCLUSION

Flow rate and pressure waveform behavior through systemic frequency response can lead to new insights in hydrodynamic behavior of blood flow (such as persistence of secondary flows) and pathophysiological conditions in the human vasculature. Using dynamic (mathematical) models, it is possible to quantify the complex relationships between blood flow rate and pressures encountered in the human vasculature.

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The Effect of Pharmacy Spatial Accessibility on Cardiovascular Risk Factors

OBJECTIVE

"One-stop-shop" co-location of health services has been proposed as a model to enhance medication adherence and patient satisfaction. Prior analyses have examined the effect of proximate availability of pharmacies but patients may not necessarily be using their nearest pharmacy. We assessed the hypothesis that co-location of pharmacy services or the distance between patient's homes and their actual pharmacy would correlate with cardiovascular risk factor control.

METHODS

For this retrospective analysis, the addresses of 2,583 adult patients seen at a single academic medical center in 2012 and the addresses of their currently used local pharmacies were obtained from electronic medical records and geocoded for analysis. Each patient's distance from their own pharmacy was calculated and analyzed by quartiles, using student t-test to compare cardiovascular risk factor control between quartiles. A separate analysis was conducted to see if on-site co-location of pharmacy services at provider locations was associated with better risk factor control. A p value of <0.05 was defined as significant.

RESULTS

The quartile ranges for distance between home and pharmacy were Q1: 0.2-3.3 km, Q2: 3.3-5.8 km, Q3: 5.8-8.0 km, Q4: 8.0-11.6 km. Mean systolic blood pressure was 127 ± 19 mmHg; diastolic blood pressure, 77 ± 10 mmHg; weight, 84.0 ± 29.6 kg; body mass index 29.1 ± 8.8 kg/m2; HgbA1c, 6.5 ± 1.6%; total cholesterol, 148 ± 68 mg/dl; high-density lipoprotein, 58 ± 18 mg/dl; triglycerides, 95 ± 79 mg/dl. There were no significant interquartile differences. 4.8% of the patients filled their prescriptions at a pharmacy co-located with their prescribing physician. Again, there were no statistically significant differences in any of these factors between co-located and non-co-located pharmacies.

CONCLUSION

Co-location of health care providers with pharmacy services is not associated with improvement in cardiovascular risk factors. In addition, the distance between home and pharmacy also does not appear to be a contributor to risk factor control. Efforts to co-locate pharmacy services may not improve outcomes.

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Gene-set enrichment analysis of Coronary Artery Disease (CAD) and related phenotype associations in Mammalian phenotype gene-set

The mammalian phenotype ontology (from http://www.informatics.jax.org/searches/MP_form.shtml) is a discrete and circumscribed way to define sets of genes that share similar physiological or morphological phenotype when genetically perturbed in the whole animal (knock-out, knock-in, over-expression). Specifically, we tested which of these Mouse phenotype ontology gene sets modestly to strongly associated with coronary artery disease or various CAD risk factors, using a GSEA (Gene-Set Enrichment Analysis) tool, MAGENTA (Meta- Analysis Gene-set Enrichment of variaNT Associations.) The approach was to test this type of gene sets using one GSEA method in the combined meta-analysis datasets of various metabolic phenotypes related to CAD (i.e. BMI, insulin resistance, lipids, BP) in order to identify the overlap between these phenotypes. This approach is in contrast to the approach used to date by the CARDIOGRAM (Coronary Artery DIsease Genome-wide Replication And Meta-analysis) pathway group of testing multiple gene sets using multiple GSEA programs with a discovery and replication design in CAD phenotype alone. Notably, a number of highly significant pathways converged on processes relating to immunity. These pathways included those related to abnormal inflammatory response, suggesting a causal relationship between inflammation and CAD. Our results from analysis of other metabolic phenotypes show that mouse models capture pathophysiology of CAD and other common human diseases and traits. Further understanding of these pathways can lead to novel therapeutic targets for CAD.

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CT Correlates with Cardiopulmonary Hemodynamics in Pulmonary Hypertension in Adults with Sickle-Cell Disease

OBJECTIVES

To determine whether semi-automated computed tomography angiography (CTA) measurements of pulmonary artery size can be used as tool to assess hemodynamics and non-invasively diagnose and characterize pulmonary hypertension (PH) secondary to sickle cell disease (SCD).

MATERIALS AND METHODS

Twenty SCD patients with PH confirmed by right-heart catheterization were compared with 20 matched controls. The diameters of the pulmonary artery (PA) trunk and branches were measured using CTA and a semi-automatic segmentation algorithm. These measurements were normalized by body size and correlated (Spearman rank correlation) with hemodynamic markers from right-heart catheterization. Receiver operating characteristic (ROC) curves were used to investigate the role of PA sizes in diagnosing PH.

RESULTS

CTA-derived PA sizes provided significant discrimination of secondary PH amongsubjects ($p<0.001$ for all) and improved when adjusted for body surface area (BSA), as shown by ROC curve analysis with area under de curve of 0.99. There was significant correlation between PA sizes and body mass index (BMI) and BSA only in controls ($r=0.46$ to $r=0.68$, $p<0.04$ for all). The most significant correlations with hemodynamic markers were found for PA sizes normalized by BMI, notably for cardiac output, systolic PA pressure, cardiac pulmonary resistance, and systemic vascular resistance ($r=-0.62$ to $r=0.47$, $p<0.04$ for all).

CONCLUSION

CTA with image analysis is a powerful non-invasive diagnostic tool for PH in SCD and shows promise as an estimator of hemodynamic markers. Potential uses for such a tool include sequential assessment of prognosis, response to treatment, or severity of illness. Our study indicates the multifactorial relationship between SCD, the pulmonary vasculature, and development of PH.

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Intermediate-Term Results of Extracorporeal Membrane Oxygenation Support Following Congenital Heart Surgery

DISCLOSURE STATEMENT

The authors did not receive any financial support for the study and declare that they have no conflict of interest.

BACKGROUND

Although there are considerable data regarding in-hospital results of congenital heart surgery patients requiring post-operative extracorporeal membrane oxygenation support, there is limited information on intermediate-term outcomes.

METHODS

A single institution retrospective review of 25 consecutive post-operative congenital heart surgery patients who required extracorporeal membrane oxygenation and survived to hospital discharge between January 2003 and June 2008. Survival was estimated by the Kaplan-Meier method.

RESULTS

At a median follow-up of 3.3 years (interquartile range: 1.2-5.9 years), there was 1 death which occurred at 6 months post-surgery. Kaplan-Meier estimated survival at 3 years was 95% (95% confidence interval: 90-100%). Indications for extracorporeal membrane oxygenation included extracorporeal cardiopulmonary resuscitation (48%), systemic hypoxia (4%), post-operative low cardiac output syndrome (28%), and intra-operative failure to wean off of cardiopulmonary bypass (20%). Following extracorporeal membrane oxygenation support, 65% of patients had unplanned cardiac re-interventions (3 requiring operative interventions, 6 requiring percutaneous interventions, and 4 requiring both), and 47% required unplanned hospitalizations. 29% developed neurological deficits, and 12% developed chronic respiratory failure. No patients developed renal failure. Overall systemic ventricular function normalized in 83% of patients, whereas 17% had persistent mild-to-moderate systemic ventricular dysfunction.

CONCLUSIONS

Intermediate-term patient survival of extracorporeal membrane oxygenation following congenital heart surgery is encouraging. However, neurological impairment and unplanned cardiac re-interventions remain significant concerns. Further delineation of risk factors to improve patient outcomes is warranted.

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Vascular Risk Score as a Predictor of Poor Outcomes in Patients Undergoing Vascular Intervention

BACKGROUND

Vascular surgeries and procedures are increasingly being performed especially in the elderly. This has increased the need for accurate risk prediction. Aging is related to frailty, but a universally accepted frailty based risk score is missing. We proposed a vascular risk score (VRS) based on attributes of frailty to predict poor outcomes in patients undergoing vascular interventions.

METHODS

We used data from the American College of Surgeon National Surgical Quality Improvement Program (NSQIP) database for years 2005-2011 to develop and test a VRS optimized for vascular interventions. We identified 20 pre-treatment binary variables that are consistently independently associated with elevated risk of poor outcome in vascular interventions. For each of these, a weight was determined using the mean odds ratio across 3 outcome models, rounded to the nearest integer to serve as the VRS. A stepwise regression was used for multivariate analysis. Possible predictors were surgery type, sex, race, ASA class, general anesthesia, smoking, inpatient vs. outpatient, and age, along with either independent functional status, or the VRS. The three outcomes tested were: 1) 30-day mortality, 2) a broad composite (cardiac arrest, MI, dialysis, AKI, DVT, CVA, wound infection, re- intubation and 3) a narrow composite (DVT, re-intubation, return to OR).

RESULTS

A total of 121,015 cases were identified. VRS was an independent predictor of mortality (OR 1.72 [1.68 – 1.75], p<.0001), broad composite (OR 1.42 [1.40 – 1.44], p<.0001), and narrow composite (OR 1.33 [1.31 – 1.35], p <.0001). For predictive accuracy, we compared ROC curves for risk based on VRS vs. functional status. VRS outperformed functional status based risk for all outcomes. C-statistics for mortality, broad and narrow outcomes were (.85 vs .83, p<.01), (.77 vs .76, p<0.01), and narrow outcome (.75 vs .74, p<.001) respectively.

CONCLUSION

A frailty based vascular risk score was a strong and independent predictor of a wide range of outcomes in patients undergoing vascular surgery procedures. Importantly the risk score was a stronger predictor than age and functional status based risk. Further research is needed to test this score in prospective studies and understand its applicability in different surgery types.

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The EGFR TKI, Erlotinib, Causes Hypomagnesemia, Oxidative Stress and Cardiac Dysfunction: Attenuation by SP-Receptor Blockade

BACKGROUND

Erlotinib (ERL, Tarceva™), approved as a first-line treatment, maintenance treatment, and 2nd- or 3rd-line treatment for advanced-stage non-small cell lung cancer, is a reversible tyrosine kinase inhibitor targeting the EGF receptor (EGFR) which is up-regulated in the majority of lung, colorectal and head and neck cancers. However, EGFR activation is also required for active epithelial Mg-absorption/re-absorption mediated by the transient receptor potential melastatin 6 (TRPM6) channel in the kidney and colon. We determined whether prolonged treatment with ERL causes hypomagnesemia, oxidative stress and cardiac dysfunction in rats, and if blockade of the neurokinin-1 (substance P [SP]) receptor is protective. Methods and Results: ERL was administered in the diet (~10 mg/kg/day) to normomagnesemic rats for 9 wks. Plasma magnesium in ERL-treated rats decreased gradually after 10 days and became significant between 3-9 weeks: -9 % at wk 3, -13% at wk 5, -16% at wk 7 and -26% at wk 9. Moderate but significant increases in plasma substance P (SP) were detected at week 3 (+27%) and week 9 (+25%). At the end of 9 weeks, neutrophils isolated from whole blood exhibited a 3-fold higher basal, and a 2-fold higher stimulated (by PMA) superoxide generating activity. Concomitantly, total plasma 8-isoprostane content, a marker of systemic lipid peroxidation, rose significantly to 210%. The effect of SP receptor blockade was assessed by dietary administration of Emend™ (as aprepitant, a SP receptor antagonist, ~ 2 mg/kg/day). Emend mildly (NS) attenuated (up to 35%) ERL-induced hypomagnesemia, but significantly attenuated SP increases, neutrophil activation and 8-isoprostane elevation. Echocardiography revealed moderate but significant decreases in left ventricular ejection fraction (LVEF: -11%) and % fractional shortening (% FS: -17%) after 7 weeks, indicative of systolic dysfunction, and significant reduction (-17.5%) in mitral valve E/A ratio at week 9, indicative of diastolic dysfunction. Concomitantly, left ventricular posterior wall thinning occurred consistent with early sign of dilated cardiomyopathy. Treatment with Emend completely prevented both systolic and diastolic dysfunction and partially attenuated anatomical changes caused by ERL treatment.

CONCLUSION

Since hypomagnesemia alone can cause neurogenic inflammation, our study suggested that chronic ERL treatment induced moderate but progressive hypomagnesemia, which in turn triggered SP-mediated oxidative inflammation and moderate levels of cardiac dysfunction. Our study also demonstrated for the first time that administration of a clinically used SP receptor blocker, Emend, effectively prevented the ERL-induced systemic oxidative stress and cardiac dysfunction.

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Characteristics of High-Burden Premature Ventricular Contraction Patients

BACKGROUND

Premature heart beats are a common occurrence throughout the world.1 In patients with an existing cardiac impairment, premature ventricular contractions (PVCs) have been shown to decrease cardiac function.2 Conversely, PVC ablation has been shown to increase cardiac function, but only in those with severe systolic dysfunction.3 As such, high-burden PVCs may be important indicator of heart failure in those presenting for PVC ablation. The prognostic value that PVC burden may have for heart failure outside of this setting has not been fully investigated.

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OBJECTIVES

Objective 1: To determine predictors of high-burden PVCs
Objective 2: Identify predictors of heart failure among those withhigh-burden PVCs

METHODS

We identified all patients undergoing 24-48 hour Holter study who presented with 20% PVCs between 2005-2013 at the University of California, San Francisco. For each high-burden PVC patient, three time-matched controls undergoing Holter monitoring were selected. All patient medical records were analyzed and PVC characteristics from 12 lead electrocardiograms (ECG) were analyzed as predictors of high-burden PVC Holters.

RESULTS

Among 5,091 participants, 66 (1.3%) exhibited at least 20% PVCs. After multivariate adjustment, high-burden PVC patients had a 3-fold greater odds of HF (odds ratio [OR] 3.15; 95% confidence interval [CI] 1.28-6.50; p=0.005) and 10-fold greater odds of having a first degree family member with sudden death (OR 9.97; 95% CI 1.78-60.8; p=0.011). The C-statistic for the number of PVCs on 12 lead ECG as a predictor of high-burden PVCs was 0.7949. Among high-burden PVC patients, the 21 (32%) with HF were more likely to have undergone coronary artery bypass grafting (CABG) (OR 11.76; 95% CI 1.30-106.49; p=0.028).

CONCLUSIONS

Among all patients undergoing Holter monitoring, 1.3% exhibited high-burden PVCs. This high PVC burden was associated with both HF and a first degree family history of sudden death. Among those with high-burden PVCs, a history of CABG was a predictor of subsequent HF.

ACKNOWLEDGEMENTS

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An Analysis of Cardiovascular Risk Factors in High-Crime Neighborhoods: Is Neighborhood Crime Associated with Metabolic Changes?

BACKGROUND

Previous studies have suggested that neighborhood attributes are associated with cardiovascular disease. Newly available public databases allow hyperlocal analysis of neighborhood characteristics. Crime may directly mediate physiologic changes by direct autonomic nervous system effects and cause behavioral changes associated with cardiovascular risk (e.g., physical inactivity). We assessed the hypothesis that neighborhood crime is associated with cardiovascular risk factor deterioration.

METHODS

This retrospective study included 2,539 Washington, DC, residents seen at a single academic medical center in 2012 over the age of 18 and with a geocodable home address. Neighborhood crime was defined as those occurring during 2011-2 within a 2-block radius of patients' homes as identified in a publically available database. Cardiovascular risk factors were analyzed based upon the number and type of crimes that occurred within their 2-block radius. Student's t-tests were then used to assess the interquartile differences between groups. A p-value of <0.05 was used to define a significant difference.

RESULTS

The quartile ranges for neighborhood crimes were Q1:0-125, Q2:126-206, Q3:207-320, and Q4:321-1298. Mean systolic blood pressure was 128 ± 19 mmHg; diastolic blood pressure, 78 ± 10 mmHg; weight, 85.5 ± 30 kg; body mass index 30.7 ± 10.3 kg/m2; HgbA1c, 6.5 ± 1.6%; total cholesterol, 148 ± 68 mg/dl; high-density lipoprotein, 58 ± 18 mg/dl; triglycerides, 113 ± 73 mg/dl. After stratification by crime, there were no significant interquartile differences. Similar analysis with only violent or non-violent crimes did not show any significant differences. Subgroup analysis by gender and by age (≥65 years, <65 years) also did not show any interquartile differences.

CONCLUSION

Neighborhood crime does not appear to be associated with changes in blood pressure, weight, body mass index, HgbA1c, total cholesterol, HDL, or triglycerides. This result was independent of the type of crime committed (i.e., violent vs. non-violent), age and gender. Despite the obvious multiple benefits of reducing crime, a halo effect on cardiovascular health improvement should not be anticipated.

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Influence of Chagas Disease on Implantable Cardiac Devices: A Comparison Between Honduras and US Patients

BACKGROUND

Chagas' disease is endemic in Honduras with an estimated prevalence of 3%. It is estimated that 30% of infected cases will develop a dilated cardiomyopathy and / or complete heart block during follow up. We hypothesized that Chagas' disease will have an effect on the cardiac devices implanted and the underlying cardiac conditions among patients from Honduras when compared to a US based university hospital.

METHODS

We retrospectively compared 136 consecutive patients who received implantable cardiac devices at a single center in Comayagua, Honduras
(G1) to 129 patients who received implantable cardiac devices at GWU Hospital (G2).

RESULTS

We analyzed 265 patients. Patients in both groups were of similar age (64.1 years; 95% CI = [61.4 – 66.9] for G1 vs 64.3 years; 95% CI = [61.7 – 67.0] for G2) and gender (55% of G1 vs 65% of G2 were males; P = 0.09). Chagas' disease was present among 20% of G1 and among none of G2 (P < 0.0001). AV block was more prevalent in G1 (49% vs 28%; P = 0.008). Among patients who have Chagas' disease; AV block rate was higher (74% vs 35%; P < 0.0001). Ventricular pacing thresholds were lower among G1 (0.73 volts; 95% CI = [0.67 = 0.787] vs 0.93 volts; 95% CI = [0.789 – 1.08]). Atrial impedance was higher among G1 (720 ohms; 95% CI = [683.2 – 758.2] vs 588 ohms; 95% CI = [553.5 – 622.7]). Ventricular impedance was higher among G1 (842 ohms; 95% CI = [795 – 889] vs 670 ohms; 95% CI = [629.1 – 710.8]). There was a lower incidence of defibrillator implantations noted for G1 as compared to G2 (22% vs 58%; P < 0.0001). Biventricular ICD devices were used rarely among G1 (2.4% vs 14.5%; P=0.004) when compared to G2. Among patients who received pacemakers, the LVEF was not significantly different (53.4%; 95% CI = [49.6 – 57.2] for G1 vs 57.9%; 95% CI = [53.8 – 61.9] for G2). Among patients who received defibrillators, the LVEF was similar (37.8%; 95% CI = [31.3 - 44.3] for G1 vs 32.8%; 95% CI = [29.4 - 36.2] for G2).

CONCLUSIONS

Among a large patient cohort comparison, Honduras patients have a much higher incidence of Chagas' disease, having influences on higher prevalence of AV block and resultant higher pacemaker implantation rates. Defibrillator implants and BiV-ICDs are much less used among patients from Honduras given their access limitations.

KEY WORDS

Chagas' disease, Cardiac Pacing, Defibrillators

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A Novel Frailty Based Vascular Risk Score for Prediction of Poor Outcomes in Peripheral Vascular Intervention

BACKGROUND

Frailty has been proposed as a predictor of postoperative morbidity and mortality in aging vascular surgery population. We developed a frailty-based vascular risk score (VRS) applicable to range of post-operative outcomes and tested it in patients who have undergone peripheral vascular interventions (PVI).

METHOD

The American College of Surgeons National Surgical Quality Improvement Program database was accessed for 2005-2011 for patients undergone PVI. A 20-item weighted VRS was developed using mean odds ratio across three outcome models. Items include: albumin < 3.4 g/dl, weight loss (>10% of body weight in 6 months), DM, COPD, pneumonia, CHF, MI, angina, rest pain or gangrene, steroids, bleeding disorder, paraplegia, impaired sensorium, disseminated cancer, dialysis, dyspnea, ascites, and BMI< 18.5 (all have weight =1); non-independent functional status and sepsis (weight = 2). Three outcomes were measured: 1) 30-day mortality, 2) a broad composite (cardiac, renal, clotting, wound, respiratory and surgical complications), and 3) a narrow composite (DVT, re-intubation, prolonged intubation, and return to OR). Multivariate testing included pre-treatment patient and surgical variables along with VRS.

RESULTS

A total of 4,201 cases with PVI were identified. Mean age was 69 yrs. and 39% were women. Event rate was 2.8% (death), 5.9% (broad composite), and 12% (narrow composite). VRS was an independent predictor of mortality (OR 2.11 [1.77-2.51], p<.0001), broad composite (OR 1.65 [1.45-1.88], p<.0001) and narrow composite (OR 1.53 [1.38-1.70], p <.0001). Mortality, broad, and narrow composite event rates increased with each additional risk level. While ROC curves of VRS were better compared to other models including independent functional status, these were not significant.

CONCLUSION

The frailty based VRS was strong and an independent predictor of mortality, broad, and narrow outcomes in patients with PVI. Our simple-to-derive score may aid in defining operative risk in an increasingly aging population.

KEY WORDS

Risk score, peripheral interventions

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Patient-Radiation Exposure in Endovascular Interventions and Coronary Procedures

BACKGROUND

Although a less invasive option than surgery, endovascular intervention (EI) carries its own unique set of risks. In particular, there is a surprising paucity of data regarding the amount of radiation used in EI, especially when compared to the better characterized percutaneous coronary intervention (PCI).

METHODS

Reference-point air-kerma (Ka,r) and kerma-area product (PKA) are measures of radiation exposure to patients associated with skin injury and elevated risk of cancer, respectively. Data from 1200 percutaneous coronary procedures comprised of 400 each of angiographies (CA), interventions (PCI), same-sitting angiography and intervention (CA+PCI), and 164 EI procedures, all performed in the year 2008 at New York Presbyterian Hospital were analyzed. Procedure-wise comparisons of log-transformed doses were done by the ANOVA test with Tukey's post-hoc correction. Multiple linear-regression analyses were done to identify predictors of radiation exposure.

RESULTS

Median (mean) values of Ka,r in milligray were 1033.5 (1215.5) for CA, 2915.5 (3454.9) for PCI, 2805.5 (3246.1) for CA+PCI and 660.96 (1012.01) for EI. Median (mean) PKA values in Gy.cm2 were 66.76 (80.89) for CA, 173.68 (213) for PCI, 165.07 (207.11) for CA+PCI and 80.28 (137.82) for EI. Within the EI group, even with multiple controls; initial results indicate women were exposed to 32.6% less Ka,r (CI: -48.23%, -12.22%; p-value= 0.0037) and 34.33 % less PKA (CI: -48.90%, -15.61%; p-value=0.0012) than men, and each kilogram increase in weight was associated with a 1.26% increase in Ka,r (CI:0.54%, 1.99%; p-value=0.0007) and a 1.75% increase in PKA (CI: 1.06%, 2.45%; p value: <.0001).

CONCLUSION

EI is associated with significantly less radiation exposure compared with coronary intervention, and is roughly equivalent to diagnostic coronary angiography. Within EI, individual patient characteristics are associated with differences in exposure. Knowledge of the effect of patient and procedural variables on radiation exposure can provide the groundwork for dose-reduction strategies.

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Outcome measurements in chronic pain patients following ketamine infusions

BACKGROUND

Chronic pain can impact many aspects of a patient's quality of life (QOL). Ketamine is a N-methyl-d-aspartic acid receptor antagonist with both anesthetic and analgesic properties. Outpatient ketamine infusions have been shown to provide relief in patients with chronic neuropathic pain.

OBJECTIVE

To assess the effect of outpatient ketamine infusions on QOL outcome measurements in patients with chronic pain.

METHODS

Patients with chronic neuropathic pain were asked to complete a survey concerning the impact of their chronic pain on aspects of their QOL (overall daily pain score, general activity, walking, work, relationship with others, sleep, and enjoyment of life) before receiving ketamine infusion and two to four weeks after the ketamine infusions at the follow up clinic visit. The patients ranked the impact of pain on QOL, from a scale of zero (no impact) to ten (severely impacts). Overall change in QOL both prior to treatment with ketamine infusion and after administration were evaluated. Four predictors (age, sex, race, and pre-treatment score) were also used in order to evaluate any change on QOL due to demographics. In order to compare pre- and post scores, a paired two tailed t-tests was used.

RESULTS

51 patients received three consecutive outpatient ketamine infusions and completed both the pre-infusion (baseline) and post-infusion (follow up clinic visit) surveys. The mean average pain score decreased from 7.00 to 6.06 post infusion and was statistically significant ($p = 0.0065$). Sleep and enjoyment of life were also found to be significantly improved with p values of 0.025 and 0.016 respectively. There was no statistical significant change in the impact of chronic pain on general activity, mood, walking, work, and ability to relate to others after ketamine infusions. Age was also found to be a predictor for the impact of chronic pain on a patients' ability to walk and to work. Pain
had less of an impact in the ability to walk or work in younger patients than older patients.

CONCLUSIONS

Outpatient ketamine infusions are effective in reducing chronic neuropathic pain in many patients where other therapeutic interventions have not helped. We examined QOL outcomes after ketamine infusions in fifty-one patients. Ketamine infusions improved patient pain scores, sleep, and overall enjoyment of life. However, general activity, mood, walking, work, and ability to relate to others were not significantly different.

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African Americans Display Increased Prevalence of Metabolic Syndrome Components in a Healthy College-age Population

BACKGROUND

The transition from adolescence to adulthood is associated with increased sedentary behaviors, poor eating habits, and weight gain. The college population forms activity and dietary habits, which are essential for health later in life. One measure of health is the presence of metabolic syndrome (MetS), which, if present, is shown to dramatically increase the risk of cardiovascular disease and type 2 diabetes. African-American (AA) women and Hispanic men and women have the highest prevalence of the MetS in adult populations. Additional research to quantify the incidence of MetS and its association with healthy lifestyle behaviors is needed (Hall, 2003).

OBJECTIVES

To compare ethnic differences in the prevalence of MetS in college-aged students enrolled in the Assessing Inherited Metabolic Syndrome Markers in the Young (AIMMY) study.

METHODS

AIMMY participants enrolled at Howard University (n=202), University of Calgary (n=194), University of Massachusetts (n=331), and East Carolina University (n=90) were used for analyses. Blood pressure, VO2 peak, body composition, fasting insulin, glucose and lipid profiles were collected. MetS was assessed according to the ATP III criteria, as defined as having 3 of the following 5 risk factors: elevated blood pressure, triglycerides, cholesterol, fasting glucose, elevated waist circumference (WC), or low HDL levels.

RESULTS

Of the 817 participants analyzed, 26% were AA, 3% were Hispanic, 57% were Caucasian and 14 % were other or multiple races. The average age at collection was 21.6±3.86 years. Using the ATP III criteria, 3.6% of the students in this study presented with MetS. The majority of subjects presenting with MetS were AA (61%). 10.8% of AIMMY participants had >2 MetS components, of which 42% were Caucasian and 38% were AA. 41% of the sample had >1 MetS component, 58% of these participants were Caucasian and 28% were AA.

CONCLUSIONS

Our research suggests that the incidence of MetS in college students is lower than that of older adults, which is ~35% (Ford, 2005). AIMMY participants with MetS components were more likely to have elevated WC (35%), HDL elevation (34%), or elevated blood pressure (40%) compared to the other metabolic risk factors in this population. Out of the participants with elevated WC, 53% were AA, which is 30% of the total AA sampled. This research suggests that AA of college age are more likely to develop MetS than other ethnicities, which holds true for both males and females and may be due to the increased prevalence elevated WC values.

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What Is the Accuracy of Intra-operative AP Imaging for Determining Acetabular Component Orientation?

During total hip arthroplasty (THA), acetabular component placement in optimal anteversion and abduction is crucial for minimizing impingement, instability, and prosthetic wear. Intra-operative imaging has been suggested for improving cup orientation. Few studies have compared the accuracy of digital software in estimating cup alignment from anteroposterior (AP) imaging in THA. The aim of the study was to determine the accuracy of intraoperative imaging in predicting cup placement when compared with standard postoperative radiographic imaging. We retrospectively reviewed the AP images of seventy consecutive patients who had undergone a primary THA. Twenty men and fifty-one women were included who had a mean age of 67 years (range, 56–82 years). Thirty-seven hips (52%) had intra-operative fluoroscopic images while the remaining (n=34; 48%) had plain radiographs. Digital software was used to estimate the degree of cup anteversion on abduction on the intra-operative images and post-operative radiographs. Intraoperative measurements were obtained on AP pelvic projections in 77% of cases (n=55) and the remaining were measured from AP hip radiographs (n=16). Cup abduction was measured as the angle subtended by the long axis of the elliptical component and a fixed horizontal line along the pelvis. Cup anteversion was measured from the elliptical projection of the acetabular component using the software.

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Paradoxical Evidence on Vitamin D Deficiency in Nephrotic Syndrome

BACKGROUND

The clinical significance of low total 25-hydroxyvitamin D (25D) levels in nephrotic syndrome (NS) remains unknown. Induction of cathelicidin antimicrobial protein (hCAP) by human monocyte (MNC), an innate immune response, depends on VitD status.

OBJECTIVES

To determine if NS is associated with decreased MNC hCAP expression, increased PTH, decreased 25D catabolism to 24,25D, and altered VitD target gene expression, consistent with a VitD deficiency state, compared with healthy controls (CO).

METHODS

Cross-sectional study of 29 NS and 40 CO participants, ages 3-40 yrs. Measures included serum 25D, 1,25D, 24,25D by LC-MS/MS, DBP, albumin, ionized calcium (ICal), phosphorus, PTH, and FGF23. Heterologous healthy donor MNCs were cultured for 24 h in RPMI medium supplemented with 10% participant serum (n=33, to date) in presence or absence of a TLR2 agonist, 19 kDa bacterial lipopeptide. RNA was isolated for quantitative RT-PCR to assess expression of hCAP, VitD receptor (VDR), and VitD hydroxylases (CYP27B1 and CYP24A1).

RESULTS

NS had lower mean 25D (8.2 vs 25.6 ng/ml), 1,25D (38.0 vs 50.4 pg/ml), 24,25D (1.3 vs 2.9 ng/ml), and ICal (1.16 vs 1.22 mg/dl) vs CO (all $p<0.008$). Serum DBP (NS 12.5 vs 17.0 mg/dl, $p=0.48$) and PTH (NS 37 vs. 43 pg/ml, $p=0.06$) did not differ. In multivariable regression, expected inverse relations of PTH with 25D ($p<0.001$) and ICal ($p=0.03$) were found in CO but not NS (both $p>0.7$). Adjusted for 25D levels, 24,25D was greater in NS ($p<0.001$). MNC expression of hCAP, VDR, CYP27B1, and CYP24A1 did not differ between groups. However, if those on calcineurin inhibitors were excluded, MNC hCAP expression was higher in NS sera. VDR expression was inversely associated with serum 25D in CO ($p=0.03$) but not NS ($p=0.3$; interaction $p=0.03$).

CONCLUSIONS

Despite profoundly low 25D in NS, the robust hCAP response, greater 24,25D levels, and lack of increased PTH levels do not suggest a deficiency state, questioning the interpretation of 25D levels in NS.

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The Use of Deep Brain Stimulation in Tourette's Syndrome

BACKGROUND

Tourette's syndrome (TS) is a childhood, neuropsychiatric disorder characterized by the presence of multiple, involuntary motor and vocal tics. It is commonly associated with other behavioral disorders including attention deficit hyperactivity disorder, obsessive-compulsive disorder, self-injurious behaviors, anxiety, and depression. Symptoms typically develop during the first decade of life and wax and wane throughout its course. The developing pathophysiology of TS suggests that a dysfunction in basal ganglia and cortical-striatal-thalamic-cortical circuitry underlies the generation of tics. TS can be effectively managed with psychobehavioral and pharmacological treatments and most patients experience a spontaneous improvement in tics in adulthood. However, symptoms may persist and cause severe impairment in a small subset of patients, despite available therapies. For such patients, surgical intervention may be warranted. In 1999, deep brain stimulation (DBS) was introduced as a possible treatment option for intractable Tourette's syndrome. Since then, multiple trajectories have been used, including the medial thalamus, globus pallidus, anterior limb of the internal capsule/nucleus accumbens (ALIC-NA), and subthalamic nucleus. While stimulation at each of these targets has been shown to reduce tic severity, the optimal target is yet to be determined.

OBJECTIVES

Perform a literature review regarding the use of deep brain stimulation for treatment-refractory Tourette's syndrome.

METHODS

A search of PubMed and MEDLINE databases was done to find available literature published from 1999 to 2013. "Tourette's" and "deep brain stimulation" were used as key words.

CONCLUSION

Evidence supporting the effectiveness of deep brain stimulation for Tourette's syndrome has been growing in recent years and it may be an appropriate and beneficial treatment option in some cases. DBS targeting the medial thalamus, globus pallidus, anterior limb of the internal capsule/nucleus accumbens, and subthalamic nucleus have all shown to improve tic severity. Improvement in other behavioral symptoms varies among target sites. The medial thalamus is the most widely used target, but increasing evidence supports the use of the globus pallidus and ALIC-NA, as well. The lack of randomized, controlled trials makes definitive conclusions about the relative efficacy of one target over another impossible. Furthermore, studies comparing one target over another remain sparse and have produced contradictory results. Future research should aim to include larger sample sizes and employ standardized methods of evaluation, surgical technique, outcome measures, and follow-up periods.

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Anterior Lumbar Interbody Fusion with Cement Augmentation without Posterior Fixation in an Osteopenic Patient

OBJECTIVE

To report the case of a 66 year-old osteopenic woman with L5/S1 spondylolisthesis and spondylosis who underwent an ALIF with anterior cement augmentation without posterior supplemental fixation.

METHODS

A literature search was performed to research existing methods of surgical spinal fusion and augmentation procedures currently being used in the management of patients with decreased bone mineral density. ALIF with anterior polymethylmethacrylate augmentation was performed on a 66 year-old patient with osteopenia diagnosed by DEXA scan using a medium footprint 13 mm hyperlordotic interbody cage packed with rhBMP-2 and collagen/ceramic strip.

RESULTS TO DATE

On Post-operative day (POD) 1, the patient experienced immediate relief of pre-operative left leg radicular pain. She was discharged home on POD 3 on PO pain medication. At 5 months follow-up, she remained symptom free. Lumbar radiographs showed excellent fusion at L5/S1 without subsidence, hardware loosening, or vertebral body height loss.

CONCLUSIONS

ALIF with anterior cement augmentation without posterior supplemental fixation is a novel surgical treatment option for patients with osteoporosis or osteopenia that provides adequate fixation while avoiding complications associated with posterior pedicle screw fixation.

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Leveraging Technology to Study the Impact of Interruptions in the Emergency Department (ED)

There are several theoretical and laboratory-based studies regarding the negative impact of interruptions on task performance. However, extending this knowledge to real-world clinical environments like the emergency department has been challenging. This study seeks to go beyond current observational research standards in data collection and visualization to analyze how interruptions impact emergency physician performance.

OBJECTIVES

1) Highlight a novel web-based tool, TaskTracker, which we developed to capture the nature of physician workflow and interruptions in the ED.

2) Demonstrate how the data from TaskTracker allows for a rigorous analysis of task interruptions, providing greater insights into mitigating the effects of interruption.

METHODOLOGY

Twenty-four hours of prospective observational data in an urban tertiary care ED (approximately 90,000 annual visits) was collected using TaskTracker. Two Emergency Medicine physicians were passively observed for twelve hours each, completed in two-hour segments over two months. Workflow was divided into ten pre-defined task types: physician/resident, assistant/technician, nurse, student, phone, direct patient care, indirect patient care computer, indirect patient care paper, and other. The modality (auditory or visual), origin (external or internal), and location of the tasks were also recorded. Observers can start, pause, resume, or stop tasks multiple times during observation. Interruptions were defined as task switches (external or internal) when a physician's attention was diverted from one task to another.

RESULTS

A total of 1,336 tasks and 1,988 task segments (start-stop intervals, mean length 43.2 seconds) were recorded. Task segments varied between task types, direct patient care being the longest and indirect patient care paper being the shortest. 70.8% of the tasks were auditory, 29.2% were visual, and 86% of tasks occurred at a designated computer workstation. Physicians attended to interruption tasks an average of 19.1 times per hour. A temporal and transition analysis of workflow shows that EM physicians were interrupted the most when at computer workstations by other physicians, residents, and nurses. 91% of interrupted tasks were returned to directly after the interruption. A density cluster analysis revealed that interruptions tended to cluster in groups of three. The average duration of these clusters was 84.1 seconds. Physicians and residents generated the most interruptions by count. Interruptions generated by assistants, technicians, students, and nurses were more frequently grouped together.

CONCLUSION

Task Tracker provides new insights about emergency physician workflow with interruptions. These findings will lay the foundation for technology and strategies to reduce the disruptiveness of interruptions in the ED and improve patient safety.

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Designing real-time decision support for trauma resuscitations

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OBJECTIVES

Traumatic brain injury (TBI) is a leading cause of childhood morbidity and mortality. In the United States, pediatric head trauma is responsible for 7400 deaths, 60,000 hospitalizations, and more than 600,000 ED visits annually. More than half of children with head injuries undergo computed tomography (CT), with most having minor head trauma. Less than 10% of those scanned have TBI and less than 1% have clinically important TBI. Given the number of children evaluated each year for head injury, the risks of radiation exposure and the added cost from overuse of head CT represent a patient safety issue and a substantial healthcare burden. Similar to some other clinical conditions for which testing or treatment is either overused or inconsistently applied, a clinical decision rule (CDR) has been previously derived and validated to guide use of head CT in injured children.

Physicians often fail to adopt CDRs and other forms of evidence-based practice through traditional means of knowledge acquisition such as journal articles and scientific presentations. This implementation gap has led to interest in tools like electronic clinical decision support (eCDS) as a means to improve physician behavior. Many existing electronic clinical decision support systems have been designed and implemented without taking into account the context in which clinical work is performed, and research confirms little demonstrable improvement in physician adoption or quality of care using these systems.

At the very least, poor implementation of eCDS systems leads to wasted effort and money. At worst, it leads to unnecessary patient morbidity or mortality by failing to accomplish its goal or serving as a time-consuming distraction to physicians. The current CDR implementation for head CT imaging in trauma in the CNMC Emergency Department is delivered as a questionnaire when ordering a head CT. It is used by more than half of clinicians, but in less than 20% of trauma cases. While "physician resistance" is often cited as a reason for non-compliance to a new procedure, a human factors approach would suggest that the failure could have been predicted. The clinical decision support may not meet the clinician's needs because it arrives well after the cognitive processing and decision has been made to perform the test. An implementation survey confirms that among 40 CNMC emergency care clinicians, the primary barriers to use of the existing tool is that the information provided is redundant and does not fit clinical workflow. These identified barriers are consistent with prior research that the two primary errors with health information technology are: 1) problems with data entry and data display; and 2) poor provider communication and coordination with clinical workflow. With these barriers in mind, we decided to use a discount usability engineering approach to implement a novel pediatric TBI eCDS tool for the fast-paced environment of trauma resuscitations.

METHODS

We assembled a team of three usability engineers and five clinical experts. Using existing trauma protocols, we designed a hierarchical task analysis (HTA) of pediatric TBI evaluation. The clinical experts then iteratively modified the HTA until reaching saturation. Guided by the HTA, we developed a computer display of a prototype eCDS, which underwent heuristic evaluation with usability engineers. Finally, the eCDS tool underwent iterative usability evaluation with clinical experts using video review of trauma resuscitation cases.

RESULTS

We developed a TBI evaluation HTA that was acceptable to clinical experts and was then used to develop the prototype eCDS tool. The heuristic evaluation showed that the prototype eCDS tool better met medical design heuristics on all but one of the 10 measures when compared to the order-entry-based CDR, and multiple design improvements were incorporated prior to usability testing. After five clinical experts gave feedback on ten video cases each, the iteratively refined eCDS tool was rated better than the existing CDR in 97% of video cases, and rated equivalent in the remainder. In addition, barriers to acceptability were solicited and were found to be infrequent: not matching clinical workflow (6.25%), medico-legal concerns (4.5%), and timing (8.9%) and content (6%) of data display. Substantive usability and workflow improvements were made iteratively during usability testing. The HTA, prototype eCDS tool and refined eCDS tool will be provided on the poster.

SIGNIFICANCE

The iteratively refined eCDS tool is now ready for live clinical feasibility and acceptability testing. The ultimate goal is to be incorporated into the process of care to display real-time guidance to medical providers about the utility of head CT imaging for children with head injuries during trauma resuscitations. This study illustrates the utility of human factors engineering in the implementation of an electronic clinical decision support tool. Effective implementation would reduce the number of unnecessary CTs for children at very low risk for traumatic brain injury. The methodological approach could be applied to improve the delivery of eCDS for other medical conditions.

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Incidence of Bacteremia in Febrile Sickle Cell Disease Patients Presenting to the Emergency Department

BACKGROUND

Febrile children with Sickle Cell Disease (SCD) are at increased risk of bacteremia due to compromised immune function. Rates of bacteremia in the general pediatric population have decreased significantly over the past few decades due to vaccine advances. It is unclear if these advances have also decreased rates of bacteremia in patients with SCD.

OBJECTIVES

To determine the incidence of bacteremia in febrile SCD patients presenting to the Pediatric Emergency Department (ED) and identify predominant pathogens in the current era.

METHODS

We conducted a retrospective, cross-sectional chart review of all SCD patients aged 3 months to 21 years presenting with fevers ≥ 38.5°C to 3 large tertiary care hospital EDs from 2005-2012. Data abstracted from individual patient visits with qualifying fevers included sickle cell disease genotype, triage vital signs, duration of fever, history of present illness, past medical history, lab and radiology test results, and final ED diagnosis. Suspected contaminant organisms, including Staphylococcus epidermidis and Streptococcus viridans, were excluded from measurement of true bacteremia incidence. Descriptive statistics of all variables were performed.

RESULTS

Positive cultures were present in 57/2089 (2.73%) of eligible patients. True bacteremia was diagnosed in 28/2089 (1.34%) of eligible patients and in only 28/57 (49.12%) with positive blood cultures. Predominant organisms identified were: Streptococcus pneumonia (19.3%), Staphylococcus aureus (8.8%), Enterobacter (5.3%), Haemophilus influenza (3.5%), Salmonella spp (3.5), E. coli (1.8%), Candida lusitanae (1.8%), Moraxella catarrhalis (1.8%), Bordatella spp (1.8%) and Klebsiella spp (1.8). Organisms deemed to be contaminants included: Streptococcus viridans (15.3%), Staphylococcus epidermidis (1.8%), Cornybacterium spp (7.0%), Propionibacterium spp (1.8%), Bacillus spp (3.5%), and other Staphylococcus spp (21.1%).

CONCLUSION

In this large sample of pediatric patients with SCD, rates of bacteremia are similar to those in the general pediatric population. Contaminants account for approximately 50% of all cultures obtained, leading to potentially unnecessary escalation of therapy. Further study is required to delineate factors most associated with true bacteremia in order to appropriately identify SCD patients most at risk of bacteremia.

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Parental stress and newborn's brain and somatic tissue oxygenation before and after skin-to-skin contact in the NICU

BACKGROUND

Parents of NICU infants experience high levels of anxiety and depression that can affect bonding. Numerous studies have shown positive physiologic effects for newborns of the skint-to-skin contact as improvement in weight gain, breastfeeding rates, cardio-respiratory tracing, parental-infant bounding; decreased oxygen requirements, NICU length of stay and nosocomial infections. Few studies are available evaluating the impact of skin-to-skin on cerebral and somatic oxygenation as well as parental stress.

OBJECTIVE

Assess the impact of skin-to- skin on maternal anxiety levels and evaluate cerebral and somatic oxygenation during skin-to-skin in the CNMC NICU.

DESIGN/METHODS

IRB approved, 25 mothers of hemodynamically stable infants in the NICU were enrolled. Parent's stress was measured using the Modified Parental Stress Scale (PSS NICU) 14 items, 3sub- scales: environment, infant behavior and appearance and parental role alterations. Each item was rated (1–5). Item not perceived as a stressor: NA. The higher the score, the higher the stress level perceived. Spanish version also available. Same survey was filled out before and after holding their babies skin-to-skin. Vital signs, cerebral and mesenteric oxygenation with NIRS sensor were monitored during study.

RESULTS

Data was obtained from 25 mothers with 0.54-3.7 kg BW, age 3-109 days old, GA of 23-41 weeks. All of the mothers reported decrease in their stress level after skin-to-skin. With Pre intervention scores 20-68, post 9-55. Highest levels of stress in the relationship with baby–parental role and how the baby looked and behaved. Based on t-study test, almost all the items had a statistical significant reduction. Major decreased were: stress caused for being separated of their infants, feeling helpless and unable to protect their infant from pain and painful procedures and in the general experience in the NICU. Regarding cerebral and somatic oxygenation, the mean StO2 and mean StO2 variability were lower during skin-to-skin. Average StO2 was 73.3% that was lower in 66% of patients. The variability was lower in 40% Apneas, bradycardias and desaturations also lower.

Cerebral StO2%	Start Crib	Kangaroo Care	End Crib
StO2 Average (SD)	74.0 (5.4)	73.3 (5.3)	73.2 (6.1)
StO2 Variability* (SD)	3.20 (1.17)	3.35 (1.50)	3.34 (1.82)

CONCLUSION

Skin-to-skin can be used as an effective technique to decrease the parental anxiety in the NICU. Lower StO2 can occur because of increased cerebral metabolism (brain more active) or because hemodynamic changes with the orientation of the baby Decreased variability could mean more stable hemodynamics and maybe better respiration function.

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Detection of sequestered cyst by laminectomy and treatment of spontaneous spinal cerebrospinal fluid leak causing cerebral hypotension

A positional or orthostatic headache is typically found secondary to an iatrogenic cause, most commonly a routine lumbar puncture. On a rare occasion, termed spontaneous intracranial hypotension (SIH), a patient will present with orthostatic headache without the preceding iatrogenic cause.1 First described in 1938, cases of SIH were documented less than 75 times by 1995; only recently, increased awareness has led to a more frequent annual incidence rate of between 2 and 5 individuals per 100,000.3,5 SIH due to spinal cerebrospinal fluid (CSF) leak remains a commonly underdiagnosed and misdiagnosed cause of persistent headaches, and the incidence rate is likely underestimated. CSF leakage, in the absence of apparent cause, is the most common cause of SIH. 5 The cardinal sign of SIH is an orthostatic headache that worsens when standing (negative intracranial pressure leading to intracranial hypotension) and improves when lying down. 5 Typically, magnetic resonance imaging (MRI) would indicate characteristic findings associated with SIH, including downward displacement of the brain, subdural fluid collections, and intracranial pachymeningeal enhancement. 4 Our case was unique in that the CSF was leaking into a sequestered ventral cyst, which was not apparent with MRI, necessitating a complete laminectomy to identify the precise location of fluid leakage. The majority of SIH cases are benign and can be managed without surgical intervention; if this conservative management fails to resolve the situation, a lumbar epidural blood patch should then be performed. 2 In patients who fail to respond to the blood patch, such as the patient presented in this case, a minimally invasive procedure involving fibrin sealant should be considered. Percutaneous placement of fibrin sealant acts to form a fibrin polymer seal, the product of injected fibrinogen solution and thrombin with calcium cofactor. 4 Once we identified our patient's ventral cyst following laminectomy, we successfully occupied the cyst with the fibrin sealant.

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Pain Catastrophizing in an Outpatient Chronic Pain Population

OBJECTIVE

An individual's pain experience consists of many emotional determinants, one of which includes pain catastrophizing. Pain catastrophizing is an exaggerated, negative cognitive sentiment toward an actual or anticipated painful experience. Pain catastrophizing is a predictor of negative pain-related outcomes, a higher severity of pain, development of chronic pain, and physical disability. This study was designed to determine specific patient characteristics associated with pain catastrophizing, so that pain practitioners can better identify patients at risk for developing negative pain-related outcomes associated with catastrophizing.

METHODS

Following approval from the Institutional Review Board, we randomly administered once a week, the Pain Catastrophizing Scale (PCS) and an additional questionnaire to chronic pain patients seen at the GW Spine and Pain Clinic between September and October 2012 and May and June 2013. Data reviewed included patient age, gender, ethnicity, duration of pain, cause of pain, frequency of pain, employment status, interference with daily life, and score on Pain Catastrophizing Scale (PCS). Total score on the PCS was then analyzed using Pearson's Correlation Coefficient (r) to assess relationships between patient characteristics and PCS score.

RESULTS

64 chronic pain patients completed the PCS and questionnaire. Age was found to be significantly (negatively) correlated with PCS with r=-0.27 (p=.03), reflecting that older patients tended to have lower PCS scores. Women were found to have significantly higher average pain (p=.04) as well as higher PCS total score (p=.03) when compared with men. Patient knowledge of the cause pain is associated with lower PCS total scores (0.02) compared to those who did not know. When the score on one variable affects the correlation between two other variables, this is known as a moderator effect. In patients who did not know the cause of their pain, the average pain score correlated highly with pain frequency (r=.83), and with interference in daily activities (r=.65). Knowledge of cause of pain did not affect those on disability or seeking disability versus not on disability.

CONCLUSIONS

Younger age, female gender, and not knowing the cause of one's pain tend to be associated with a higher incidence of pain catastrophizing. Not knowing the cause of pain was also associated with a higher frequency of pain and interference with daily activities. Identifying patients who are at higher risk for pain catastrophizing may help pain practitioners approach pain management in these patients more effectively. It also may support incorporating behavioral interventions designed to improve patient related outcomes.

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Next-Generation Sequencing of the Lung Microbiome from Mechanically Ventilated Patients

BACKGROUND

Ventilator associated pneumonia is a serious complication that occurs in intubated patients in the intensive care unit (ICU) setting and can cause significant morbidity, mortality, and increased healthcare costs. Rapid and accurate pathogen identification is essential to enable targeted antibiotic use. Current agar-based bacterial culture methods are time-consuming, cannot readily distinguish colonizing from pathogenic bacteria, and do not support growth all bacteria.

OBJECTIVES

To assess the use of next-generation DNA sequencing technology on sputum samples obtained from intubated patients with suspected pneumonia and to compare these results with standard microbiologic culture on selective media, with a goal to use this technology to allow physicians to identify respiratory pathogens more quickly and more accurately than with current laboratory methods.

METHODS

Deep tracheal aspirates were collected from intubated patients with suspected pneumonia in the GWU ICU under IRB approved protocol. The DNA was extracted from the sputum and the bacterial 16S ribosomal DNA was amplified using PCR. The extracted DNA was sequenced using the Pacific Biosciences RSII platform for each patient sample, and the data was analyzed using multiple alignment strategies.

RESULTS

The interim analysis was performed on 5 samples obtained from 3 men and 2 women who ranged in age from 19 to 65 years old. The mean length of intubation was 27 days and the mean duration of antibiotic use was 6 days. All microbiologic cultures had at least moderate to abundant growth of certain bacteria (Pseudomonas, Enterobacter, MRSA). Each sputum sample analyzed using SMRT sequencing identified the bacterial species from the standard bacterial cultures but these species were frequently not the predominant bacterial DNA identified by sequencing. These results suggest that in a majority of these cases, the standard culture result was clinically misleading given that these bacteria more likely represented nonpathogenic colonizers rather that actual respiratory pathogens

CONCLUSION

Next-generation DNA sequencing technology has the ability to identify a vast array of bacterial pathogens directly from clinical specimens and provide quantitative data that could significantly aid in the interpretation of standard microbiologic culture results. With refinement, this technology might be able to provide results within 24 hours and more accurately than current culturing methods. DNA genome sequencing may also provide additional information such as antibiotic resistance for physicians to provide better care for patients on ventilators with pneumonia.

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Rethinking Pain Assessment in the Emergency Department

BACKGROUND

Pain is one of the main motivations that drive patients to seek care in the Emergency Department (ED), comprising approximately 18.9% of ED patient visits. This research study is designed to identify the significant contributors to an emergency patient's pain, which includes physical, psychological, social and spiritual aspects, so that specific and efficacious treatments and referrals can be prescribed. Better delineation of the source of pain or distress may aid clinicians in more appropriate treatment and attention to the "whole" patient.

STUDY OBJECTIVES

1) Observe how pain is discussed in the ED between patients and clinicians in order to 2) examine the current pain assessment techniques for evaluating pain and 3) uncover which elements have an impact on clinical encounters in the emergency department.

METHODS

Setting: Two hospitals in the Washington, D.C. Metropolitan Area. From September 2011 to April 2013, trained research assistants completed ethnographic observation of 144 clinicians and 119 patients. Clinicians included physicians, nurses, and physician assistants. Patients and physicians were observed and interviewed. Patients were excluded if non-English speaking, in police custody, hemodynamically unstable or younger than 18 years old. Data was analyzed using a theme and pattern analysis.

RESULTS

Patients were motivated to report their pain in order to: eliminate pain, eliminate fear of the unknown, and be believed or validated. Clinicians were motivated to treat pain based on whether or not a patient was exaggerating their pain, in order to increase patient throughput, to avoid over medication, and to follow The Joint Commission protocols. Clinicians utilized techniques to detect pain, which primarily included body language, verbal cues, and physical cues. Three types of encounters between patients and physicians were observed: productive, nonproductive and inconclusive. Some clinicians were found to express dislike and mistrust of the 0 to 10 pain scale and described supplemental techniques they used to evaluate pain.

Conclusions: Patients and clinicians have competing motivations during pain assessment, resulting in possible unproductive clinical encounters for both patients and clinicians. To guarantee accurate assessment of patient discomfort and bridge the gap between competing motivations of clinicians and patients, the ED pain assessment model may need to address all types of pain. More reliable tools for ED assessment of pain are needed.

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Vitamin D Deficiency Associated with Malabsorption – Should We Blame the Gut?

Unlike the other vitamins that are acquired only from the diet, the human body synthesizes most of the needed vitamin D in the skin; less than 20 percent of the vitamin D needed by an adult human body comes from diet. Synthesis of vitamin D begins in the epidermis of sun-exposed skin areas with a UV light-stimulated photoreaction. The resulting vitamin D3 is secreted into the circulation and subsequently metabolized in liver and then kidney into biologically active vitamin D3. Vitamin D deficiency is defined by less than 20ng/ml of 25(OH)-D3 in the circulation. Many patients with various malabsorptive conditions (such as celiac disease, cystic fibrosis, short bowel syndrome, irritable bowel syndrome, Crohn's disease, gastrointestinal accessory organ dysfunction, etc.) present with vitamin D deficiency. Since dietary sources only provide at most 20 percent of the body's vitamin D need, why do these patients develop vitamin D deficiency? To answer this question, we conducted a PubMed literature search using the terms "vitamin D" and "malabsorption." We categorized the information from these articles by taking the following patient information into consideration: malabsorption disease states, vitamin D levels, symptoms, treatment, and lifestyle. In general, these published articles, not surprisingly, show vitamin D deficiency in patients with malabsorptive diseases. Furthermore, the vitamin D deficiency is automatically attributed to malabsorption of dietary vitamin D in most of these articles. Here we show that vitamin D deficiency in patients with malabsorption could be multifactorial. Specifically, some patients with malabsorptive diseases such as cystic fibrosis take drugs that then make them more photosensitive, possibly affecting their compliance of sunlight exposure and hence vitamin D synthesis; some patients could develop vitamin D deficiencies as a consequence of medication-mediated drug interactions that affects the liver's ability to produce 25(OH)-D3. We propose that disease-related lifestyle changes and medications are important contributing factors for vitamin D deficiency in patients with malabsorptive disorders. For instance, the disease could affect the patient's ability or desire to be outside, decreasing their sun exposure. Future research should focus on the lifestyle of patients with malabsorptive difficulties. Possible treatments for vitamin D deficiency in such patients include the use of specially designed indoor UV-B lamps, outdoor activities under the sun, use of vitamin D supplements that are conjugated to polar moieties for easy absorption, and vitamin D delivery in ways other than through oral supplements.

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In Vivo Enhanced Depth Imaging Optical Coherence Tomography of the Trabecular Outflow Pathway in Human Normal Eyes

OBJECTIVE

To assess the usefulness of enhanced depth imaging optical coherence tomography (EDI OCT) for evaluating in vivo microarchitecture of the trabecular outflow pathway and to determine if differences exist in its dimension among regions.

METHODS

Serial horizontal EDI OCT B-scans were obtained in the nasal and temporal limbal areas from one eye of each normal subjects (81 scans per 15x5 degree rectangle; interval between scans, ~35 μm; Fig 1A and 1B). The cross-sectional area of SC was measured in each EDI OCT B-scan. The intra- and inter-observer reproducibility of the Schlemm's canal (SC) cross-sectional area measurement was evaluated using 40 randomly selected EDI OCT scans (8 scans per each of 5 normal eyes). The CCs connected to the SC were counted in these areas. SC measurements and CC counting were performed by an independent observer, who was masked to the clinical information of the examined eyes.

RESULTS

Eleven normal eyes (11 subjects; mean age, 28±5 years) were included. The SC cross-sectional area measurement by the two observers showed excellent intra- (ICC [intraclass correlation coefficient] = 0.830 for observer 1 and 0.886 for observer 2) and inter-observer (ICC = 0.793) reproducibility (all $p<0.001$). The cross-sectional shape of SC varied considerably among regions with intermittent bifurcation (Fig 1C-1E). Most CCs were connected to the outer wall of the SC and their locations varied from the medial to the lateral ends of SC (Fig 1F-1H). The mean cross-sectional SC area was significantly greater nasally than temporally (3837±1397 μm2 vs. 3188±1204 μm2; $p=0.034$; Fig 2A). The number of the CCs was significantly greater nasally than temporally (7.5±1.7 vs. 5.5±2.0; $p=0.004$; Fig 2B).

CONCLUSIONS

EDI OCT is useful for evaluating the in vivo microarchitecture of the trabecular outflow pathway. SC is larger with more CCs nasally than temporally in normal eyes. This may have important implications for the development of treatments that target the trabecular outflow pathway.

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Differentially Expressed Circulating and Urinary microRNAs as Molecular Signatures of Focal Segmental Glomerulosclerosis

BACKGROUND

MicroRNAs (miRNAs) are non-coding RNA molecules that play important roles in the pathogenesis of various kidney diseases. In the present study, we examined the diagnostic potential of simultaneous measurement of urinary and serum miRNAs to differentiate between patients with minimal change disease (MCD) and focal segmental glomerulosclerosis (FSGS).

METHODS

Exosomal miRNAs were extracted from serum and urine samples of patients with FSGS (n=20), MCD (n=5) and healthy controls (n=5). MiRNA profiling was performed using Affymetrix GeneChip miRNA 3.0 arrays and the miRNA targets were predicted using miRIAD. Results: (i) Comparison analysis of FSGS versus MCD revealed 88 significantly differentially regulated miRNAs in serum and 95 significantly differentially regulated miRNAs in urine; (ii) significantly more miRNAs were down-regulated in both serum and urine samples of FSGS patients compared to MCD; (iii) only 38 of these miRNAs were previously cited whereas the remaining 160 miRNAs have not been described and are novel; (iv) serum levels of miR-30b (2.8-fold; $p<0.001$) and miR30c (2.3-fold; $p<0.001$) were shown to be significantly decreased in FSGS compared to MCD patients and normal controls; and (v) urine levels of mir-1225-5p (14.4-fold; $p<0.0001$) and mir-1915 (3.2-fold; $p<0.0001$) were significantly decreased in FSGS compared to MCD patients and normal controls.

CONCLUSIONS

These results suggest that identifying and validating the expression of miRNAs in urine and serum could be used to develop biomarkers. Serum miR-30b and miR-30c and urine miR-1225-5p and miR-1915, identified in this study have the potential as biomarkers to differentiate FSGS from MCD. Mir-30 family members target Notch 1 and p53. Loss of miR-30 could lead to podocyte injury and endothelial mesenchymal transition leading to kidney fibrosis, whereas miR-1225-5p and miR-1915 play a role in stemness of adult renal stem/progenitor cells. These miRNAs could be useful for the screening of high-risk patients and may also serve as targets for future drug development. Furthermore, recognition of miRNAs that are differentially expressed between FSGS and MCD may help to identify those miRNAs that are involved in their pathology.

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The Utility of Bedside Ultrasound in the Assessment of ED Patients with Abscesses

BACKGROUND

Community-acquired methicillin-resistant staphylococcus aureus (MRSA) is now considered the most common identifiable cause of skin and soft tissue infections (SSTI) in the United States, accounting for up to 64% of SSTI seen in emergency departments (ED). Some studies indicate bedside ultrasound (US) can improve the diagnostic accuracy of purulent versus non-purulent SSTI and characterize findings that may suggest an abscess associated with MRSA.

OBJECTIVES

To determine if bedside ultrasound characteristics can predict the presence of MRSA in ED patients with SSTI.

METHODS

We conducted a secondary analysis of an ongoing randomized trial evaluating the Cepheid GeneXpert SA/SSTI rapid molecular assay compared to standard broth enriched culture in ED patients with suspected cutaneous abscesses. In a convenience sample of these patients, bedside US was performed to confirm the presence of an abscess and to characterize the abscesses in patients with a positive culture result for MRSA. Eligible adult patients presenting to the ED with a suspected cutaneous abscess were examined using standard US scans in B-mode and Doppler to identify defining characteristics prior to incision and drainage (I&D). Wound specimens underwent standard broth enriched culture. Univariate analysis was executed to evaluate whether US features correlate with the presence of MRSA

RESULTS

In this study, a total of 32 patients were enrolled. US identified a drainable abscess in 26 cases. In 6 cases considered for I&D based on clinic impression of abscess, performing US ruled out to presence of a drainable collection. In the patients who underwent I&D after US, thirty-one percent (8 patients) had cultures positive for MRSA. The average size of the US identified fluid collection was 0.58cm (depth) by 0.71cm (width) by 1.19cm (length). Univariate analysis of characteristics of the fluid collections in the ultrasound group revealed no significant differences in the size of the abscess, echogenicity, capsular margins, pericollection cobblestoning and Doppler characteristics in patients with MRSA as compared to non-MRSA abscesses.

CONCLUSION

Bedside US is useful in demonstrating the absence of a drainable collection in SSTI felt to be abscesses, but failed to identify characteristics correlated with the presence of MRSA.

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Pathologic Spectrum of Renal Biopsy Diagnoses at George Washington University

BACKGROUND

Glomerular diseases are the third most common cause of end stage renal disease in the United States. There is limited data on the clinical outcomes of patients who undergo renal biopsies.

OBJECTIVES

We created a renal biopsy registry to record the epidemiology of the renal biopsies and the clinical outcomes of all patients who received renal biopsies at George Washington University (GWU) from July 2011-present time.

METHODS

Patients who had a renal biopsy performed through the GW Division of Renal Diseases and Hypertension starting July 1, 2011 to the present were included in the biopsy registry. Patient's renal biopsy diagnosis, date of biopsy, age, method of biopsy (ultrasound vs CT guided), baseline proteinuria, serum creatinine, treatment plan, date of last renal follow up visit, date of last serum creatinine and proteinuria were recorded.

RESULTS

A total of 55 renal biopsies were included in the renal biopsy registry to date. The following renal histologic diagnoses were identified: Focal Segmental Glomerulosclerosis (N=8), Diabetic Glomerulosclerosis (N=7), Membranous Nephropathy (N=7), SLE Nephritis (N=6), IgA Nephropathy (N=6), Membranoproliferative Glomerulonephritis (N=6), Hypertensive Nephrosclerosis (N=4), Minimal Change Disease (N=2), Granulomatous Interstitial Nephritis secondary to sarcoidosis (N=2), Pauci-immune Glomerulonephritis (N=2), Mesangial Proliferative Glomerulonephritis (N=1), Thin Basement Membrane Disease (N=1), and Chronic Tubulointerstitial Nephritis (N=1). 51% of the patients were female. The mean proteinuria at the time of renal biopsy was 4797 mg/g creatinine, and the mean serum creatinine was 2.84 mg/dl. The mean proteinuria on last renal follow up was 2998 mg/g creatinine, and the mean serum creatinine was 2.33 mg/dl. 42% of the patients required immunosuppression. Of the patients who required immunosuppression, 70% were on corticosteroid based therapy. The second most common form of immunosuppression prescribed was Mycophenolate Mofetil. Six out of the 13 patients with diabetes mellitus had a diagnosis other than Diabetic Glomerulosclerosis. Seventeen out of 55 patients had a reduction in proteinuria or partial/complete remission in proteinuria.

CONCLUSIONS

The most common renal histologic diagnoses in the registry were Focal Segmental Glomerulosclerosis, Membranous Nephropathy, and Diabetic Glomerulosclerosis. Corticosteroids were the most common form of immunosuppression used in the treatment of glomerulonephritis at our center. Long-term follow up and increased enrollment of patients is necessary in order to draw additional conclusions.

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Use of excimer laser for Morphea

BACKGROUND AND OBJECTIVES

Morphea, also known as localized scleroderma, is a sclerotic inflammatory disorder that primarily affects the skin but has the potential to involve fascia, muscle and bones. With no cure for this disfiguring disease, therapeutic modalities including topical regiments, immunosuppressive agents, antimalarial medications, and phototherapy are used to manage the symptoms and progression. While many treatments options are available, they vary in efficacy.

METHODS

We present a case of a 28-year-old woman with active sclerotic plaques distributed along her neck, left flank. She had previously failed therapy with topical steroids and methotrexate, and was started on hydroxychloroquine 400 mg daily and calcipotriene/betamethasone ointment 0.005% BID. Since she was still having active lesions, she was referred to our clinic for consultation regarding excimer laser therapy. We used excimer laser therapy at 260 mJ twice a week, supplementing the hydroxychloroquine and calcipotriene/betamethasone ointment.

RESULTS AND CONCLUSION

Within two months of therapy, no new lesions had occurred and current lesions showed no active inflammation. To our knowledge, this is the first description of excimer laser used for the treatment of morphea.

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Time Costs of Oral Contrast in Abdominopelvic CT Scans in the Emergency Department

BACKGROUND

The use of CT scans for the evaluation of patients with abdominal pain is now used almost universally in the emergency department, however, the use of contrast for CT scans varies among sites. With the development of advanced CT technology the necessity of oral contrast for undifferentiated abdominal pain has increasingly become more controversial.

OBJECTIVES

The aim of this study is to examine the time expenditure for oral contrast administration in patients obtaining an abdominopelvic CT scan compared to those without oral contrast.

METHODS

All abdominopelvic CT scans that were performed from February 12, 2012 to March 3, 2013 in an urban, academic emergency department were retrospectively reviewed. Patient data was separated into those that received oral contrast and those that did not and analysis was done to evaluate 1)Time to order 2) Time to scan 3) total ED length of stay (LOS).

RESULTS

A total of 4517 CT scans were reviewed. A total of 4135 abdominopelvic CT scans were included in the study, 2188 with oral contrast and 1947 without oral contrast. In aggregate, median time to order was 125 minutes without oral contrast and 166 with oral contrast ED time to scan was 101 minutes without oral contrast and 272 minutes with oral contrast. ED LOS was 440 minutes without oral contrast and 646 with oral contrast (206 minutes).

CONCLUSION

There is a significant time expenditure for patients given oral contrast for abdominopelvic CT scans which affects length of stay and time to scan compared to those who did not receive oral contrast. With the continued improvement in CT scan technology and recent studies showing near equivalent sensitivity and specificity for abdominopelvic scans without oral contrast compared to those with, this study provides evidence that deferring oral contrast may improve ED throughput and decrease patient wait times.

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Monitoring intravascular (Vb), interstitial (Vi), & intracellular (Vc) volume changes during hemodialysis (HD) in patients (pts)

INTRODUCTION

A multi-frequency electrical impedance spectroscopic (EIS) technique was developed that enables non-invasive measurement of compartmental volume (CV) changes in monitored human subjects. The aims are 1) to evaluate the feasibility & precision of EIS to quantify acute changes in Vb, Vi, & Vc during HD in CU & AU, & 2) to assess differences in CV changes in relation to the total amount of fluid removed (Vt), between CU & AU.

METHODS

Using EIS, we prospectively evaluated changes in Vb, Vi, & Vc in ESRD pts in CU & AU. Each HD was completed according to the nephrologist's prescription. Volume changes were obtained by analysis of electrical impedance spectra taken on the left calf of each pt at approximate 1-min intervals throughout each HD by a quadrapolar EIS device as previously described.1

RESULTS

Table 1 shows the mean volumes of fluid removed during HD from Vb, Vi, Vc, & Vt in CU & AU. Table 2 shows the mean pre & post HD CVs & the associated % distributions in CU & AU.

Table 1 Volume removed[a]

	Vb (%)	Vc (%)	Vi (%)	Vt (%)	Vb (mL)	Vc (mL)	Vi (mL)	Vt (mL)
CU (n = 53)								
Mean	12	-11	30	9	96	-44	81	133
Std Dev	8	12	13	5	65	52	44	70
AU (n = 22)								
Mean	-21	-6	15	1	-4	-51	72	16
Std Dev	73	13	20	4	58	81	81	46

a negative values indicate a gain in volume

TABLE 2 MEAN PRE & POST HD CVS

	CU Vb	Vc	Vi	AU **Vb**	**Vc**	**Vi**
mL pre	717	407	270	379	654	425
	51%	29%	19%	**26%**	**45%**	**29%**
mL post	621	451	189	383	705	353
	49%	36%	15%	27%	49%	25%

SUMMARY

The patterns of CV changes in the monitored calves differed between CU & AU. AU pts retained a larger % of total fluid in the Vi & Vc compartments compared to CU pts. Vc increased during HD in pts at both centers.

CONCLUSION

The EIS technique reported previously1 was able to track acute fluid volume changes in the 3 principal fluid compartments of ESRD pts' calves during HD. Results indicate that Vc in the monitored calves tended to increase during HD at both centers as overall calf volumes were being reduced.

REFERENCE

Montgomery LD, Gerth WA, Montgomery RW, Lew SQ, Klein MM, Stewart JM, et al Monitoring intracellular, interstitial, and intravascular volume changes during fluid management procedures. Med Biol Eng Comput 2013;51(10):1167-75

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Respiratory Inductance Plethysmography Improves Diagnostic Sensitivity and Specificity of Obstructive Sleep Apnea

RATIONALE

Respiratory Inductance Plethysmography (RIP) is a non-invasive technique that has been previously shown to correlate with esophageal pressure during respiration. When used during a polysomnogram (PSG), it serves as a surrogate of respiratory effort and can help detect inspiratory airflow limitation. We hypothesize that RIP can improve the sensitivity and specificity of scoring hypopneas when compared to both American Academy of Sleep Medicine (AASM) Recommended (3% oxygen desaturation or arousal) and Acceptable (4% oxygen desaturation) criteria.

METHODS

We retrospectively analyzed a cohort of 12 patients who had a PSG at George Washington-Medical Faculty Associates Center for Sleep Disorders and who had no Obstructive Sleep Apnea (OSA) or mild OSA as scored by the AASM Acceptable criterion for hypopneas, but had high clinical suspicion for a diagnosis of OSA. These patients were rescored using the Recommended AASM criterion, as well as RIP, by a senior sleep technician blinded to the study. RIP sum channel (combining input from chest and abdominal belts) was used for scoring. Hypopnea was scored when there was a 30% decrease in the amplitude of the RIP sum channel curve. The patient's response to CPAP was assessed by using a short questionnaire (Post PSG Sleep Assessment - PPSA) that evaluated pre- and post-CPAP subjective sleep quality. A positive response was considered an improvement in PPSA score after CPAP use and was considered a "true positive" diagnostic study.

RESULTS

When scored using the Acceptable AASM criterion, ten patients had a negative study and two patients had mild OSA for a sensitivity of 11% and specificity of 50%. When scored using the Recommended criterion, ten patients had OSA and two were negative, for a sensitivity of 78% and specificity of 70%. By RIP scoring, all 12 patients had >5 respiratory events per hour for a sensitivity of 100% and specificity of 75%.

CONCLUSION

In this small retrospective study, scoring hypopneas by RIP sum channel shows improved sensitivity and specificity. Larger, prospective studies are needed to validate this technique for detection of hypopneas.

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Effect of OPRM1 Genotype on the Dose Response to Spinal Morphine for Post-Cesarean Analgesia

BACKGROUND

The mu-opioid receptor (OPRM1 gene) is the site of action of endogenous opioid peptides and opioid analgesic drugs, and morphine serves as a prototypical agonist of these receptors. There is a single nucleotide polymorphism (SNP) in the OPRM1 gene that has been shown to affect opioid analgesia in other studies. The SNP of guanine for adenine results in an amino acid change from aspargine to aspartate. There have been some studies that analyzed the possible effect of this SNP in response to spinal morphine administration. However, only two studies have involved cesarean section, and no study has examined a dose-response, utilizing only a single dose. Most women undergoing a C-section are given spinal anesthesia, and most of these patients are given a dose of preservative-free morphine with the anesthesia, which serves as a high quality analgesic. The dose of morphine administered is 75-200 micrograms, but there is no standard of care for the dose. Due to the genotype, there may be women that require much less than 75 mcg, but as previously mentioned, there are very few studies that address dose responses.

OBJECTIVE

To determine whether differences in the OPRM1genotype affects the amount of spinal morphine that should be administered to provide optimal relief with few side effects. To be able to administer a specific dose of spinal morphine during a C-section based on an individual's genetic make-up would prove to be an extremely useful tool that could improve pain management for these patients in the future.

METHODS

This study is a randomized blinded study that will involve 300 women who are undergoing elective caesarean section at term pregnancy receiving intrathecal anesthesia. The 300 women will be divided into three groups of 100, and each group will be given a different dose of spinal morphine during the surgery (50, 100, and 150 micrograms). The amount of intravenous morphine (this is separate from the morphine given during surgery) the patients self-administer will be monitored postoperatively and will be the primary outcome of the study. Their blood will be obtained and shipped to Columbia University Medical Center for genotyping of the OPRM1 gene.

RESULTS

At this point, 70 patients have been enrolled at GWU and 70 patients have been enrolled at Columbia University. The first round of data analysis will begin shortly after genotyping of these patients.

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A Lack of Vigabatrin's-Associated Vision Loss in the Treatment of Infantile Spasms

BACKGROUND

Vigabatrin (VGB) is one of the only two FDA-approved drugs indicated for the treatment of infantile spasms (IS). As an inhibitor of GABA transaminase, it increases the level of GABA in the brain. IS is a type of epilepsy typically seen in children under 2, which manifests with clusters of involuntary spasms (seizures) and a distinct electroencephalography pattern (hypsarrhythmia). Although neurodevelopmental impairment is common, normal development is possible if treatment is prompt and successful. However, the main barrier to the use of VGB is the perceived risk of irreversible retinotoxicity and peripheral vision loss, with estimates of risk approaching 50%. In addition, there are reports of brainstem white-matter signal changes observed on MRI, which have most often been subclinical and reversible, but rarely associated with reversible movement disorders and respiratory crises.

HYPOTHESIS

Of the patients treated at UCLA with Vigabatrin for their infantile spasms, the prevalence of clinically significant visual impairment is lower than previously reported in adults.

METHODS

A retrospective medical records review was conducted with a cohort of patients at UCLA treated with VGB from 2008 to 2013. We carefully documented peak and cumulative dosages, utilizing each patient's dates of treatments, dose changes, and weights at each encounter. Responses to treatment were recorded to document both clinical response and video-EEG confirmed absence of seizures and hypsarrhythmia. Vision loss attributable to VGB was tabulated and differentiated from pre-existing and centrally-mediated visual impairment using available records and ophthalmologic evaluation reports. The presence of subcortical T2 MRI abnormalities was similarly tabulated.

RESULTS

Of the 209 patients with infantile spasms, 111 received VGB treatment and 87 were included in the final analysis. Patients with insufficient records were excluded from analysis. VGB had a clinical efficacy in 29 cases (33.3%) and definite vEEG-confirmed efficacy in 16 cases (18.4%). Though 21 patients (24.1%) showed evidence of vision loss, none were clearly attributable to VGB. 7 patients (8%) exhibited MRI changes (subcortical T2 hyperintensities) with their VGB exposure, of which 5 patients manifested clinical sequelae including respiratory arrest and movement disorders.

CONCLUSIONS

In this highly-refractory cohort of patients with infantile spasms treated with VGB, there was no vision loss that could be clearly attributed to VGB as would be suggested by past studies. These results preliminarily suggest that the incidence of retinal VGB toxicity has been over-reported and may be an unreasonable deterrent to the use of VGB as a first or second-line therapy.

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The Patient's Perioperative Perspective during the Treatment of Obstructive Sleep Apnea

OUTCOME OBJECTIVES

- Describe the patients' pre-operative and post-operative experience in the treatment of obstructive sleep apnea (OSA).
- Understand how the patients' perceptions may influence their post-operative outcome and satisfaction.

METHODS

To analyze the differences between quantitative and qualitative post-operative results, we developed a modified phenomenological qualitative study of OSA patients who failed continuous positive airway pressure (CPAP) use and underwent surgery. From May-August 2012, patients were interviewed using a semi-structured approach until thematic saturation was reached (n=17). Of these interviews, 13 were held in-person while four were performed by phone. Through Moustakas' analysis, the transcribed interviews were broken down into codes. These were grouped into overarching themes. Upfront debriefing, investigator triangulation, epoche, reciprocal coding, member checks and thick, rich description ensured data trustworthiness. Additionally, the patient's pre operative sleep studies and post-operative sleep studies were analyzed and compared to the subjective results.

RESULTS

The study identified six themes relating to OSA surgery:

1. Importance of OSA on personal and professional life
2. Motivating factors for choosing surgery
3. Patient knowledge
4. Post-operative challenges
5. Impact of OSA surgery

CONCLUSION

The patient's experiences going into the surgery can largely influence their perceived outcome and satisfaction. These experiences are individual and subjective, and the post-operative sleep studies do not capture the whole outcome of the patients' response to surgery. This suggests when patient reported outcomes are combined with post-operative sleep studies, otolaryngologists can gain a much better perspective about their patients.

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Neuroimaging of Glioblastoma using Diffusion Tensor Imaging: A Case Report

BACKGROUND

Gliosarcoma refers to an uncommon astrocytic tumor of the central nervous system. These tumors include both glial and mesenchymal components by definition, and are extremely malignant. Gliosarcomas are particular to tumors with distinct gliomatous and sarcomatous constituents1, and are distinguished from gliobastomas which have undergone mesenchymal metaplasia.2 Gliosarcomas encompass 2-8% of all glioblastoma cases and tend to occupy the supratentorial regions of the brain, especially the temporal lobe. Rare infratentorial lesions including the cerebellar hemisphere,3 intraventricular,4 and multi-focal5 tumors have also been reported.3 Accurate neuroimaging diagnosis is critical and diffusion tensor imaging (DTI) and spectroscopy can be useful to differentiate from inflammatory disease.

METHODS

We report a 38 year-old Caucasian male with a right parietal lobe glioblastoma. The patient presented with new onset tonic-clonic seizures lasting approximately five minutes associated with postictal confusion and incontinence. The patient had conventional brain MRI scans including DTI. MRI data was processed to obtain tractography and fractional anisotropy (FA) maps. MR images were examined for location and extent of tumor as well as invasion, destruction or displacement of brain parenchyma and white matter tracts.

RESULTS

Noncontract CT revealed no abnormality and emergent MR imaging shows a ring-enhancing lesion measuring 3.1x2.2x3.1 cm at the junction of the right parieto-occipital region. The lesion abuts the dural surface, characteristic of gliosarcoma. Extensive surrounding edema causing complete effacement of the posterior horn of the right lateral ventricle, parietal effacement of the anterior floor of the right ventricle, and a 1.2 cm right to left midline shift were observed. Mild diffuse enhancement in the region of the splenium of the corpus callosum was likely compatible with seizure activity. Increased signal intensity of axial FLAIR image was seen in this area after four weeks. Fractional anisotropy is reduced at the tumor site suggesting an aggressive and invasive lesion. Diffusion tensor tractography shows destruction of white matter tracts compatible with destruction rather than invasion of parenchyma. Histopathology confirms gliobastoma multiforme, demonstrating mixed glial and sarcomatous components. However, GFAP was strongly positive in both areas and a reticulin stain was not increased in the sarcomatorus areas excluding the sarcomatous variant of glioblastoma.

CONCLUSION

We report the imaging findings of a rare gliosblastoma radiographically presenting as a gliosarcoma due to its location along the dural surface, but with lack of pathologic findings. Gross total tumor resection was performed and the patient and is undergoing adjuvant radiation therapy with concurrent chemotherapy.

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Should The Ddimer Cutoff Level Be Increased In ED Patients With Suspected Pulmonary Embolism?

BACKGROUND

Multiple studies suggested that a Ddimer cutoff value at 500 ng/ml can safely and accurately be utilized in diagnostic approach of patients with acute pulmonary embolism (PE). However, a lower Ddimer is still commonly used to exclude acute PE in low risk patients, that will result in unnecessary CT scans.

OBJECTIVES

The aim of this study is to investigate whether a higher cutoff value of Ddimer would lead to an increase in clinical utility without jeopardizing safety in ED patients with suspected PE.

METHODS

Patients treated in an urban, academic ED from January 1, 2011 to December 31, 2011 who had both a CT scan of the chest and Ddimer level were included and had their charts retrospectively reviewed. Ddimer concentrations were assessed and compared against CT scan results. Fifteen percent of the CT scans were randomly selected and independently reviewed by a senior radiology attending. The receiver operating characteristic curve (ROC curve) was established. The sensitivity, specificity, negative predictive value and the likelihood ratio of the Ddimer test at different cutoff values were analyzed.

RESULTS

A total of 526 patients had both a Ddimer and a CT scan of the chest performed during the reviewed period. An institutional Ddimer cutoff value of 380 ng/ml established as the upper limits of normal for the diagnosis of DIC was used and 451/526 (86%) patients were found to have a "positive" value greater than 380ng/ML. Twenty one patients (4%) had a PE diagnosed on CT scans. All 21 patients with PE had Ddimer values above 380 ng/ml (range: 39020,000 ng/ml) for sensitivity and a negative predictive value of 100%. Increasing the cutoff value to 500 ng/ml resulted in a sensitivity of 95.4% and a NPV of 99.4%. This new cutoff value represents an excellent negative likelihood ratio as 0.08 in ruling out PE. Increasing the cutoff value to 1000 ng/ml also had a sensitivity of 90.4% and a NPV of 99.7%. Area under ROC curve was 0.86. Increasing the cutoff point to 500 ng/ml had a potential to save further imaging in 167/ 526 (32%) of patients.

CONCLUSION

A higher cutoff values for Ddimer as 500 ng/ml, demonstrated performances comparable with the institutional reference value of 380 ng/ml with a potential for avoiding unnecessary CT scans.

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The Financial Impact of False Positive Blood Cultures in the Emergency Department

BACKGROUND

Blood culture is the reference standard test for bacteremia, but false positives lead to excessive use of resources. A false positive rate of ≤2% is one national benchmark.

OBJECTIVES

1. Determine the blood culture contamination rate (BCCR) in the emergency department (ED) at Children's National Medical Center Sheik Zyed (SZ) and United Medical Center (UMC).
2. Assess the BCCR process stability across the study period.
3. Estimate the costs associated with these contaminant cultures.

DESIGN / METHODS

We retrospectively reviewed all peripheral aerobic blood cultures samples from the SZ and UMC EDs between 1/1/2012-12/31/12. Samples were excluded if the patient had an indwelling device, oncologic condition, or was >21 years old. Cultures with growth of an organism were reviewed by an Infectious Disease expert to determine whether culture results were positive or contamination. The contamination rate was calculated as the number of contaminants divided by the number of blood cultures. We used a proportion control chart to determine the BCCR stability over time. We then estimated the ED and hospital-based charges from these contaminants based on chart review.

RESULTS AND DISCUSSION

Of 2799 blood samples during the study period, 2501 met inclusion criteria. The BCCR was 3.4%. The proportion run chart indicated a stable process. The 83 contaminant cultures incurred additional charges of $257,365 ($3,139/sample). With education and provider feedback, we will aim to decrease the BCCR and decrease related charges.

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Metastatic Melanoma in an Ulcerative Colitis Patient on Infliximab 9 Years after Surgical Resection of Early Stage Primary Melanoma

Localized stage I and II primary melanoma have a cumulative recurrence risk of 2-5% between 5 and 20 years after complete resection and eradication. There has been speculation that immunosuppressant therapy may increase the risk of recurrence. However, recent data has suggested that immunosuppressants may not increase the recurrence risk of early stage, completely resected melanoma. Nevertheless, concern about the association of immunosuppressants and malignancy recurrence persists. This is a case of a patient with ulcerative colitis and a history of completely resected stage 1B primary melanoma who developed metastatic melanoma within 8 months of initiating infliximab therapy.

A 41 year old male presented to the gastroenterology clinic with bloody diarrhea and was found to have ulcerative colitis. His medical history was significant for a primary left shoulder melanoma stage IB (T1bN0M0, 0.80 mm depth, non-ulcerated, mitotic rate of 4 of 10 per high power field) diagnosed and completely resected 7 years prior. He was started on and initially responded to mesalamine. However, subsequent flares were not controlled with mesalamine and tapering courses of prednisone. Infliximab therapy was subsequently initiated. Eight months later, he presented with significant weight loss. CT imaging showed new lesions in the right lower lobe of the lung and body of the sternum, which were confirmed by PET scan to be malignant metastatic lesions. He underwent right nodule resection, with pathology showing pleomorphism and spindle cell morphology and negative surgical margins. He was started on vemurafenib chemotherapy. Repeat PET showed regression of sternal metastasis, but new metastases to the spine, femur, and brain. Despite aggressive radiation therapy, the patient died within 8 weeks.

It has been speculated that there is an association between anti-TNF-alpha agents and development of melanoma. Metastatic melanoma in individuals with psoriasis, rheumatoid arthritis and solid organ transplants treated with anti-TNF-alpha has been reported. However, recent studies suggest that the association between anti-TNF-alpha agents and recurrence of an early stage melanoma that has been surgically treated is unclear. This is an unusual case of aggressive, ultimately fatal, metastatic melanoma occurring 8 months after initiation of infliximab in an individual who had completely resected early stage melanoma 9 years earlier. It is possible that infliximab increased the susceptibility for recurrent disease. Alternatively, the short duration of infliximab treatment raises the possibility that unrecognized recurrent melanoma was present prior to starting infliximab therapy. There are presently no guidelines for use of anti-TNF-alpha agents in individuals with a history of early stage melanoma. However performance of PET CT imaging, in addition to clinical examination, may be considered in the rare circumstance in which an individual with previously treated early stage melanoma requires administration of an anti-TNF-alpha agents. Continued attention to this matter is necessary to ensure optimal therapy to individuals with a history of melanoma and inflammatory bowel disease.

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An Unusual Case of Steroid Refractory Pyoderma Gangrenosum and Crohn's Disease in a Patient with Chronic, Recurrent Isotretinoin

Isotretinoin (Accutane®) is used to treat cystic acne and its use has rapidly increased over the last two decades. Among the significant side effects of isotretinoin, evidence of whether it serves as an etiologic factor for the development of inflammatory bowel disease (IBD) is inconclusive. IBD is known to have extraintestinal manifestations affecting the skin, including pyoderma gangrenosum. While isotretinoin may have an uncertain relationship with development of IBD, we present an unusual case of steroid refractory pyoderma gangrenosum presenting as an initial manifestation of IBD in a patient with a chronic history of isotretinoin use.

A 45-year-old female with no significant past medical history presented to the gastroenterology clinic with a 5-month history of progressive pyoderma gangrenosum after being tried on topical and oral corticosteroids by her dermatologist. She denied abdominal pain, melena, hematochezia, or change in bowel habits. She had no family history of colon cancer or IBD. Further questioning revealed a history of isotretinoin use. Over the last 20 years, she used isotretinoin approximately three to five times for a duration of 4-6 months each time. Physical exam was unremarkable except for multiple large, ulcerated, necrotic-appearing lesions. The largest lesion measured 15 cm in diameter, affecting bilateral lower extremities anteriorly and posteriorly, with overlying edema and serosanguinous drainage. Previous evaluation included negative anti-nuclear antibodies and tumor markers. A colonoscopy revealed pseudopolyps in the ascending colon with biopsies of the colon significant for cryptitis, crypt destruction, and architectural destruction affecting the cecum, ascending and transverse colon.

This case of a patient with a history of isotretinoin use who presented with steroid-refractory pyoderma gangrenosum and colonoscopic changes consistent with Crohn's diease. The association of isotretinoin and inflammatory bowel disease has been evaluated in several prior studies, but data continues to be inconclusive. It is of interest that this patient had chronic, recurrent isotretinoin use and subsequent development of pyoderma gangrenosum and Crohn's disease. While it is unclear that the medication is related to her clinical circumstances, her presentation warrants continued consideration.

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Consistency of FMRI Language Task Panel in Determining Language Dominance

BACKGROUND

Functional magnetic resonance imaging (fMRI) is a noninvasive method for determining language localization and lateralization in children. FMRI language studies are used for preoperative planning including predicting postoperative language outcomes. The concordance between fMRI and the intracarotid amobarbital procedure (IAP) is established; however, the reliability of a single study in an individual patient is unclear. Moreover, there are several tasks available but there is no consensus regarding which combination of tasks should be used.

OBJECTIVE

To use a panel of four fMRI language tasks to assess the influence of task type, language region, and age on language lateralization, and to assess the consistency of laterality measures across tasks.

METHODS

Seventy-two right-handed, healthy children completed a battery of four language paradigms: semantic decision, verbal fluency, listening comprehension, and reading comprehension. Tasks were designed to identify anterior "expressive" networks in inferior frontal gyrus (IFG) and/or to identify "receptive" areas along the superior temporal sulcus (Wernicke's Area (WA).

RESULTS

Our results reveal differences in language dominance related to task, development, and region of interest. The majority of children were left dominant in WA (81.1%) and IFG (68.7%). The largest age-related changes in lateralization occurred in the task that also yielded the strongest lateralization overall, the semantic decision task. The youngest children (ages 4-6) were less left lateralized in IFG compared to the older children (ages 7-12) ($P < 0.05$), suggesting that the fundamental left lateralized fronto-temporal language network is established by age four, however frontal language functions increase in specialization as age increases. Additionally, certain combinations of tasks more consistently target specific regions of interest. The semantic decision and listening comprehension tasks activated WA in the same hemisphere in 73.3% of subjects; the semantic decision and verbal fluency tasks consistently activated IFG in 64.3% of subjects.

CONCLUSIONS

In preoperative mapping, scan time is limited and decisions must be made for which tasks to use. The semantic decision task should take precedence over other tasks as it activated both frontal and temporal regions, lateralized language to a greater extent than other tasks, and was sensitive to developmental differences. When a lesion is suspected to exist in a language region, using a combination of tasks that target the region with the highest consistency is recommended. For WA, a semantic decision task should be used with a listening comprehension task and for IFG, a semantic decision task should be used with a verbal fluency task.

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Are repeat ketamine infusions associated with cognitive dysfunction?

Outpatient ketamine infusions can be effective in relieving severe neuropathic pain for a period of weeks or months. The NMDA receptor is involved in learning and memory and antagonists such as ketamine may be associated with cognitive impairment (1,2). The objective of this study is to investigate whether repeat outpatient ketamine infusions are associated with cognitive dysfunction as measured by the Manos 10-point clock test, a validated screening tool for cognitive dysfunction(3).

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Role of Imaging in the Diagnosis of Occult Hernias

BACKGROUND

An abdominal hernia is a weakness or tear in the abdominal wall in which intestines or fat protrudes, causing pain and discomfort. Diagnosing hernias primarily relies on a thorough history and physical exam, as patients usually present with significant pain with activity, and a bulge or tender mass in the area of pain. However, the term occult hernia, or 'hidden hernia', is referred to when no mass or bulge is seen on exam, especially in the case of inguinal hernias. This can lead to a variety of tests and radiologic studies being done, some of which may be falsely inconclusive for hernia.

OBJECTIVE

To assess the effectiveness of various imaging techniques, including ultrasound (US), computerized tomography (CT), and magnetic resonance imaging (MRI) in the diagnosis of occult inguinal hernias.

METHODS

A retrospective review of patients with hernias from 2008-2013 was performed in the setting of a specialty referral practice. Thirty-six patients met the following inclusion criteria: a) symptoms suggestive of inguinal hernia, b) no palpable hernia on exam, c) at least one form of imaging preoperatively, and d) an operation for inguinal hernia. We measured the sensitivity, specificity, and predictive values of US, CT, and MRI of the groin and pelvis for detection of occult inguinal hernias.

RESULTS

Of the 322 patients with inguinal hernias, 36 were deemed 'hidden hernias'. The number, sensitivity, specificity, positive predictive value and negative predictive value of each imaging modality were, respectively: US (9, 0.33, 0, 1.00, 0), CT (39, 0.54, 0.25, 0.86, 0.06), and MRI (34, 0.91, 0.92, 0.95, 0.85). Of 11 hidden hernias that could not be seen by CT, 10 (91%) were confirmed by MRI.

CONCLUSIONS

US and CT cannot reliably exclude occult groin pathology. MRI is by far the most sensitive, specific, and reliable modality to diagnose inguinal hernias. Patients without physical exam findings, but high clinical suspicion of inguinal hernia, should undergo MRI as the definitive radiologic examination.

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The Impact of Propofol Shortage on Start Times in the Operating Room

Propofol is a commonly used intravenous anesthetic, both for the induction of general anesthesia as well as the maintenance of sedation or general anesthesia. Due to manufacturing issues and product recalls, there was intermittent limited propofol availability between 2009 and 2013. Despite the great concern and possible harms to patient care presented by the propofol shortages, there is little literature regarding how this shortage effected operating room functioning. The purpose of this study was to determine if the propofol shortage impacted operating room efficiency.

METHODS

Following IRB approval, a retrospective analysis of operating room records from October 15, 2012 through January 18, 2013 was performed. The propofol shortage at GWUH began on November 19th, 2012 and extended to December 14th 2012. We inspected the anesthetic induction agents (propofol or sevoflurane) used. The respective time from entry into the room to start of operation during this period was compared with four weeks preceding and following this time. We excluded cardiac cases, operations performed without general anesthesia, and operations performed on patients already intubated. The resulting dataset compares 788 anesthetics during the propofol shortage with 836 anesthetics in the preceding and 658 anesthetics in the following periods of shortage. Univariate and multivariate regression analysis was performed.

RESULTS

A total of 2053 patients were reviewed, 334 in the sevoflurane arm and 1719 in the propofol arm. Overall, there was no significant difference in the mean time to start of surgery between the propofol and sevoflurane groups (34.7 ± 17.8 min v. 34.4 ± 18.0 min, p=0.78). On univariate analysis, use of sevoflurane was associated with a significantly longer time to start of operation in patients undergoing laparotomy/laparoscopy and arthroscopy. On multivariate regression correcting for surgical approach, service, age, ASA, and emergent procedure, induction medication remained significantly associated with time to start of operation only in patients undergoing arthroscopy. In order to address outliers, we analyzed the quartile with the longest time to operative start within each approach. No significant difference was noted between induction agents.

DISCUSSION

Overall, there was no statistically significant correlation in time to start of operation and the induction medication used. Although overall operating room efficiency may not be affected, the optimal strategy for allocation of scarce propofol in the future should be inclined towards arthroscopic over other cases.

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Panfolliculoma: A Case Report

Proliferation of both upper and lower components of the hair follicle was termed panfolliculoma by Ackerman in Neoplasms of Follicular Differentiation in 1993. It is a rare cutaneous neoplasm with few documented cases. Unable to be diagnosed clinically due to its ordinary appearance, histological examination is required. We present a case of panfolliculoma with sebaceous proliferation located on the dorsal nasal wall of a 55-year-old woman. The dual proliferation of the folliculosebaceous-apocrine line, as seen in our case of panfolliculoma, is exceptionally rare. Only one other case of panfolliculoma with sebaceous proliferation has been documented.

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Bone abnormalities in trichothiodystrophy: central osteosclerosis is a prognostic marker for increased risk of early death

BACKGROUND

Trichothiodystrophy (TTD) is a rare, autosomal recessive, multisystem disorder characterized by low birth weight, short stature, developmental delay, microcephaly, absent myelin in the brain, ataxia and altered reflexes, congenital cataracts, photosensitivity, ichthyosis and sulfur-deficient, brittle hair.

OBJECTIVES

To characterize the spectrum of bone abnormalities and clinical manifestations present in TTD patients examined at the NIH. To identify predictive factors and long-term consequences of bone abnormalities in TTD.

METHODS

We followed a cohort of 32 patients with TTD from 2001 to 2013. Their age ranged from 0.75 to 29 yr (mean 8.3 yr) and mean length of follow-up was 2.6 yr. All patients had diagnostic "tiger tail" banding of their hair on polarized microscopy. We reviewed clinical documents and radiographs of TTD patients utilizing Clinical Research Information System (CRIS), and analyzed medical record and radiographs from outside hospitals. We evaluated x-rays, CTs, and MRIs for the onset, presence and progression of bone abnormalities. We assessed the relationship between clinical outcomes and bone abnormalities using Fisher's exact test and Kaplan Meier curve.

RESULTS

There was a high frequency (81%) of bone abnormalities found. The most common abnormalities seen on bone imaging studies were central osteosclerosis (55%), peripheral osteopenia (35%), hip abnormalities (16%), generalized osteopenia (13%) and delayed bone age (13%). Five patients with hip abnormalities had severe progressive walking impairment. We found that XPD mutations and having a height and weight below the third percentile were significantly related to the presence of central osteosclerosis ($P<0.001$; $P<0.001$). TTD patients with radiographic evidence of central osteosclerosis of the skeleton had a poor clinical prognosis. Eight patients died (median age 8 yr) and 7 of these had central osteosclerosis. By ages 10-20 years, TTD patients with central osteosclerosis had a higher (45-60 fold) risk of death as compared to the general US population.

CONCLUSION

Bone abnormalities are a common finding in TTD. Hip involvement may predict impaired ambulation and central osteosclerosis may be a marker for early mortality.

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The Relationship between Adult Pain Management of Acute Renal Colic during Initial Presentation and the Likelihood of a Return Visit within 72 Hours in the Emergency Department

BACKGROUND

With increasing patient volume and changes to CMS reimbursement criteria, reducing the number of unexpected return visits within 72 hours in the Emergency Department (ED) is a growing concern, and standard return rates are currently between 2.2 and 9.0%. We hypothesize that patients who receive adequate pain management during their ED stay are less likely to return with pain complaints, and a review of the literature suggests that nonnarcotic analgesics are more effective at managing acute renal colic than narcotic analgesics.

OBJECTIVE

To assess the relationship between pain management of adult acute renal colic and the occurrence of an unexpected return visit within 72 hours in the ED.

METHODS

This study was a retrospective chart review of a consecutive sample of subjects presenting to the ED of a suburban, university-affiliated hospital in the northeast United States over a 15 month period who were diagnosed with acute renal colic, received analgesic, and discharged home. Exclusion criteria included patients who refused pain medication, received pain medication prior to arrival, were admitted to inpatient services, or showed signs of renal impairment. Pain management plan and occurrence of a return visit within 72 hours of initial triage time were recorded.

RESULTS

A total of 297 patients were screened, and 233 patients met inclusion criteria. 80 (34%) of patients were female, and average age was 45 years. 40, 2, 52, 1, 20, and 118 patients received NSAIDs, NSAIDs and Flomax, narcotics, narcotics and Flomax, both NSAIDs and narcotics, and no medication, respectively. There were 37 unexpected return visits within 72 hours of initial triage time. 14, 0, 24, 0, 59, and 3 percent of return visits received NSAIDs, NSAIDs and Flomax, narcotics, narcotics and Flomax, NSAIDs and narcotics, and no medication, respectively. Results of a Chi-Squared Test with Yate's Continuity Correction were not statistically significant (p=0.63).

CONCLUSION

It does not appear that there is a significant difference between type of analgesic administered to treat adult renal colic and the occurrence of an unexpected return visit to the ED. We note that patients receiving narcotics were 5% more likely to return than patients receiving NSAIDs. Patients who received Flomax in combination with an analgesic during their initial visit did not return, however, sample sizes of these groups are small.

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The SMART Project: Feasibility of a Text Message Program for Adolescents with Type 1 Diabetes

INTRODUCTION

Type 1 diabetes (T1D) is a lifelong condition that is particularly challenging during adolescence. Most adolescents use cell phones; thus, mobile health interventions may be a novel, effective method of T1D education and adherence promotion. The objectives of this feasibility study are to 1) describe recruitment, retention and response patterns to the SMART Project, a text message program for adolescents with T1D, 2), to explore demographic/medical variables associated with text response rates, and 3) to investigate the relationship between self-reported medical behaviors and text response rate.

METHODS

Twenty-three participants (M age = 15.13 years; Range = 13-17) were enrolled in the SMART Project, a 6 week text message program that sent adolescents BG prompts and T1D education texts 2-3x/day. Adolescents completed a demographic/medical history questionnaire, a cell phone use questionnaire, the Diabetes Behavior Rating Scale (DBRS), and the Self-Care Inventory (SCI). Glucometer data regarding the past 30 days were downloaded. Medical charts were reviewed for HbA1C.

RESULTS

Fifty-four percent of eligible patients agreed to participate; 96% of participants completed all 6 weeks of the SMART Project. Participants responded to 78% of texts; the highest response rate was to texts regarding nutrition and physical activity. Girls, participants who sent more daily texts, and participants who reported better diabetes care on the DBRS responded to a greater number of SMART Project text messages. Other demographic/medical variables were not related to text response rate.

DISCUSSION

Adolescents from diverse backgrounds who were interested in receiving T1D texts actively engaged with the SMART Project for a sustained period of time. Girls, frequent texters, and adolescents who perceive they manage their T1D well may be most likely to participate in similar programs. Implementation of these programs may lead to improved T1D health behaviors by helping adolescents remember to complete T1D care and providing T1D education.

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Regaining Control: An exploration of the medication adherence behaviors of hypertensive Black men

BACKGROUND

Medication Adherence of Black men is among the lowest of all ethnicities, regardless of income or race1, 2. Controlled blood pressure is considered a systolic blood pressure of <140mmg and a diastolic blood pressure of <90mmg3. Patients who adhere to their hypertension treatment plan are 3 times more likely to have controlled blood pressure; reducing their risk for cardiovascular disease, hospitalization, kidney failure, and other life threatening ailments. Even though multiple treatment options for patients exist, according to a 2003-2004 survey only 37% of hypertensive patients had controlled high blood pressure4. Research focusing on hypertensive Black men's medication adherence is limited; however, there is a growing body of literature exploring this population's medication adherence. These studies have explored factors that hinder medication adherence have focused on psychosocial stressors and behavioral barriers. This study will expand upon existing knowledge by exploring barriers and facilitators to medication adherence, and their applicability to existing behavior change models.

OBJECTIVE

This study seeks to explore the influence of psychosocial, behavioral, and structural factors that influence medication adherence of hypertensive Black men.

METHODS

This study is a mixed methods analysis of secondary data and individual interviews of self-identified hypertensive Black men (97%) enrolled in the Hair, Heart, and Health program (n=41). Participants were recruited at 4 barbershops in Washington, DC and inclusion criteria included 1) hypertension diagnosis, and 2) taking high blood pressure medication. Participants completed quarterly visits where they received a blood pressure screen and were administered the Morisky medication adherence scale, totaling 102 participant observations. Time series regression analysis of dependent variables: 1) level of medication adherence as determined by Morisky scale score and 2) blood pressure ranges. Qualitative analysis of individual interviews will be used to further explore quantitative findings, highlighting significant psychosocial, behavioral, and structural barriers and facilitators to medication adherence. Data will be analyzed using SPSS and Atlas.ti.

RESULTS TO DATE

Quantitative data analysis is currently underway and qualitative data collection will begin in the coming weeks. Preliminary results show with the average self-reported adherence as "moderate" (scale score 1-2). Additionally, Pearson's correlation shows a linear relationship (p=.001) between secondary diagnosis of high cholesterol and medication adherence score.

CONCLUSIONS

Exploring the medication adherence behavior of hypertensive Black men, modifiable barriers and facilitators may be identified. These findings could benefit the Hair, Heart, and Health program by recognizing programmatic opportunities that can better support patient medication adherence to control blood pressure.

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Development of an Anatomically Difficult Airway Mannikin

INTRODUCTION

Physicians initially learn the tracheal intubation procedure using mannikins that replicate nominal anatomy and the diseased airway. Current mannikins, however, do not represent common anatomic variants that can increase intubation difficulty. We have adapted an existing mannikin1 to model an anatomically difficult airway.

METHODS

Lower jaw length, laryngeal position, and degree of obesity were adapted. We hypothesize that adjusting this anatomy will help to develop a mannikin that reflects clinically difficult-to-intubate patients. A shortened thyromental distance (TMD), influenced by the length of the mandible or the location of the larynx, restricts access to the airway2. To simulate patients with short jaws, we created interchangeable mandibles3 with variable ramus lengths. Anterior laryngeal placement reduces the angle between the oral and laryngeal axes and impedes visualization of the vocal cords. We implemented a variable length connector between the thyroid cartilage and mentum, which displaces the larynx anteriorly. Finally, we simulated the effect of obesity on body and head positions. Excess posterior fat lifts the pelvis and tilts the trunk, while dorsocervical fat limits head extension. A metal bracket was constructed to apply this body habitus to the mannikin

RESULTS

In the AP plane, the original jaw measures 5.5 inches; the shortest jaw is 4.5 inches. Mouth opening was measured between planes that extend anteriorly from the top and bottom sets of teeth when the mouth is opened. The original jaw opens 1.5 inches; the smallest jaw opens 1 inch. Measurements for TMD and oral-laryngeal axes angles were taken with and without the variable length connector. Attaching the connector to the original jaw pulls the larynx anteriorly, reduces the TMD by 1.5 inches and decreases the oral-laryngeal axes angle by 20˚. Utilizing the connector with the smallest jaw shortens the TMD by .25 inches and narrows the oral-laryngeal axes angle by 10˚. The metal bracket provides 1 inch of elevation and tilts the torso 15˚.

CONCLUSION

We have created a mannikin with anatomic adjustments that simulate a less favorable airway for intubation. Anatomic, rather than pathologic, variables fill a gap in the existing training toolkit.

Learners may practice pre-intubation assessment of TMD, mouth opening and body habitus, as well as intubation skills. We expect that learners will become better prepared to manage difficult airways. Preliminary evaluations of this adapted mannikin suggest that it will be a valuable asset to current simulation practice.

REFERENCES AND EXISTING MANNIKIN PRODUCTS

1. Laerdal Airway Management Trainer (Item Number: 25000033)

2. Chestnut D, Polley L, Tsen L, Wong C: Obstetric anesthesia principles and practice, 4th edition. Philadelphia, Mosby, 2009, pp 657-8.

3. Laerdal Little Anne Jaw Assembly (Item Number: 020201)

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Radiologist Orders versus Scanner Steps: Reconciling MRI Protocols to Reduce Unnecessary Imaging

BACKGROUND

The Accreditation Council for Graduate Medical Education (ACGME) has indicated the need to incorporate Quality Improvement (QI) initiatives into medical education for the purpose of enhancing understanding of the medical system and ensuring patient safety. This QI project was initiated after radiologists at Children's National Medical Center (CNMC) noted that certain views for several musculoskeletal (MSK) sequences were not being performed despite being present in the radiologists' protocol ordering set.

PURPOSE

Radiologists may prescribe an MRI protocol from the radiology information system (RIS) or other system. MRI technologists then enter those sequences onto the MRI console where the exam is being performed or choose a protocol from a pre-existing menu on the scanner. Discrepancies between protocols in the RIS and on the scanners can lead to inappropriate sequences being performed, increased exam times, and non-diagnostic scans. The purpose of this quality project was to quantify and reduce the amount of mismatched MSK MRI protocols between the RIS and MRI consoles.

METHODS

All MSK MRI protocols were exported from both the RIS (Centricity, GE) and one of the MRI consoles in a tertiary care academic pediatric hospital. All protocols that had an MSK identifier (ie – Limb, Wrist, Joint, Elbow, Shoulder, Pelvis, Limb, Hip, Knee, Ankle or Foot) within their main descriptions were included. Spine protocols were excluded. Protocols from the RIS were compared manually with associated scanner protocols to identify possible discrepancies at the overall protocol level (ie – multiple scanner protocols that matched the description of a single centricity choice,) and individual sequence level (ie - T1 vs T2). Protocols in the RIS from which the radiologists prescribed the protocols were considered the reference standard. As steps identified in Centricity were considered the standard when determining mismatches, differences or omissions within the scanner steps were considered discrepant. Additional scanner options not listed in the RIS were not counted as such. Discrepancy information was used to inform an ongoing quality improvement program in which MSK MRI protocols were continually reviewed with the lead MRI technologist in an effort to minimize discrepancies between radiologist prescribed protocols and protocols performed on the scanners. Protocols were reviewed on a weekly basis along with the development of an educational program for MRI technologists.

RESULTS

There were a total of 30 unique protocols that we identified within the searches; 35 RIS protocol options were identified from the manual search and 44 scanner protocol options were exported from the scanner. When matched by name and/or specific description, there was a match rate of 17/30 (56.7%). 5/35 (14.3%) of the RIS protocols and 11/44 (25%) of the scanner protocols had more than one possible option to choose from for a given protocol name/description. Of the 17 protocols that had matching Centricity and scanner descriptions, only six (35.3%) had completely identical steps in both systems. The remaining 11 protocols had steps that matched from 57% - 89% of the time.

CONCLUSION

MRI protocols which are managed on disparate information systems including the scanners themselves lead to separate silos of protocol definitions. This increases the potential for inappropriate sequences, non-contributory scanning, and non-diagnostic scans. Targeted efforts by radiologists and technologists to reconcile such differences can reduce this discrepancy rate. Ongoing reviews of scanner and RIS information allow radiologists and MR technologists an opportunity to discuss the most effective protocol techniques, especially as newer sequences continue to be added to our imaging repertoire.

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Improving Practice of Medicine (POM) Communication Scores

BACKGROUND

The George Washington University School of Medicine and Health Sciences introduces students to patient interaction skills early in their education through the Practice of Medicine Course (POM). At the conclusion of each year of the POM course, students are graded through a written exam, subjective mentor evaluations, and a Standardized Patient (SP) exam. During the SP exam, student grades are based on their overall communication, history taking, and physical exam skills by a standardized patient. To increase their exposure to actual patients in the clinical setting, and apply the principles of psychosocial medicine learned in the POM course, students are offered a volunteer opportunity at the HEALing Clinic.This clinic provides health services to culturally diverse and underserved populations residing in Washington, DC. It operates in partnership with GW's medical students, faculty, and two existing clinics, Bread for the City in the Shaw neighborhood, and Family Medical and Counseling Services in the Anacostia neighborhood.

OBJECTIVE

To measure the impact of HEALing Clinic volunteerism on POM exam grades between first and second year medical students.

METHODS

Students from the graduating class of 2013 (n=144), were divided into four groups for both their first year in medical school (MS1) and second year in medical school (MS2):

A. Students who did not sign up to volunteer.
B. Students who signed up but were not randomly selected for one of the available spots.
C. Students who volunteered on a single night as an alternate.
D. Students who volunteered for a full four week shift.

Independent sample t-tests and regression were employed to analyze differences in volunteer status from MS1 to MS2 for Communication, History Taking, and Physical Exam Skill test grades.

The dependent variable was the change in scores between MS1 and MS2 while the independent variable was an increase in volunteer hours, a decrease in volunteer hours or no change in volunteer hours between MS1 and MS2.

RESULTS

Students who had any increase in volunteerism at the HEALing clinic improved their Communication scores from MS1 to MS2 (+ 7 percentage points) relative to those who volunteered the same or less (-2 percentage points). The 9 percentage point difference in grade change between the two groups was statistically significant (p=0.001).

CONCLUSION

Increased volunteerism at the Healing clinic improved POM communication scores. It is possible that these improved scores can be extrapolated to overall communication skills.

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The Junior Residents' Perspective of Learning in a Simulation-Based Otolaryngology Boot Camp

OUTCOME OBJECTIVES:

1. Determine what residents experience in an otolaryngology boot camp (OBC).
2. Understand how the individual resident's background influences learning.

METHODS

Using a qualitative phenomenological approach, investigators interviewed 36 junior otolaryngology residents who had participated in a one-day simulation-based OBC. The residents attended camps in Washington, DC (July 2012) or in London, Ontario (September 2012). A semi-structured interview of each resident was recorded and transcribed. Using Moustakas' analysis, the interviews were broken up into codes and clusters to create a codebook. To ensure trustworthiness of the qualitative data, investigators used upfront debriefing, investigator triangulation, epoche, reciprocal coding of transcripts, member checks, and thick, rich description.

RESULTS:

Five learning themes emerged during OBC:

1. Residents aim to gain knowledge and experience to positively affect their performance and patient outcomes.
2. Prior clinical experience and OBC's realistic scenarios influenced resident learning.
3. The residents valued their development of leadership and teamwork.
4. Residents actively learn by synthesis and application of their knowledge.
5. The faculty plays a critical role in the boot camp.

CONCLUSION

The ACGME has specific core requirements to improve resident performance and competency. To address this, innovative otolaryngology faculty has developed specialty specific boot camps, and quantitative research has documented the learners' performance gains. Using the residents' own words, this qualitative research study shows how residents learn and why residents benefit from attending a simulation-based otolaryngology boot camp. This research will help us better understand our learners and how we can improve their learning experience.

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Developing New Materials for Teaching and Learning the Risk of Deficiencies of Fat-Soluble Vitamins in Alcoholics

Standard textbooks and teaching materials used in Medical Biochemistry courses commonly inform medical students that alcoholics are most likely to have deficiencies of water-soluble vitamins but unlikely to have deficiencies of fat-soluble vitamins. However, this way of teaching is purely based on the water-solubility or fat-solubility of the vitamins and may not be true of real life alcoholics if one considers their life styles. We conducted a comprehensive research of the medical literature in the PubMed database about the status of fat-soluble vitamins of alcoholics in order to better teach and learn about the nutritional status of alcoholics. Our findings indicate that there is a large body of evidence to indicate that it is not uncommon to see deficiencies of fat-soluble vitamins in alcoholics in addition to deficiencies of water-soluble vitamins. Thus, our current way of teaching and learning the status of vitamins, especially the status of the fat-soluble vitamins, of alcoholics in the Medical Biochemistry course have serious shortcomings and deviates from reality; that is, alcoholics also develop deficiencies of fat-soluble vitamins that can result from insufficient dietary intake. Furthermore, it is important to teach and learn the status of fat-soluble vitamins in alcoholics in the context of real life situations.

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Are the components of the Kids to Health Careers Program uniformly incorporated?

BACKGROUND

Research shows that minority health providers disproportionately serve medically underserved communities and shows that underrepresented minorities are more likely to choose health care providers of their own ethnic and racial background. Thus increasing the diversity of the healthcare workforce has the potential to serve as a mechanism to ensure that medically underserved communities and minority populations receive proper healthcare. Kids 2 Health Careers (K2HC) is a program provided by the Capital City Area Health Education Center that supports students who aspire to become health care professionals by providing individualized mentoring, job preparation, and college prep. K2HC utilizes a "3H" approach curriculum that teaches healthy life skills, healthy choices, and health careers

OBJECTIVE

To examine if the components of the 3H curriculum of the K2HC program are uniformly incorporated throughout the program via the use of a post-program evaluation that assesses the change in knowledge of the scholars.

METHODS

The scholars of the K2HC program were provided a post-program survey that allowed them to rate their change in knowledge about the 3Hs: health careers, healthy life skills, and healthy choices. The scores were used as a means to measure the level of exposure the students had to the different "3Hs". The mentors of the program also completed a post program survey.

RESULTS

The responses of the scholars were converted into rating scores. There was a +1.15 increase in rating score for health careers, +0.775 increase for healthy skills, and +0.6125 increase for healthy choices. The results of the survey demonstrate that the greatest increase in knowledge was seen with health careers, followed by healthy skills, and then healthy choices. The results of the mentor evaluation displayed that overall the mentors expressed that they thought that the curriculum effectively promoted the 3Hs, but expressed that there were parts of the curriculum that needed to be expanded.

CONCLUSION

K2HC strives to expose students to the health care field through the use of a "3H" approach curriculum; health careers, healthy life skills, and healthy choices. The results showed that the knowledge increase wasn't equivalent across the 3Hs; rather the scholars expressed a larger change in their knowledge of health careers. The study doesn't however provide insight as to why there's a difference. Understanding why is paramount to making the necessary adjustments to provide a well-rounded curriculum that will shape our scholars into well-rounded students on their way to becoming health professionals.

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Personal and advice network factors associated with human papillomavirus vaccine (HPV) refusal among African American parents

BACKGROUND

The HPV vaccine is grossly underutilized with completion rates for the recommended 3 dose vaccination series of only 29.1% and 23.1% for Caucasians and African Americans respectively. It is unknown which personal and network factors are associated with parental refusal of HPV vaccination on behalf of their children.

OBJECTIVES

To uncover personal and advice network factors associated with African-American parental vaccine decision-making regarding HPV vaccine on behalf of their children.

METHODS

We recruited 219 parents of patients aged 10-12 from the Child and Adolescent Health Centers at Children's National Health System who had never received the HPV vaccine and were offered it at that day's encounter. We administered an oral survey to assess demographics, degree to which participants self-identified with their ethnic background, characteristics of the participants' social networks, and participants' perceptions of the health encounter. Lastly, we reviewed the child's medical record to determine parental vaccination decision. Associations between dependent variables and HPV vaccination refusal were determined using t-tests and x^2 tests.

RESULTS

Overall, 47.0% of our participants refused HPV vaccine. Age of the child was associated with parental HPV vaccine refusal; 67.3% of 11 year olds received the HPV vaccine vs. 46.7% and 24.3% of 12 and 10 year olds, respectively ($p<0.001$). Lower sense of ethnic group self-identification was associated with lower acceptance of HPV vaccination (3.15 vs. 3.29 on a 4-point Likert scale, $p<0.05$). We did not find a significant association between HPV vaccination decision and either the total number of network associates or the number of associates providing vaccine advice. The level of trust in the provider was significantly associated with HPV vaccination decision-making. Participants who reported less trust in their providers were less likely to accept the HPV vaccine (9.3 versus 8.7 on a 10-point scale, $p<0.05$). Finally, the strength of the provider's recommendation for HPV vaccination was associated with HPV vaccine refusal by those who received less emphatic recommendations (2.06 vs. 2.36 on a 10-point scale, $p < 0.05$).

CONCLUSIONS:

Parental HPV vaccine refusal is likely multi-factorial. At play are the child's age, the level of connection a parent feels with his or her ethnic group, and aspects of the doctor-patient interaction. Further analysis may demonstrate whether and how ethnic group belonging may mediate or moderate the effect of specific vaccine advice network factors on vaccination behavior.

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

Prematriculation Program at GWU SMHS

The George Washington University School of Medicine and Health Sciences (GWU SMHS) held its first prematriculation summer program during July 2013. A select group of nontraditional students completed this program before matriculating to their first year of medical school. This was created as an alternative to the school's previous decelerated 5-year medical program. GWU SMHS will no longer have the 5-year program with the implementation of a revised curriculum in 2014. Therefore, two rising MSII students and members of GWU SMHS Medical Education Leadership Track, Mack Goldberg and Samantha Margulies, created the 1-month summer prematriculation program under Dean Haywood's supervision. While the composition of selected students remained the same as those selected for the 5-year program, the mission of this piloted program encompassed the following areas: general preparation for the pace and depth of medical studies, mentorship oriented to medical students, exposure to clinically relevant extracurricular activities, and introduction of basic science course material from the first semester. In particular, students were evaluated in Gross Anatomy and Embryology (combined subjects), Micro Anatomy, and Neuro Anatomy at the end of each week with individual and group exams (written and practical formats). Supplementing the basic sciences, Mack and Samantha conducted peer counseling, focus groups, clinical reasoning and study skills workshops, guest lecturing, and interdisciplinary field trips around Washington, DC. Students provided weekly anonymous feedback to Mack and Samantha regarding the material presented, teaching style, and program, which allowed for appropriate real-time adjustments in teaching approach and content. The teaching principles Mack and Samantha implemented during the program stemmed from their experience in the track program. To clarify, the Medical Education Leadership Track is a longitudinal extracurricular program wherein medical students partake in monthly lectures on Adult Learning Theory, learn about multimedia technology in teaching, and analyze medical education research. The track also offers hands-on teaching experiences through summer experiences elected by each student. In the context of the numerous existing medical school prematriculation programs, the piloted GWU SMHS program's use of Medical Education Leadership Track-trained students as primary lecturers, out-of-classroom/multidisciplinary experiences, and rising MS2 colleagues as guest lecturers make this program unique overall among others implemented across the country.

STATUS

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

An innovative approach to teaching emergency genitourinary procedures

INTRODUCTION

Male genitourinary procedures within EM physicians' scope of practice are limited in number and relatively simple to perform. However, residents often have insufficient clinical exposure to GU pathology, resulting in a high degree of anxiety about performing a procedure in a sensitive area. We describe a simulation model designed to help trainees master techniques and increase confidence in treating two genitourinary emergencies

OBJECTIVES

Increase skill and confidence in performing
- Paraphimosis reduction
- Penile dorsal nerve and ring blocks
- Corpus cavernosum aspiration & intracavernosal injection

DESIGN

EM physicians collaborated with simulation center staff to create two models of male genitalia. A penis mold was created using a cardboard and clay shell with a mold-max silicone rubber wall. The mold was filled with a small plastic core surrounded by silicone. After the silicone cured, the plastic core was removed leaving a hollow cavity in the final simulators. In the priapism simulator, artificial blood was injected into the core, causing swelling and purple discoloration of the silicone. The "erection" could then be drained via cavernosal aspiration. In the paraphimosis simulator, a silicone foreskin was connected to the hollow core, allowing for injection of saline to create edematous foreskin. Sufficient manual pressure decreased edema allowing for paraphimosis reduction. Dorsal slit technique was reviewed but not performed as the foreskin could not be re-used if cut. Self-sealing silicone mimicked skin; both models were attached to full body simulators.

EFFECTIVENESS

23 residents (PGY1-4) used the simulators. 52% of residents had never performed any of these procedures; no resident had performed them more than 3 times. 91% and 84% (respectively) of residents felt that the priapism and paraphimosis simulators appeared realistic. All residents reported they would feel more comfortable performing these procedures after this session.

STATUS

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

A Medical School Without Faculty: A Survey of Available Resources to Assist in Curriculum Development

BACKGROUND

There is a critical shortage of faculty available to teach and train medical students in the developing countries of the world and this faculty shortage is the major barrier to creating the human resources needed for improved global health. The Medical Education Partnership Initiative (MEPI) was created by the US Government (PEPFAR, NIH, HRSA) to increase the capacity and quality of African medical education and improve retention of medical graduates. Research from MEPI has determined that efforts are needed to increase the number of teaching faculty in these countries and to find ways to deliver the required curriculum in innovative and cost-effective ways.

OBJECTIVES

To collect, catalog and evaluate available e-learning curricular resources for medical schools. Specifically, to evaluate how available educational resources would function in, and their usefulness to, medical schools with limited resources in sub-Saharan African.

METHODS

Online resources readily available by search engines were compiled. An evaluation rubric was developed to evaluate each e-learning resource according to its cost, appropriateness for African culture and patient population, required technological infrastructure, website loading speed, time demands on faculty, learning value, and comprehensiveness of content. Depending on the stated data collected, each resource was given a recommendation from 1 to 4 (where 4 means highly recommended).

RESULTS

A total of 268 online resources were evaluated covering 19 traditional medical school courses (e.g. anatomy, pediatrics). For each subject area an average of 15 online resources were found, with an average of 2 resources receiving a recommendation of "4."

CONCLUSIONS

We were able to provide recommendations for 268 existing educational resources that can substitute for faculty-lead classroom experiences. This is an ongoing project, and the course evaluations are being compiled on a website and made available to African medical faculty. What is most important is that we have established a comprehensive rubric to guide medical school deans and faculty in the developing world so they can rate and compare the usefulness of these new resources for their students.

STATUS

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

Exploiting User Data to Drive a Website Redesign

BACKGROUND

One of the most challenging aspects of redesigning an organization's website is balancing the needs of existing users while optimizing the experience for future users. This balance is especially crucial in academia where new users arrive every semester and may remain for anywhere from a year to a decade or more. When faced with the task of redesigning its website, GW's Himmelfarb Health Sciences Library conducted extensive user research in an attempt to design a site that preserved the positive aspects of the experience of existing users while improving their experience and reducing the learning curve for new users.

METHODS

- In the late fall 2012, Himmelfarb made enhancements to its existing Google Analytics setup to provide more in-depth information regarding how users interact with its website.
- The library distributed a 16 question survey asking faculty and students in the Schools of Medicine & Health Sciences, Public Health & Health Services, and Nursing to critique the library's website.
- Himmelfarb staff administered in-person usability tests of the new website with students and faculty.

RESULTS

The raw data provided by Google Analytics was useful in allowing Himmelfarb Library to determine the most and least used portions of its website and also provided insight into the navigation paths of users. Results of the survey, completed by 150 users, provided additional information that mere numbers could not. Among other things, the survey allowed Himmelfarb to differentiate between portions of the website that were not used because they were hard to find and those found not useful by users, and also to identify content that users desired to be added to the website. Finally, in-person usability tests ensured that existing users still found the website useful and that their positive user experience remained intact and in many cases improved with the new site.

CONCLUSION

Himmelfarb launched its new website January 2, 2014 so feedback has been sparse but generally positive. Use of key information resources has increased up to 80% since the launch of the new website when compared to the old website over the same length of time. Overall, it seems that library was able to preserve the positive user experience for existing patrons. Further assessment is planned for the fall 2014 semester when a large group of new users will be available.

STATUS

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Developing a Hybrid Course: On-line and On-campus

STATUS

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BACKGROUND

Mobile Healthcare: Innovations in Telemedicine, is a course that investigates solutions to healthcare delivery challenges by focusing on the three pillars of health care reform: improving access, quality, and reducing costs. The course is presented in a multidisciplinary format examining fields such as Medicine, Engineering, Public Health, Business, and Law. The course began in 2011 when it was a one-week, intensive on-campus course. This past summer, the course was transformed into a hybrid course with five weeks of online coursework and three days of on-campus learning. It was moved online to allow individuals to attend the course while continuing their degrees and careers. Prior to launching this new format, a Blackboard course was designed, lectures pre-recorded, and assignments and grading rubrics were created.

OBJECTIVES

To obtain an understanding of the benefits and challenges of transforming a course from the traditional setting to a hybrid course. To enable students to enroll in the course from various fields of study. Lastly, to determine if the hybrid course would be as successful as the traditional course.

METHODS

Surveys were completed by students following each lecture to determine the effectiveness of the speaker, clarity of objectives, and application of the lecture to telemedicine. Subjective data was collected on the overall functioning of the course on Blackboard and the students' responses to the course; i.e. were the students participating in the discussion boards. Upon completion of the course, each student completed an IRB approved survey. This same survey was also completed in 2012.

RESULTS

Fewer students signed up for the course (18 students versus 31) in 2013 than did in 2012. In comparison to 2012, students hailed from a wider variety of fields. The post-course survey indicated that 89% of the students from 2012 would recommend the course, compared to 92% in 2013.

CONCLUSIONS

Adaption of the course to the hybrid format was successful as indicated by students' willingness to recommend the course. Student enrollment was down, perhaps due to scheduling issues during registration, but diversity was increased. While initially difficult to migrate the course online, the benefits far outweighed challenges. Through observation, discussion boards showed meaningful engagement and submitted assignments and final projects were consistent with academic expectations. Surveys support that students' expectations were met and they were likely to participate in a hybrid course again. Mobile Healthcare: Innovations in Telemedicine will continue as an online/on-campus hybrid course for this summer 2014 session.

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Assessing Medical Student Passenger Flight Safety Awareness

BACKGROUND

Airline crashes such as the Asiana Airlines crash in San Francisco in July 2013 remind the flying public of the potential dangers of commercial air travel. A prior study performed in Asia noted that only 69% of the passengers watched the crew safety briefing and only 39% read the safety information card.

OBJECTIVES

This study assesses the flight safety awareness of medical students, a population which typically flies often.

METHODS

After Institutional Review Board review, all medical students at The George Washington University School of Medicine and Health Sciences were invited to participate in an online questionnaire in the Winter of 2013.

RESULTS

155 of 700 medical students participated, of which 149 noted that they have taken at least 1 flight in the last 12 months. Only 50% of medical students felt at least aware of flight safety instructions. 70% of students noted that they either never or rarely pay attention to the crew safety briefing, while 75% do not read the safety information card. Out of 14 students who noted that they are not aware of flight safety at all, only 5 read the safety card and all but one either rarely or never pays attention to the safety briefing. 61% felt that new FAA rules allowing electronic devices throughout the flight will make it even less likely that they will pay attention to safety information. 93% of students always keep their seatbelts fastened when seated. 54% felt safer in a plane than in an automobile. Finally, about 50% of students felt that they would be able to provide medical care in case of an in-flight emergency, with 75% indicating that they are a 3rd or 4th year medical student.

CONCLUSIONS

Although most respondents flew recently, a majority of students do not feel that they understand aviation safety, yet also do not take steps to help familiarize themselves with safety such as listening to the flight crew safety briefing or reading the safety information card. This is in contrast to Asian studies, showing more attention to these safety measures.

STATUS

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

Parents' and Physicians' Perceptions and Understanding of the Informed Consent Process for Procedures in the Pediatric Emergency Department

BACKGROUND

In the Pediatric Emergency Department (PED), obtaining informed consent (IC) is challenged by the urgency of procedures. There are currently no published reports studying parents' and physicians' perception and understanding of this process.

OBJECTIVE

A pilot study looking for themes and patterns in parents' and physicians' perceptions and understanding of the IC process in a PED.

METHODS

We studied a convenience sample of parents and physicians of patients 0-7 years of age, who underwent a procedure requiring IC at Children's National Medical Center PED. Parents' data was collected via semi-structured interviews and physicians' data via structured written questionnaires.

RESULTS

We recruited 14 parent and physician pairs. Parents' mean age was 33 years old; were equally distributed between races; 64% had at the least a college degree. 64% had previously experienced an IC process; and half expected the procedure to be performed. Half of the physicians were Pediatric Emergency Medicine trained and half were residents in training (Pediatrics and Emergency Medicine); 69% of the physicians who did the IC also did the procedure. Parents' most mentioned positive perceptions were that: the IC process went well; was important; with good physician interaction that used clear wording; and all concerns were well addressed. Parents' most mentioned negative perceptions were that: the parent was stressed; the consent form was too long and they pretended reading it; parents preferred verbal and written information together; and did not like it when the procedure was performed by a resident in training. All parents knew why the procedure was performed, and gave the same reason as the physician did. However, only 54% listed the same benefits as the physician did; and 15% listed the same risks and alternatives. Yet, using likert scales, 33% of parents reported better understanding of the information provided to them than the paired physician who did the IC had anticipated, 8% less understanding, and the rest (58%) were in agreement, reporting excellent understanding. It is noteworthy that 23% of the physicians did not list any alternatives to the procedure offered.

CONCLUSION

Overall, the IC process appears to be well perceived by the parents in the PED. However, the above information will allow us to focus on specific areas to improve on such as the consent form, parental understanding of the information provided by the physician and physician education.

STATUS

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A Medical School Without Faculty: A Survey of Available Resources to Assist in Curriculum Development

BACKGROUND

There is a critical shortage of faculty available to teach and train medical students in the developing countries of the world and this faculty shortage is the major barrier to creating the human resources needed for improved global health The Medical Education Partnership Initiative (MEPI) was created by the US Government (PEPFAR, NIH, HRSA) to promote partnerships between medical schools in the United States and Sub-Saharan Africa. Research from MEPI has determined that efforts are needed to increase the number of teaching faculty in these countries and to find ways to deliver the required curriculum in innovative and cost-effective ways.

OBJECTIVES

To collect, catalog and evaluate available e-learning curricular resources for medical schools of developing countries.Specifically, to evaluate how available educational resources would function in, and their usefulness to, medical schools with limited resources in Sub-Saharan African.

METHODS

Online resources readily available by search engines were compiled. An evaluation rubric was developed to evaluate each e-learning resource according to its cost, appropriateness for African culture and patient population, required technological infrastructure, website loading speed, time demands on faculty, learning value, and comprehensiveness of content. Depending on the stated data collected, each resource was given a recommendation from 1 to 4 (where 4 means highly recommended).

RESULTS

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

Incivility in Academic Medicine: A Review of the Literature in North America

BACKGROUND

Bullying, incivility and abuse has become a topic of heightened & timely concern. Bullying in the school setting, sports and the workplace have been explored to varying degrees. What is unexplored is the culture of abuse and incivility within the medical education system.

OBJECTIVE

To review the literature involving United States and Canadian medicine to determine the prevalence and effects of bullying behavior and incivility across the continuum of education.

METHODS

We used the following search engines: SCOPUS, PubMed, PsychInfo. Key words included medical education, bullying, the hidden curriculum, abusive and disruptive behavior, demeaning behavior, harassment, sexual harassment, humiliation, mistreatment, incivility and professionalism. We assessed articles for the target of bullying, the perpetrator, the personal effects, the setting, and the impact on the culture.

RESULTS

Our review of the medical education literature revealed 16 studies that have addressed incivility and abuse. Eight of the studies identified medical students as targets, while five focused on residents as victims. Three studies found that team members, regardless of their status, were at risk of being mistreated. The perpetrators were described to be attending physicians and clinical faculty in 13 of the studies. Residents were the source of incivilities in seven studies, and other team members, such as nurses or anesthesiologists, were labeled in six studies. These incivilities ranged from harsh criticisms to sexual and racial harassment and resulted in poor patient outcomes, higher stress, and increased medical student and physician burnout and substance abuse.

CONCLUSIONS

1) The real incidence and causes of incivility and bullying remain unknown, as the culture of medicine has not promoted scholarly studies to assess the problem. 2) The AAMC graduation questionnaire has documented the incidence of student mistreatment retrospectively. 3) The terminology in the literature contributes to a potential fragmented look at the problem. 4) The impact of incivility/bullying is significant for academic institutions and its employees, including job dissatisfaction, psychological implications, effects on interpersonal relationships and termination of faculty.

STATUS

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Student Perception of Premedical Coursework in the Anatomical Sciences

OBJECTIVE

To assess the motivations of students taking undergraduate anatomy courses, whether their perceptions of this discipline changed throughout the semester, and whether this changed perception affected their future career choices.

BACKGROUND

It is common to assume that students take upper-level undergraduate anatomy courses in an effort to excel in post-graduate work in health science fields. Previous research has reinforced this assumption, showing that students understand the importance of undergraduate anatomy courses in relation to potential future clinical work. While this initial assumption provides a reason students may desire to enroll in undergraduate anatomy courses, a research study directly questioning the motivation behind students enrolling in such courses was never conducted.

METHODS

A sample size of 150 students was recruited from four specific undergraduate anatomy courses held at George Washington University to participate in this study. The students initially received an e-mail describing the nature and purpose of the study. Participants were asked to respond to two online surveys, one at the beginning (pre-course) and one at the end (post-course) of the course. Pre-course questions assessed the students' motivations and expectations of the class, while post-course questions assessed if the students' perception of the class had changed. The anonymous data collected from these surveys was displayed using appropriate tables, charts, and graphs.

RESULTS

Forty-seven students responded to the pre-class survey while twenty-five students responded to the post-class survey. Analyses from the pre-course survey revealed that 79% of respondents enrolled in preparation for a career in the health sciences. Results from the second questionnaire indicated that all students gained a greater understanding of the relevant topics. Importantly, after completing the course, 80% of the respondents felt that their course was an impetus to pursue a career in health sciences.

CONCLUSION

Our results indicate that George Washington University undergraduate students use anatomy courses as a standard for excelling in post-graduate work. Moreover, they are not deterred, but rather inspired to continue with educational pursuits.

STATUS

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

We are patients too: how integrative medicine can improve medical student wellness.

Clinical research shows that the stress of medical school often allows students to lose many things they love along the path towards becoming a doctor. Students do not have time for activities that improve their well-being. My objective as a summer intern at the Center for Integrative Medicine (CIM) of the University of Pittsburgh was to learn about Integrative Medicine (IM) modalities in order to modify them and make them accessible to myself and my fellow medical students. I wanted to learn the pragmatic aspects of providing complementary care. IM offers varied medical treatments to patients in a collaborative and unified system.

I worked with most of the providers at the clinic in order to learn about their modality of healing and how the different practices are used to offer the best patient care. While shadowing the practitioners, I listened to patients and learned how they use IM techniques to strive towards wellness. I attended weekly lectures on IM practices like pilates, yoga, mindfulness, meditation, and research techniques. I used PubMed to find studies on medical-student-wellness. Through this summer experience of shadowing, lectures, research, and reflection, I gained a deeper understanding of how I can practice medicine in a more holistic manner and how I can begin to live the lessons that I will teach my future patients.

By listening to patient stories and reflecting on my own experience as a medical student through reading, meditation, and painting, I have come up with a few techniques that I believe can be of service to others. IM treatment modalities are important and helpful for patients suffering from stress, anxiety, depression, pain, and chronic illness. Through a collaborative and team-oriented approach, an integrative medicine center offers patients a wide variety of care that encompasses many aspects of their medical needs, including diet counseling, physical training, and spiritual and emotional support. This commitment to total wellness can be applied to medical student wellness, too. Clinical research shows that physicians are better healers when they feel personally fulfilled and "well". As a medical student, I aim to include exercise, mindfulness, meditation, creativity, and social interactions into my medical training and life so that my heart, soul, and body are developed along with my mind. I am using what I learned this summer to develop activities through the Medical Students for Community Wellness to offer students the opportunity to find spiritual, emotional, and social wellness.

STATUS

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

Improving Anatomical Knowledge Retention in Medical Students entering the Surgery and Obstetrics and Gynecology Clinical Rotations by Nesting Interactive Modules

BACKGROUND

It is well documented in the medical education literature that students retain minimal anatomy knowledge when transitioning from pre-clinical didactics to clinical application on the wards. In a previous study at our own institution we were able to quantify this knowledge deficit in students on surgical clerkships, specifically surgery and obstetrics and gynecology (OB/GYN). Using our previous data, we designed an integrated, nested clinical teaching model utilizing e-modules to review clinically relevant surgical anatomy during their clinical rotations.

OBJECTIVE

The goal of this study is to evaluate the impact of a newly designed method of teaching clinically relevant anatomy to medical students on surgical rotations. The surgery curriculum will implement and evaluate the use of interactive e-modules. The OB/GYN curriculum will combine the use of interactive e-modules and hands-on anatomy laboratory sessions.

METHODS

Quantitative and qualitative methods were used to assess the retention of students' anatomical knowledge before and after they completed the nested modules. Using principles of adult learning and instructional design, two educational models were built and nested into the curriculum. The first model consists of e-modules highlighting clinically relevant anatomical topics such as biliary anatomy/cholecystectomy for surgery, and uterine anatomy/hysterectomy for OB/GYN. These modules include an assessment of baseline knowledge, an interactive learning session and post-activity evaluations. The second model, only used in the OB/GYN clerkship, consists of hands-on gross lab sessions reflecting the content of the e-modules, with model building and practice of clinical techniques. We are currently evaluating their effectiveness at our institution by using multiple choice testing and subjective surveys.

RESULTS

Data from the pre-tests continue to show a need to close the anatomical knowledge gap found in third year medical students. Students entering their surgery clerkship answered 47%, 54%, and 63% of multiple choice questions correctly concerning bone, inguinal, and abdominal anatomy, respectively. The average total score on the surgery clerkship test consisting of questions on a variety of anatomic topics was 62.67%. Average multiple choice scores on the OB/GYN clerkship were similar with students answering 54.5% of questions on varied anatomic topics correctly. Post-intervention scores increased significantly for OB/GYN students, averaging 74.8% of questions correctly answered ($p<0.0001$).

CONCLUSIONS

Although promising, more data needs to be gathered to prove success of our nesting intervention. We also plan to conduct a multi-centered study to further demonstrate that using this nesting technique improves clinically-relevant anatomical knowledge in adult learners.

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ENVIRONMENTAL SCIENCE

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Adoption of Renewable Energy Innovations in the Cement Industry – A Qualitative Approach

INTRODUCTION

Climate change mitigation is a high priority internationally, but motivating industries to reduce greenhouse gas emissions is a formidable challenge. This research investigates barriers and catalysts of the diffusion, adoption and acceptability of renewable energy technologies and solar cement in the cement industry. Diffusion of Innovation (DOI) Theory and other energy/technology adoption frameworks are used to evaluate factors influencing the cement industry's decision-making process.

METHODS

A qualitative approach was used to collect data through interviews with representatives of key stakeholder groups including cement companies, industry trade associations, engineering design firms, government agencies, non-governmental organizations (NGOs) and academia, and through review of industry annual sustainability reports.

RESULTS

Data show social, technical, environmental, economic and regulatory (STEER) factors are important in explaining adoption of new technologies. Social factors, relating to a particular company's attitudes, approaches fostered by managers, the actions of individuals internal and external to a company, and social networks were found to play an important role. Study participants also confirmed the expected roles of economic and technical factors, as well as institutional factors, relating to regulations, policies and standards set by government and NGOs in adoption.

DISCUSSION

Socio-technic theories remain relevant in explaining the role of STEER Factors in the diffusion, adoption and acceptability process for new, innovative, renewable technologies. Based on factors that can restrict or promote acceptability of renewable technologies, this research suggests strategies for overcoming current barriers such as government mechanisms, working with managers, altering downstream demand, and changing attitudes within the industry.

STATUS

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MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Lifecycle Assessment of a Novel Green Technology for the Cement Industry

INTRODUCTION

Global greenhouse gases, especially rising carbon dioxide levels, pose a major threat to public health. Since cement-manufacturing releases 5-6% of worldwide carbon dioxide emissions, such industrial operations represent a potential avenue for significant reductions. The Solar Thermal Electrochemical Process (STEP), a novel technology developed at the George Washington University, offers a carbon dioxide-free option to produce lime for cement. However adopting and commercializing such a technology poses several risks and challenges. The current study aims to quantify the health, environmental and economic benefits over the lifecycle of the STEP Technology which has not previously been assessed.

METHODS

This research uses lifecycle assessment (LCA) techniques to generate process flow diagrams to illustrate a potential industrial application of the STEP technology, propose a scale-up model for the process and calculate initial lifecycle estimates.

RESULTS

The study describes an industrial application for an end-of-pipe solution for industrial carbon emissions and the initial industrial plant scale-up model indicates the need to consider real-world siting considerations and the available material resources. Preliminary lifecycle estimates suggest that using the STEP technology in comparison to current cement manufacturing methods will significantly reduce carbon dioxide emissions, lower the number of disability-adjusted life years (DALYs) and produce large amounts of graphite, a marketable co-product.

DISCUSSION

The results of this research are expected to help industry decision-makers, government regulators and other stakeholders by altering risk perception associated with commercializing the STEP technology and add public health into decision-making for adopting such novel technologies.

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ENVIRONMENTAL SCIENCE

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Urinary Organophosphate Metabolites and their relationship with Human Sperm Chromosomal Abnormalities

BACKGROUND

Reproductive problems are increasing among the US population. Researchers have been trying to characterize environmental exposures and their impacts on men's reproductive health. The role of environmental contaminants, such as organophosphate pesticides, and their relationship to sperm abnormalities needs further evaluation.

OBJECTIVES

This research aims to understand environmental exposures to organophosphate (OP) pesticides and their association with altered frequency of chromosomal abnormalities (e.g., disomy) among adult men.

METHODS

A subset of 159 men from a study assessing the impact of environmental exposures on male reproductive health was used in this investigation. Men between 20-54 years of age, seeking an infertility evaluation from the Massachusetts General Hospital were eligible for the parent study (N=341). Participants provided urine and semen samples, and completed a self-administered questionnaire which collected information about medical history, demographic and lifestyle factors. Six urinary dialkyl phosphate (DAP) metabolites of OPs [dimethylphosphate (DMP); dimethylthiophosphate (DMTP); dimethyldithiophosphate (DMDTP); diethylphosphate (DEP); diethylthiophosphate (DETP); and diethyldithiophosphate (DEDTP)] were analyzed using high-performance liquid chromatography. Multiprobe fluorescence in situ hybridization for chromosomes X, Y, and 18 was used to determine XX18, YY18, XY18 and total disomy in sperm nuclei. Descriptive statistics were summarized for subject characteristics and outcome variables. Exposure variables were categorized into quartiles for most metabolites. Poisson regression was used to model the association between organophosphate exposures and disomy measures. Incidence rate ratios (IRRs) and confidence intervals were calculated for each adjusted model.

RESULTS

Most men were white (86%) and non-Hispanic (94%); only 7% were current smokers and 74% had never smoked. About 57% of the urinary samples were above the limit of detection (LOD) for DAP metabolites. In models adjusted for relevant covariates, increased disomy rates were observed for men in different exposure quartiles of DMTP, DMDTP, DEP and DETP when compared to men with exposure levels below the LOD. The highest disomy rate was observed for XX18 (IRR=1.50; 95% CI: 1.34, 1.67) for men with DMTP exposure levels (3rd quartile) when compared to men below the LOD. For DMP and DEDTP, inverse effects were observed for most disomy adjusted IRRs.

CONCLUSIONS

This is the first epidemiologic study to examine the relationship between environmental organophosphate exposures and sperm chromosomal disomy outcomes. These preliminary findings suggest that increased rates of disomy were associated with DMTP, DMDTP, DEP, and DETP exposure levels above the LOD. The results of this study will be used to inform additional pesticide analyses and future studies.

STATUS

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Dietary exposures to mercury and sex chromosome disomy in men from the Faroe Islands

BACKGROUND

Aneuploidy, or an incorrect number of chromosomes, is the most common form of chromosomal abnormality in humans, occurring when chromosome pairs fail to separate properly during cell division. Sex chromosome disomy is the most frequent aneuploidy found in human sperm. While most chromosomal abnormalities are lethal and result in pregnancy loss, some types may result in viable offspring with significant physical or mental health disabilities. Though the underlying causes of sperm sex chromosome disomy are not well understood, a limited number of studies have reported associations between exposures to environmental contaminants and increases in the frequency of sex chromosome disomy in human sperm. Individuals from the Faroe Islands have high exposures to environmental contaminants, including mercury, due to their consumption of traditional marine food such as blubber from pilot whales.

OBJECTIVES

This study will seek to evaluate the potential associations between dietary exposures to mercury and the frequency of sex chromosome disomy in Faroese men.

METHODS

Blood and semen samples were collected from 484 men in the general Faroese population born from 1981-1987. Blood samples were analyzed for total mercury by flow-injection cold-vapor atomic absorption spectrometry after digestion in a microwave oven. Semen analysis for concentration, motility and morphology was conducted by three technicians at the National Hospital (Rigshospitalet, RH) in Denmark. Disomy was assessed for 90 samples using fluorescence in-situ hybridization (FISH) with probes for chromosomes X, Y and 18. After imaging each sample using a wide-field fluorescence microscope, samples were scored using custom Matlab software that identified nuclei meeting inclusion criteria and signals contained within those nuclei. The software used a co-localization analysis to assess the frequency of three disomic conditions: XX18, YY18 and XY18.

RESULTS TO DATE

Preliminary assessment of the data shows that 76 subjects have complete exposure and outcome data available. The mean (standard deviation) percent disomy for each disomic condition were: XX18: 0.31(0.18); YY18: 0.30(0.18); XY18: 0.83(0.57); and total disomy: 1.44(0.83). Statistical analyses for this study will use Poisson regression to assess associations between exposure to mercury and the frequency of sex chromosome disomy, and will include covariates such as age, smoking status and abstinence time.

CONCLUSIONS

This study will be one of the first to assess whether dietary exposures to mercury are associated with sex chromosome disomy in human sperm.

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Occupational Health in the Construction of the New GW SPHHS Building

OBJECTIVE

Falls are one of the leading causes of workplace death, lost work time, and costs to industry, particularly in construction. The public health burden of falls is significant, as approximately 25% of nonfatal injuries and 38% of fatalities in the general construction industry are due to falls. The goal of this study is to develop an assessment tool to evaluate fall safety in general construction and to evaluate fall safety among five skilled construction trades (i.e. electricians, painters, carpenters, welders, and roofers) throughout different stages of a new building construction project. The project is the new School of Public Health and Health Services building at the George Washington University at Washington Circle in Foggy Bottom, Washington, DC, being built by the general contractor The Whiting-Turner Contracting Company.

METHODS

A comprehensive assessment instrument was developed through review of pre-existing assessment tools and modified according to Occupational Safety and Health Administration (OSHA) standards for general construction, validated through inter-rater reliability by a panel of experts (including the on-site safety superintendent), and tested for on-site usability through a two-week pilot study. Data were collected from April 2013 through February 2014 using the GW Audit of Fall Risk (GAFR) instrument by a master's-level researcher through routine observation of the construction site throughout the five construction phases (i.e. concrete pouring, skin, interior rough end, interior finishes, and roofing). Observed safety targets were organized in the GAFR assessment instrument into seven domains: general safety, guardrails, personal fall arrest, roof sheathing, scaffolding, aerial lifts, and ladders. Safety practices were scored dichotomously as to whether or not they were observed, and if observed, whether or not they met the definition of best safety practice (as noted in OSHA regulations).

RESULTS

Over 35 inspections of the building were completed during the observation period. Preliminary analyses demonstrate ironworkers and carpenters appear to be at highest risk for falls with the improper usage of mobile scaffolding and harnesses as the more frequent conditions putting these workers at risk for falls from heights.

CONCLUSIONS

Fall hazards in skilled trades have been understudied. This unique university-general contractor partnership capitalizes on the opportunity to ensure public health principles are being realized during construction. This presentation will include the application of the GAFR assessment instrument and the current results, highlighting the importance of observational assessment of worksites. Additionally, the lessons learned from the field assessments will also be discussed.

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Urinary Bisphenol A and Semen Quality, The LIFE Study

BACKGROUND

Bisphenol A (BPA) is a high-production industrial chemical used in epoxy resins and polycarbonate plastics. BPA is found in water bottles, baby bottles, reusable food and drink containers, and water supply pipe and food can liners. As BPA may leach from these products, dietary ingestion is considered the main route of exposure. BPA has demonstrated an ability to disrupt hormone-signaling systems. In rodent models and a small number of epidemiologic studies, BPA has been associated with sperm quality.

OBJECTIVES

To assess the relation between total urinary BPA concentrations and 35 semen quality parameters among reproductive aged men enrolled in the Longitudinal Investigation of Fertility and the Environment (LIFE) Study.

METHODS

501 couples from 16 counties in Michigan and Texas were enrolled upon discontinuing contraception for the purposes of becoming pregnant and followed for up to 12 months of attempting pregnancy. At enrollment, males provided a urine sample that was used to quantify total urinary BPA. Following two days of abstinence, males collected a baseline semen sample and a second sample approximately 1 month later.

Using established standard operating procedures and next-day analysis, 35 semen quality endpoints were assessed: 5 general parameters, 8 motility measures, 6 sperm head measures, 14 morphology measures, and 2 SCSA measures.

Comparison of men who did (n=473) and did not (n= 28) provide semen samples is under way as are descriptive analyses of various characteristics and semen quality, comparing men who did and did not have urine for analysis. These characteristics include abstinence time, age, alcohol consumption, BMI, creatinine, education, income, previously fathered pregnancy, race, serum cotinine, and study site. Unadjusted and adjusted linear regression models will be implemented to estimate the effect of BPA on each semen quality parameter. Mixed effects modeling will account for repeated measures of semen quality.

RESULTS TO DATE

In the LIFE Study, 501(100%) men provided baseline urine samples, although 62 (12%) samples did not have adequate volume for analysis. Initial semen samples were collected from 473 (94%) men with 378 (77%) men providing a second sample.

CONCLUSIONS

The LIFE Study will be the first to explore the association of urinary BPA concentration and semen quality among men from the U.S. general population, or those not recruited from clinical settings. It will also be the most inclusive analysis of semen quality conducted to date, allowing for a thorough assessment of BPA exposure and male fecundity, as measured by semen quality.

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Vaginal douche use: a potential risk factor for racial/ethnic disparities in phthalates exposure

BACKGROUND

Certain phthalates are commonly used in many fragranced personal care/beauty products, including vaginal douches. Phthalate metabolites have been associated with various reproductive health issues, such as pelvic inflammatory disease, ectopic pregnancy, infertility, and cervical cancer. However, no prior study has examined whether feminine hygiene products increases internal exposure to phthalates. This issue may be of particular concern to African American women, who report higher use of vaginal douches than other racial/ethnic groups.

OBJECTIVE

To examine the relationship between certain phthalate metabolites and vaginal douching among reproductive-age women in a nationally-representative sample of the US population.

METHODS

Using data on 739 reproductive-aged women from the National Health and Nutrition Examination Survey (2001-2004), we examined the association between self-reported vaginal douche use and urinary levels of two phthalate metabolites: mono-n-butyl phthalate (MnBP) and monoethyl phthalate (MEP). Percent change estimates were calculated using beta coefficients from linear regression after covariate adjustment.

RESULTS

Black women were 2-3 times more likely to report douche use in the past month compared to White and Mexican American women. Women who reported douche use had 34% (95% confidence interval (CI): (1%, 77%); $p < 0.01$) higher levels of MEP than non-users. There was a monotonic dose-response relationship between frequency of douching and MEP levels (ptrend <0.0001). The high use group (≥ 2 times/month) had 152% (CI: (71%, 272%); $p < 0.01$) higher levels of MEP than non-users. The association between race/ethnicity and MEP was partially mediated by douche use.

CONCLUSIONS

Vaginal douche use may contribute to racial/ethnic disparities in phthalates exposure. Future work should examine the health consequences of chemical exposures from feminine hygiene product use.

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Hydraulic Fracturing and Climate Change: An Assessment of Upstream Life-Cycle GHG Emissions from Marcellus Shale Gas Production

BACKGROUND

In recent years, the widespread use of hydraulic fracturing ("HF") has enabled the proliferation of unconventional shale gas and oil production in the US. As a result, US natural gas production is projected to increase by 66% from 2011 to 2040. Natural gas is also projected to become the leading source of electricity generation over coal in the US by 2040. When considering the full life-cycle greenhouse gas (GHG) emissions associated with HF, concerns have been raised regarding the impacts this change in the US energy portfolio are having on climate change. Previous study has focused on methane venting and leakage during the production through distribution phase of shale gas development. There has been little focus on upstream processes.

OBJECTIVES

To assess the life-cycle GHG emissions associated with the production and transportation of water, sand, and chemicals used in HF in order to determine the relative impact these upstream processes have on climate change compared to all processes involved in HF.

METHODS

Water, sand, and chemical usage data from 1,921 Pennsylvania HF wells were used to create a chemical inventory detailing mean quantities used per well and chemical frequency of use. The EIO-LCA model was used to assess GHG emissions associated with the production and transportation of chemicals and the mining of sand on a per-well basis. Ton-miles from the transportation of sand and water were assessed and used with life-cycle transportation emissions factors to generate life-cycle GHG emissions.

RESULTS

According to the data, 4.27 million gallons of water, 4.89 million pounds of sand, and 18,958 gallons of chemicals are used on average per well in HF. In order to transport sand and water used in HF, approximately 1,850 truck-trips are made (not including empty return trips). Total GHG emissions from all processes assessed in the study equaled 1,313 t CO2e per well (range: 1,033 to 1,595 t CO2e per well), with the highest proportion coming from the transportation of sand (754 t CO2e) and wastewater disposal (299 t CO2e). When compared to GHG emissions of all other life-cycle processes in HF from other studies, the total emissions from this study make up 0.61% of total life-cycle GHG emissions from HF.

CONCLUSIONS

The relative impact of the production and transportation of water, sand, and chemicals on climate change compared to all other life-cycle processes associated with HF is trivial. Focus should remain on methane venting and leakage during HF.

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Regional Malnutrition in Ethiopia: Identifying the Determinants of Stunting in Children under the Age of Five in Amhara, Oromia

Ethiopia has some of the highest rates of chronic malnutrition in the world. However, no studies explore the determinants of stunting across regions. The objective of this study was to identify the main determinants of stunting (-2 SD below the median height-for-age Z score) in children under five in Ethiopia's three most population regions: Amhara, Oromia, and SNNPR. Methods: This study used 2011 Ethiopia Demographic and Health Survey (EDHS) data on Amhara (n = 1,068), Oromia (n=1,515), and SNNPR (n=1,368). Pearson's Chi-Square tests determined the association between being stunted (yes/no) and potential risk factors that were divided into seven categories of variables: 1) socio-economic and demographic, 2) household and environmental, 3) maternal characteristics, 4) child characteristics, 5) breastfeeding and child care, 6) barriers to health access, and 7) women's decision-making power. Backward stepwise logistic regressions were run to determine which variables were independently associated with stunting.

RESULTS

Stunting is much more widespread in Amhara compared to Oromia and SNNPR. In Amhara, visiting a health facility in the last 12 months led to a 32 percent decrease in the odds of a child being stunted (OR=0.68, p=.02). Being male led to a 40 percent increase in the odds of stunting (OR=1.4, p<0.02). Size at birth and living in a household with no electricity also increased the odds of stunting in this region. In Oromia, being in the richer (OR=0.5, p=0.04) or richest (OR=0.3, p=0.02) wealth quintiles led to a 50 percent and 70 percent decrease in the odds of being stunted. Longer duration of breastfeeding also increased the odds of stunting. In SNNPR, a one year increase in maternal education leads to a 10 percent decrease in the odds of being stunted (OR=0.9, p<0.01). Being male also leads to increased odds of stunting (OR=1.3, p=0.04).

CONCLUSIONS

The causes of malnutrition are multi-faceted and cross-sector programs are necessary to reduce malnutrition. By determining the regional risk factors for stunting, decision-makers can implement more effective programs to reduce chronic malnutrition in children under five in Amhara, Oromia, and SNNPR.

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Integrating visual and textual data for a case study analysis: Understanding the Concept of Ownership of the Community Health Information System (CHIS) in SNNPR, Ethiopia

BACKGROUND

The Community Health Information System (CHIS) was implemented in the Southern Nations, Nationalities and Peoples' Region (SNNPR), Ethiopia in 2010 and serves as a tool to aid the work of Health Extension Workers (HEWs). The concept of CHIS ownership at the health worker level has not been widely studied. Ownership in public health usually assesses ownership at the country level, however ownership at the health worker level is seldom studied.

OBJECTIVES

1. How can visual data be used in understanding the concept of CHIS ownership in SNNPR, Ethiopia?
2. How much does visual data help in understanding the CHIS?
3. In what areas of the CHIS was visual data the most helpful in understanding the concept on ownership?

METHODS

This study used data that was collected using case study methodology for the purposes of assessing the range of effects of the CHIS intervention. The case study collected visual data (health facilities photographs) and textual data (in-depth interviews and observations) at different health system levels. For that case study, photographs were used to understand the process HEWs used in preparing the CHIS report and to visualize health facilities organization. This study specifically asked, "What did we learn about the health worker's sense of ownership of the CHIS from the case study data, and what was the value-added of the visual data?" The method used to analyze ownership includes a literature review followed by developing a program theory specific to ownership. Visual and textual data was uploaded onto Atlas.ti (a qualitative data analysis software). Fourteen codes defining ownership components were developed and coded throughout all 349 visual and textual data documents. Ownership was first analyzed using only the coded textual data, and then using both the coded textual and visual data, and the results compared.

RESULTS

Visual data is an efficient method to capture detailed information and provides nuances to CHIS interpretations. The photographs analyzed validated textual data, and at times could exclusively provide a wealth of information on ownership. Of the 14 codes used, five codes were applied to visual data and referred as 'photo codes'. Four photo codes (organization, data accessibility, dedication to work, and goals achieved in a timely manner) provided more information on the front end of the program theory that focuses on ownership components needed for CHIS sustainability. One photo code (rewards/incentives for good performance) provided information towards the end of the program theory, once CHIS sustainability was attained.

CONCLUSION

The concept of ownership is complex with various moving parts, however the use of visual data has facilitated in understanding ownership. This study demonstrates visual data usage is an efficient method of collecting detailed information and adding depth, nuances to interpretations, and validating textual data.

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The role of women's empowerment as a determinant of stunting status in Kenya

OBJECTIVE

There is a dearth of research on female empowerment and child undernutrition globally and only three studies specific to the Kenyan context. Further research is needed to expand on existing methodologies and to update findings. This paper contributes to the discussion of determinants of stunting status in Kenya by asking two questions: What role does women's empowerment play in determining stunting status of children under-five in Kenya and can this be determined using data available through the Demographic Health Survey?

METHODS

In order to assess the extent to which women's empowerment is associated with stunting status, an analysis of the 2008-2009 Kenya DHS dataset was conducted. The study analyzed indicators of women's empowerment included in the nationally representative survey including: decision-making control, attitudes towards wife beating, educational attainment, age gap between partners, age at first birth and wife rank. The study used a weighted logistic regression model, controlling for region, wealth quintile, sex of the child and residence.

RESULTS TO DATE

Independent variables were regressed on stunting status to determine bivariate associations. In the adjusted association, mother's educational status was the only statistically significant variable at the 95 percent confidence level. Compared to children of women who had completed secondary or higher education, children of women with no education had a 1.16 times higher risk of stunting and children of women who had completed primary education had a 1.45 times higher risk. Other associations were also positive, though not statistically significant. In the multivariate logistic regression model, adjusted for all independent and control variables, only primary education was statistically significant, with children of women with primary education only at a 1.45 times higher risk of stunting that children of women with secondary or higher education.

CONCLUSIONS

The study illuminated several methodological and conceptual issues that challenge the notion that the association between women's empowerment and stunting status can be determined through analysis of KDHS data. Only one indicator of women's empowerment (educational attainment) was shown to be statistically significant despite a strong conceptual basis supporting the role of other empowerment indicators in determining child nutritional status. Additional analysis revealed limitations to KDHS data and challenges to the empirical measurement of the UNICEF Conceptual Framework for Undernutrition.

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Male Participation in Family Planning: a Quantitative Cross-Country Comparison of Ethiopia and Uganda

BACKGROUND AND OBJECTIVE

Male involvement has long been recognized as a critical component to successful family planning programming. For the past thirty years, practitioners and researchers have tried to understand the role that men play in decisions about family planning, and more specifically, contraceptive use. While their role has been recognized as critical to successful family planning programming, few studies have examined how male involvement influences family planning choices in different contexts, especially in traditionally male-dominated societies such as Ethiopia and Uganda. The objective of this study is to examine the complex dynamics of male participation in family planning and determine the subsequent effect on contraceptive prevalence and total fertility in Ethiopia and Uganda.

METHODS

Data came from the three most recent Demographic and Health Surveys in Ethiopia and Uganda, conducted in 2000, 2005, 2011 and 2000-01, 2006, and 2011, respectively. Responses from married men and women were analyzed for several measures of male involvement in family planning. Knowledge and awareness of family planning methods, couple concordance on family size, current contraceptive use, decision-making and other demographic variables were all examined. Couple concordance on family size was used as a proxy measure for spousal communication. Multivariate logistic regressions were used to identify factors influencing modern contraceptive use and examine the effect that male involvement had on modern contraception utilization.

RESULTS

In both Ethiopia (2000, 2011) and Uganda (2000-01, 2006, 2011) women who reported not knowing their husband's ideal number of children were less likely to use modern contraception than women who reported wanting the same number of children as their husband. When men were involved in making decisions about large household purchases, women were less likely to use modern contraception than if the husband had not been involved (ET 2005, 2011 & UG 2011). Women in Ethiopia (2005, 2011) and Uganda (2011) were more likely to use modern contraception when they accurately reported family size concordance compared to women who inaccurately reported it.

CONCLUSIONS

Family planning programs in male-dominated societies should consider involving men by including components on spousal communication. More research is needed to fully understand how male involvement affects contraceptive use, especially in decision-making and concordance on family size.

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Formative research assessing knowledge, attitudes, and existing health promotion exposure on handwashing behavior among five set

BACKGROUND

Diarrheal diseases are among the leading infectious causes of childhood morbidity and mortality, and are the second leading cause of death for children under five. About 88% of diarrheal-associated deaths are attributable to unsafe water, inadequate sanitation, and insufficient hygiene. Proper handwashing practices can reduce diarrheal associated deaths by up to 50%. In 2012, the Washington D.C. Professional Chapter of Engineers Without Borders (EWB) began a project to develop a potable water and hygiene education project in Mbokop, Cameroon, a community made up of five settlements. EWB assessed the handwashing behavior, handwashing and diarrheal disease knowledge, as well as the existing health promotion framework in place. Through an initial qualitative analysis, it was shown that each settlement displayed varying levels of exposure to health messaging and knowledge. EWB then conducted formative quantitative research to further understand handwashing knowledge and behaviors.

OBJECTIVES

The objectives of this study were to assess existing health promotion exposure by source, frequency, and type of health messages along with handwashing and diarrheal disease knowledge and handwashing practices through a quantitative analysis.

METHODS

Current EWB members conducted a household questionnaire in Mbokop, Cameroon. Survey sampling methodology utilized the probability proportional to size technique to capture data respective to the size of each of the five settlements. Data points collected through household questionnaires were entered into Microsoft Excel, coded, cleaned, and analyzed using bivariate analyses.

RESULTS

Exposure to handwashing messages in Mbokop occurred mostly through health promoters (37.9%), schools (25.2%), parents (24.3%) and religious sources (24.3%). The main health messages individuals recalled being told by health promoters included drinking clean water (18.4%), preparing food hygienically (14.6%), and using soap (10.7%). Seventy-five percent of respondents indicated in the last month they had no interaction with health promoters. Only 49.5% responded that diarrhea can be prevented, and when asked to list the opportune handwashing moments, 55.3% were able to list two of the four critical handwashing instances -most mentioned before eating (79.6%). Fifty percent of respondents cited that they do wash their hands at two of the four critical instances, 74.8% citing handwashing before eating.

CONCLUSION

The formative research shows that there is a clear need for EWB's project mission to develop a hygiene education program. While health workers may be the main source of health messaging in the community, messages need to be targeted at the individual's ability to prevent diarrhea especially through proper handwashing practice.

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Effectiveness of Cleaner Cookstoves Interventions to Achieve Health Protective Air Quality Standards.

Household air pollution from solid fuel use is estimated to cause more than 3 million premature deaths each year. The use of solid fuels for cooking and heating is the third largest risk factor for morbidity and mortality in the global burden of disease analysis sponsored by the World Health Organization.

Cleaner cookstoves and fuels can reduce exposures to household air pollution, and a global effort is underway by the Global Alliance for Clean Cookstove to distribute more than 100 million stoves. Preliminary results from a randomized control trial using an ethanol cookstove intervention study in Ibadan Nigeria will be used to evaluate the effectiveness of an ethanol stove to reduce exposures to household air pollution and improve birth outcomes. Three hundred women in the early second trimester of pregnancy are being recruited from Primary Care Hospitals in Ibadan, Nigeria. The women use wood or kerosene as their primary cooking fuels. Half of the study population will receive an ethanol cookstove and fuel for cooking. All women recruited are educated on the known health impacts of household air pollution and receive prenatal care. The intervention group is trained to use the ethanol cookstove. This study is unique in that it focuses on an urban population in sub-Saharan Africa using a mixture of wood and kerosene, living in multi-family dwellings. An innovative exposure assessment plan will quantify continuous exposures to fine particulate matter (PM2.5) and carbon monoxide (CO) and integrated polycyclic aromatic hydrocarbon concentrations of (PAHs) in two 72-hour monitoring periods, once in the second and third trimester. GPS monitoring during the exposure assessment periods will quantify the impact of location on personal exposures. Stove use monitoring with low cost temperature sensors will provide an objective measure of intervention adoption as well as direct method to measure the impact of stove usage on personal exposure to PM2.5 and CO.

The preliminary results show that the ethanol cookstove reduces both mean and maximum exposures to PM2.5 and mean exposures to CO in comparison to kerosene cookstoves. Mean 72-hour personal exposures to PM2.5 for women who exclusively cook with kerosene are higher than the World Health Organization (WHO) daily mean exposure guidelines for PM2.5 of 25 ug/m3. These results will be shown in comparison to a global review of in-field cookstove interventions with published exposure data. We will discuss the effectiveness of the ethanol stove intervention in Ibadan Nigeria to reduce exposure below the WHO guidelines for PM2.5 and CO, and also household or behavior variables that influence these reductions.

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Reducing Global Household Air Pollution Emissions via Improved Cookstoves: Using SUMs Technology for Evaluation of Exposure Time

The use of kerosene for cooking is particularly common in urban cities of developing countries, as it can be a less expensive fuel than biomass.1 In addition to release of potential harmful pollutants when burned in appliances, kerosene presents possible health risks prior to combustion, as it contains toxic compounds like n-hexane, naphthalene, and benzene.1 Previous studies have found that women and children may spend longer periods of time in the kitchen cooking with kerosene as the emissions are less visibly smoky than biomass emissions.1,2 The monitoring of total kerosene stove use in the household is important in assessing an individual's potential exposure time to kerosene cookstove emissions. Data was obtained from the on-going study: Household Air Pollution (HAP) from Burning Biomass: Implications for Maternal Health and Pregnancy Outcomes conducted in the city of Ibadan, Nigeria. The study is recruiting pregnant women in early second trimester of pregnancy, as determined by ultrasound imaging. The study will ultimately quantify the relationship between personal exposures to CO, PM2.5, and PAH during pregnancy and birth weight and pulmonary function impairment of the mother. Ethanol stoves are randomly allocated to half of the participants (intervention group) who are encouraged to use this particular stove exclusively. The ethanol stoves and traditional cookstoves (predominantly kerosene) are equipped with stove use monitors (SUMs). The SUMs records the temperature of each stove every ten minutes for the entire pregnancy to determine the amount of time the stove is in use. Preliminary, crude analyses were conducted on stove use for 84 households (45 intervention, 39 control). The intervention homes used their kerosene stoves (n= 755 days) for 21 fewer minutes relative to control homes (n=757 days) on average per day (70. 4 min/day to 91.6 min/day, respectively) However, when combining ethanol and kerosene stove usage in the intervention homes, the average total daily stove time use is greater than the control group by almost 87 min/day (178.5 min/day to 91.6 min/day, respectively). The ethanol stove did not fully replace the use of the kerosene stove, but only reduced kerosene stove use. Future analysis will include examination of survey data to factor in family size and other potentially confounding home characteristics. Determining an average amount of cooking 'events' per day as well as the average length per cooking 'event' will provide another measure of HAP exposure. This will allow better evaluation of acute versus chronic exposure to HAP.

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A Comparison of Water, Sanitation, and Hygiene (WASH) Segmentation by Culture and Gender: A Case Study from Mbokop, Cameroon

BACKGROUND

Diarrheal disease remains a major cause of death around the world. Water, sanitation, and hygiene (WASH) interventions can reduce morbidity and mortality caused by diarrheal disease, as well as improve the quality of life for millions around the globe. Population segmentation is a critical component to developing health interventions, including WASH programs. Segmentation is an opportunity to tailor interventions to populations to provide the greatest opportunity for success and behavior change. The most common segmentation methods are by demographics variables. Current research has suggested that a more appropriate method for segmentation is using cultural indicators.

METHODS

Twelve focus groups were conducted in a large, rural community in Northwest Cameroon. The focus groups explored WASH knowledge, attitude, and behavior indicators to determine proper segmentation for WASH interventions. Focus group discussions were recorded, transcribed, coded, and analyzed for common themes. WASH indicators on hand washing, sanitation, and water quality were evaluated by tribe and gender to determine common trends and therefore the most applicable segmentation model for a WASH intervention.

RESULTS

The focus groups among the different tribes indicated minor variation in WASH knowledge, attitudes and practices. Different tribes had specific strengths for certain indicators and specific weaknesses for others. More significant differences were revealed between the female and male focus group comparisons. For example, women reported much higher levels of open defecation than men.

CONCLUSIONS

Based on the focus groups for this rural community, our findings suggest that the more traditional demographic variable, gender, is the more appropriate segmentation design when compared to the cultural indicator, tribe.

KEYWORDS

hand washing; water, sanitation, and hygiene (WASH); water quality; segmentation; social theory; knowledge, attitudes, and behavior

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Childhood Immunizations in Nigeria: Do Maternal Autonomy And Gender Norms Matter?

INTRODUCTION

Globally, vaccine-preventable deaths account for 29% of deaths in children under five, and in 2011, 1.5 million children died from vaccine preventable diseases. In Nigeria, vaccine-preventable deaths account for 22% of deaths in children, or 200,000 deaths per year. Global public health strategies are currently geared towards establishing gender equality as a means of promoting maternal and child health.

OBJECTIVES

This paper examines measures of maternal autonomy, gender norms and their associations with full immunization in Nigerian children.

METHODS

A multivariate logistic regression was carried out with data from the 2008 Nigeria Demographic Health Survey which included currently married women 15-49 years. The associations between socio-economic variables and variables measuring maternal autonomy and individual attitudes to gender norms were investigated.

RESULTS

About 18% of children had received full immunization. Children of mothers 35-44 years old had a higher likelihood of receiving full childhood immunization (OR 2.99, 95% CI 2.19-3.06). Education (OR 2.38, 95% CI 2.17-2.60), place of residence (OR 1.66, 95% CI 1.41-1.94), ethnicity (OR 1.17, 95% CI 1.13-1.46) and autonomy (OR 1.29, 95% CI 1.13-1.46) were associated with the receipt of full childhood immunization.

CONCLUSIONS

These findings emphasize the need for public health programmatic and policy interventions aimed at promoting gender equality and female empowerment. This will positively impact child health outcomes.

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The Dangers of Cooking in Kakuma: How Access to Cooking Fuel Compromises the Safety, Dignity, and Well-being of Women and Girls

BACKGROUND

In 2006, WFP conducted a survey assessing how access to cooking fuel affects vulnerability to violence. The assessment found that beneficiaries resort to negative coping methods, like collecting firewood in restricted areas, to cook food distributed by WFP. Women are usually responsible for collecting firewood, exposing them to violence. To reduce the likelihood of beneficiaries reverting to these mechanisms, Safe Access to Firewood and alternative Energy was piloted in six countries, including Kenya. Established in 1992, Kakuma Refugee Camp is located in Northwestern Kenya. In 2012, 250 incidents of sexual and gender based violence were reported in Kakuma, yet due to the sensitive nature of SGBV, cases usually go unreported.

OBJECTIVES

To evaluate if the provision of fuel-efficient stoves and training on SGBV reduces the number of trips women take to collect firewood, thus decreasing the exposure and vulnerability of women to SGBV and increasing the number of violent acts reported.

METHODS

The study divided 402 households into three groups: non-intervention, stove recipient only, and stove plus SGBV sensitization for both baseline and end line surveys. Two outcome variables were chosen for analysis: the number of collection trips per week and if the participant reports incidences of SGBV. Exploratory analyses were done to check for any statistically significant differences between the baseline and end line surveys. Bivariate analyses were conducted to measure the relationships between the outcome variables and the relevant independent variables. All analyses were performed using Stata.

RESULTS

Proportionally, more individuals collect firewood one to two times per week (71.20%) as opposed to three or more (28.00%). For the intervention groups, the proportion of respondents who reported incidences of SGBV increased by 14.21%. 76.29% of participants reported saving fuel and all but two participants reported saving time cooking each day, with 34.04% saving 3 hours per day. At a 95% CI ($p<0.05$), 'type of fuel', 'if firewood is provided for free', and 'if the participant saved time/ fuel', were significantly correlated to both outcome variables.

CONCLUSIONS

The results of this study demonstrate positive change for the women receiving stoves. Although reduction in exposure to and risk of SGBV has not been dramatically improved by the distribution of the fuel-efficient stoves and SGBV sensitization, a larger-scale, more vigorous follow up study can reinforce the findings determined here. A more developed, SAFE program with comprehensive interventions may have a more profound impact on the exposure to SGBV.

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Cinterandes

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BACKGROUND

The country of Ecuador is a developing nation with many essential infrastructure needs not in place. Much of Eucador's economy is based on oil revenues, which the government selectively appropriates towards projects and organizations it deems essential. However, despite being well funded, the health care system of Ecuador still suffers greatly due to several outdated facilities and the inaccessibility of care to population in rural areas along the oceanic coast, Amazon basin, and mountainous ranges. The Cinterandes Foundation, is an initiative started by former Minister of Health, Dr. Edgar Rodas to address and relieve these health care disparities. It's mission statement is: "Carrying out Mobile Surgery programs in remote places of the Country, organizing programs to enhance human capabilities, and satisfying basic human needs."

OBJECTIVES

Our chief objective was to engage ourselves in the Ecuadorian health care system to learn about its infrastructure, the morbidities that plague the system, and how Cinterandes addresses these issues.

METHODS

Over a four week time period, our project had us allocate our time at different medical sites within the Ecuador health care system, including one week on a trip to the Amazon basin with a mobile surgical unit. For the majority of the time period, we were located in the city province of Cuenca, where we rotated in local primary care level clinics in locations that were both in the city as well as rural outskirts. During this time we aided in a public health awareness campaign for child wellness, taking weight and measurements of school children. In addition we were able to make several rotations in the city's Emergency Room, where we were able to inquire information at the hospital level of the health care system. Finally, we traveled to Nueva Loja for a week's duration to assist in a mobile surgical unit mission that provided procedures that were not offered by local medical facilities such as hernia repairs and gall bladder removals.

RESULTS

During our four-week time period with Cinterandes we had many opportunities and experiences to familiarize ourselves with the Ecuadorian health care system. We saw many patients, and interviewed several health care workers to understand the structuring of the system and how initiatives like Cinterandes have tried to address the system's inadequacies.

CONCLUSIONS

We engaged ourselves within the Ecuadorian healthcare system and were able to familiarize ourselves with its strengths and inadequacies. We found that despite being unavailable to populations in rural areas, the healthcare system is able to deliver quality primary care. However, for addressing extensive and chronic issues, the resources such as updated facilities, medicines, and medical training were not available. We also witnessed how Cinterandes has addressed these shortcomings.

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Cinterandes

"The Cinterandes Foundation is a non-profit organization whose goal is to deliver surgical care in the most remote places, organize programs in family health and promote human development."

OBJECTIVES

To help fulfill the mission of the Cinterandes Foundation. To learn about the Ecuadorian health care system, the logistics and implications of using a mobile surgery unit, and to aid in the delivery of healthcare to underserved populations.

METHODS

For three weeks, my partners and I lived in Cuenca, a small city in southern Ecuador. We were able to rotate in local healthcare facilities, which included: rural clinics, emergency rooms, and local hospitals. For another week we joined the Cinterandes surgical team on a trip to Nueva Loja. It is in this small rural oil town, about 15 hours north of Cuenca, where we stationed our mobile surgery unit. The mobile surgical unit is van that has been outfitted to be an operating room. We were able to accompany the physicians during surgical consultations the first day to see what surgeries we would be performing for the following days. The most common surgeries included: cholecystectomies, hysterectomies, lipoma removal, and hernia repair. These surgeries were done free of charge and would have been unavailable for this population otherwise.

RESULTS

We were able to the gain exposure to a variety of healthcare experiences in Ecuador, deliver care to a variety of patients, and aid in fulfilling the mission of the Cinterandes Foundation.

CONCLUSIONS

Ecuador's healthcare system is diverse. One could even compare the country's diverse approaches to healthcare to that of its biodiversity and varied ecosystem. The diversity is in part due to both financial and natural barriers (urban vs. rural/mountains). Working with Cinterandes, I was able aid in the care for populations whom had little to access to health/surgical care in remote places and comparatively was also able to see surgeries in a large urban hospital. Bearing witness to an organization attempting to bridge this gap in healthcare was inspiring and educational.

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Cross-Cultural comparison of Reproductive Medicine and Development of Language Through Immersion in Valencia, Spain

While in Valencia, my objectives were to 1) gain cultural insight of the differences in the attitude towards treatment of infertility in a socialized setting through clinical experience, and 2) investigate assisted reproduction treatments in the OB/GYN department at Hospital La Fe, as compared to Instituto Valenciano de Infertilidad (IVI), a private institution, in terms of the types of fertility treatment that covered by public insurance. Although many pathologies causing infertility can be treated for free in the Spain's socialized medical system, the actual fertility treatment at the institutions with the best pregnancy rates are costly services, no matter where you are in the world. I found that in order to receive assisted reproduction technologies and fertility treatment in Hospital La Fe covered by the public insurance, the patient must be less than 38 years old, the reason for infertility must be medical, not for social/lifestyle choices and repercussions (i.e. some pathology must be present), and the patient must have also been trying to get pregnant for one year without success. The hospital does not perform services such as Preimplantation Genetic Diagnosis (PGD) and Screening (PGS), egg and sperm donation, as well as embryo donation. If a patient does not fit these criteria or needs one of the above treatments, they must go to a private institution, such as IVI, for their treatment.

About 90% of the patients at IVI are receiving treatment in the form of egg donations for various reasons, which include; Age, endometriosis, removal of ovaries at early age due to endometriosis or malignancy, ovarian failure due to premature menopause, and repeated IVF failure or recurrent miscarriage. While the demand for egg donations have greatly increased, the supply of egg donations has also increased because donors are paid for each egg donation cycle that they provide. Due to the economic crisis in Spain, women ages 18-34 return for as many as 6 egg donation cycles to help pay for living expenses.

Reproductive medicine is prime example of a continuously growing field due to the confluence of cultural and economic and technological changes in society today. Due to advancements in the quality of reproductive research and the technology developed for infertility treatment, people dealing with infertility now have many treatment options to help them conceive. People who never thought they would be able to have children now have more options to try to get pregnant. From a cultural and economic standpoint in the United States, an increasing amount of women are putting off having children because of careers, making it more difficult for them to conceive when they are ready. Infertility is increasingly prevalent issue affecting both women and men in all regions of the world. The attitude towards infertility treatment in Spain, even Europe as a whole, is very similar, as exemplified above with the supply and demand trend for egg donations.

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Reconciling Cultural Treatments

BACKGROUND

Physicians in foreign countries are often faced with the dilemma of mediating western and alternative medicine when treating their patients. Due to lack of communication and misunderstandings, the two types of medicine are commonly at odds; thereby, potentially jeopardizing the patient's health care.

OBJECTIVE

To assess an efficient way to mediate the two types of treatments, while providing optimal care for the patients straddling the two types of medicine, by observing health care in rural Ecuadorian towns.

METHODS

Observations and a literature search were used to assess the interactions between western and alternative medicine. The observations seen at the rural clinic of Pitirishka, Ecuador and the Hospital Voz Andes Shell in Puyo, Ecuador were then compared to current research present on the topic in order to understand how viable the observations were.

RESULTS

Based off of the observations from my own experiences and those of the health care workers in both clinics, majority of the cases where both types of medicine were employed were in patients with chronic conditions. The local and foreign nurses and doctors that were interviewed explained that patients tried to use both types of medicinal treatments in search of a cure for their chronic conditions such as diabetes and lupus. However, due to the lack of knowledge concerning alternative medicine and lack of communication with alternative healers, physicians were unable to effectively mediate the two types of medicine, while maintaining their patient's trust. The majority of cases reportedly ended in mistrust and noncompliance. According to Bartlett, et al , the most successful interactions between the two types of medicine were in integrated clinics, i.e. clinics that had both western medicine doctors and traditional medicinal healers. The article found that the two types of medicine were able to improve health care, and they were together able to obtain more support for health care within their communities.

CONCLUSION

Therefore, our study shows that a solution to mediating the two types of medicine involves a type of cooperation, in which healers and doctors work side by side. Not only would it obtain local trust in foreign communities, but also, it would bolster the willingness of patients to obtain the appropriate health care in a controlled environment.

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GLOBAL HEALTH

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The Practical Application of Emergency Management of Displaced Persons: A Case Study of Jordan's Refugee Population

Jordan has, for many years, been a refuge for many asylum seekers of the Middle East and surrounding region due to its relative political and economic stability. The refugee population rose exponentially in the wake of the Syrian Civil War. While Jordan in the past provided adequately for displaced persons residing in the country, this massive influx of people could potentially limit the capability of the government and non-governmental organizations to aid those in need.

Using the Sphere Handbook as a reference to the guidelines and standards of refugee care, I performed a literature review to determine what quality of care has been given towards refugees thus far. Sources consisted mainly of journal publications and newspaper articles, supplemented with information from informal interviews with physicians who treated refugees in Amman, Jordan as well as the refugees themselves. With a focus on the minimum standards as out lined by Sphere regarding the water supply, sanitation, and hygiene; food security and nutrition; shelter, settlement, and non-food items; and health action, it appears as though Jordan's government and the agencies working within the country are upholding many of the standards set by Sphere, though there are some areas in which improvements can be made. A main source of the discrepancies between Sphere's standards and what has been achieved in Jordan can be attributed to an underestimation in the number of Syrian refugees that Jordan expected when the Syrian conflict began, as well as the urgent nature of the response; as a result, the main refugee camp, Zaatari, was not built to accommodate as many civilians as it currently does and facilities within the camp are stretched thin. In addition, security and safety within Zaatari appear to be a major problem, which is a topic that the Sphere Handbook does not address as adequately as other issues. A more in-depth analysis of the management of the crisis could be performed in the future with data that shows how resources were allocated by the organizations involved and with interviews with representatives of the organizations carrying out relief efforts.

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Race and ethnicity in clinical guidelines: improving quality of care or increasing confusion?

Clinical guidelines are statements issued by healthcare organizations to define clinical best practices based on current evidence. Several organizations in the US and abroad include race and ethnicity as parameters for clinical decision-making in their guidelines. Race and ethnicity are used as proxies for clinically relevant differences between patients of different ancestry. The current approach may compromise quality of care by placing patients at harm who do not have the biological trait that is assumed to be linked to ethnicity. Similarly, patients who have the trait but are assumed to not be of a particular ethnicity are also at risk. Some race specific guidelines (RSGs) have been challenged by researchers, but no comprehensive review of the use of race and ethnicity in guidelines has been done. We performed a search of medical and public health databases in English speaking countries worldwide to identify RSGs. After identifying some 3500 clinical guidelines, we used a keyword bank to identify recommendations that referenced race or ethnicity. Selection criteria were then applied to determine if each guideline was an RSG. For each RSG the specific recommendation, implied counterstatements, definitions of groups referenced, evidence cited, and data on other features were collected. From the clinical guidelines searched, 46 RSGs from five English speaking countries were identified. None of the 46 RSGs included definitions of the groups or guidance statements on how to determine if someone belonged to a particular group. Preliminary results show that RSGs containing recommendations related to screening and prevention may be supported by different levels of evidence than those containing treatment recommendations. Data collection and analysis are ongoing.

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

The Role of Homeopathic Medicine in Urban, Rural, and Indigenous Regions of Ecuador

BACKGROUND

The Quechua and Shuar communities are two prominent indigenous cultures in Ecuador. Despite being separated from the general Ecuadorian population, many of their traditional medical treatments have spread throughout the country. International healthcare workers need to understand these customs so that they can integrate allopathic techniques with the cultural medical practices that Ecuadorians have practiced for ages.

OBJECTIVES

To determine which allopathic and homeopathic methods are valued and practiced by physicians and patients in the city, rural, and indigenous areas. I also hoped to gain a better understanding of the cultural values and beliefs behind these homeopathic practices.

METHODS

I conducted a focus group to determine specific illnesses with common homeopathic therapies. I then determined three possible treatment options for the common conditions: asthma, eczema and gastroenteritis. I used this information to construct a survey for practitioners (physicians, shaman) and patients in Quito, Puyo, and the Shuar communities. I asked each physician and patient how they treated specific medical conditions and then categorized their answers based on whether it was allopathic (i.e. albuterol and corticosteroids) or homeopathic (i.e. ingesting tree sap and bathing in hot springs). In the city of Quito, I surveyed 4 physicians and 10 patients. In Puyo, a rural area of Ecuador, I surveyed 6 physicians and 24 patients. In an isolated Shuar community, I interviewed the tribe's Shaman (healer) and 18 Shuar community members.

RESULTS

In Quito, 100% of surveyed physicians and 70% of surveyed patients preferred using allopathic treatments. Of the surveyed patients in Quito, 30% reported using homeopathic treatments and only using allopathic methods as a last resort. In Puyo, 100% of physicians and 37% of patients preferred allopathic remedies. Also, 21% of patients reported using both allopathic and homeopathic remedies and the remaining 42% of patients only used homeopathic methods. In the Shuar community, the Shaman and all of the community members reported only using homeopathic remedies.

CONCLUSIONS

Through this study I learned about a range of homeopathic remedies including chewing ginger for asthma, bathing in hot springs for eczema, and drinking tree sap for gastroenteritis. The results of the surveys showed that physicians in urban and rural communities prefer allopathic treatments, whereas healers and patients in rural and indigenous regions prefer homeopathic treatments. As a result of this study, I can educate future physicians and medical students about the role of homeopathic medicine in urban, rural, and indigenous regions of Ecuador.

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GLOBAL HEALTH

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The Dual Burden of Malnutrition: Quetzaltenango, Guatemala

BACKGROUND

In June 2013, I participated in the Somos Hermanos Summer Immersion Program in Quetzaltenango, Guatemala. This eight-week program aims to foster bilingual and culturally competent health care professionals through Spanish language classes and volunteerism at clinical locations. Additionally, I designed an IRB-approved research study, "The Dual Burden of Malnutrition: Quetzaltenango, Guatemala," with Dr. Robert C. Morrow. The purpose of this study was to assess whether the "dual burden of malnutrition" phenomenon is present in Guatemala.

OBJECTIVES

With the program, my objectives were to improve my Spanish language skills, to gain medical experience at clinical locations, and to develop a better understanding of the Guatemalan culture, traditions and health care. The principal objective of the study was to assess whether the "dual burden of malnutrition" phenomenon is present in the Guatemalan population. This concept suggests that a diet high in carbohydrates and starches can promote both undernutrition in children, which can cause adverse health problems, such as stunting, and eventually promote obesity in adulthood.

METHODS

The program included a Spanish course designed to develop Spanish language skills; clinical volunteer opportunities; and lectures about Guatemalan culture, history, and the health care issues. For my research study, I recruited mothers and children at the rural clinic of Chiquilaja. The study utilized 24-hour food recalls, along with weight and height to calculate BMI, arm circumference to measure malnutrition, and waist circumference to measure adiposity, in order to compare and contrast the health statuses of caregivers and their children.

RESULTS

After two months in Guatemala, I gained 120 hours of Spanish language instruction, clinical experiences interviewing patients, practicing physical exams, and observing surgeries, and learned a great deal about Guatemalan culture and health care. With the study, I interviewed 25 mothers and 25 children about their diet and collected biometric measurements, including height, weight, upper arm circumference, and waist circumference. We are in the process of analyzing the data currently and plan to compare and contrast the caloric and nutrient intake with the measurements from both the caregivers and children to assess the possibility of a "dual burden of malnutrition" phenomenon.

CONCLUSIONS

After two months in Guatemala, I learned a tremendous amount about primary care and the struggles of accessing proper medical care in a resource-challenged country. My passion for primary care and global health have been reaffirmed and I look forward to pursuing these interests further.

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Mobile Surgery in the Amazon Basin

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BACKGROUND

Ecuador is a country with many barriers to health. First, poverty in much of the country negatively affects health. Also, Ecuador is still developing modern infrastructure, and many parts of the country are without adequate healthcare facilities. Ecuador's people are very diverse and live in environments ranging from snow-covered mountains, to the amazon basin, to the coastline. With this diversity comes a diverse cultural milieu and diverse medical needs. The Cinterandes Foundation is an organization dedicated to addressing some of these challenges by "Carrying out Mobile Surgery programs in remote places of the Country, organizing programs to enhance human capabilities, and satisfying basic human needs."

OBJECTIVES

Our goal was to learn as much as we could about the Ecuadorian healthcare system, the types of disease seen at our project sites, how a mobile surgical unit works, to gain experience with telemedicine, and to assist in the care of patients.

METHODS

Over a total of four weeks we split our time between different areas of the Ecuadorian healthcare system. We worked everywhere from the primary care level in clinics in the rural areas outside Cuenca, assisting in epidemiological surveys and child wellness campaigns to the acute care setting in Cuenca's Emergency Rooms dealing with trauma patients. We also had the opportunity to participate in a weeklong medical mission to Nueva Loja, a town on the edge of the Amazonian frontier. There, Cinterandes assisted the local healthcare system by providing free elective surgical care that would have otherwise been unavailable.

RESULTS

During our four week tenure with Cinterandes we saw countless patients in the clinic whose medical needs ranged from tropical diseases to pregnancy to trauma. We also participated in a surgical mission that provided around 20 successful operations free of cost.

CONCLUSIONS

We witnessed a healthcare system that is delivering very good primary preventative care, but is limited by a lack of money, technology, and infrastructure in the higher levels of care it can provide. We also witnessed an organization designed to bridge this gap using mobile surgical units and telemedicine to take high level surgical care to remote parts of the country.

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Overview of Bhutanese Traditional Medicine and Observations on the Integrated Western and Traditional Healthcare System

Bhutan established a unique national healthcare system in 1967. The official government policy was to preserve and extend traditional Bhutanese medicine, a 1200 year old Tibetan medical practice and system, while simultaneously offering integrated Western medical services, both free of charge to the population. Integration of multiple medical practices can provide more options to patients, and traditional medicine and the natural products used can be an important source for future drug discovery. Through six weeks of direct observation and interviewing healthcare professionals in Bhutan, this project reports on traditional medicine in general, the current state of integration with its challenges and benefits after 50 years of healthcare practice, and on the future possibilities of this system. Data was collected at the National Traditional Medicine Hospital and at the National Referral Hospital. Both of these are located in the capital Thimphu, and at the Phuentsholing District Hospital. Bhutan now has hospitals and health clinics throughout the country offering both Western and traditional care. Instead, findings indicate that the system can hardly be considered integrated. Patients are free to seek care from either traditional or Western physicians. However, few physicians of one practice background have adequate understanding of the other practice to refer patients, collaborate on treatment plans, or effectively work together with physicians of the alternative practice. A recent effort was initiated to improve integration. Traditional physicians have been attending grand rounds and case discussions in the psychiatric department of the National Referral Hospital to learn more about Western psychiatric medicine. Western physicians have been simultaneously learning about traditional medicine's approach to mental health, all in an effort to help bridge the gap between the two practices of medicine. The research indicates that the current Bhutanese healthcare system is not truly integrated, and thus is unable to maximize on the benefits of an integrated system. Further research is needed to follow up on the mental health collaboration effort, as well as to investigate the mechanism of action and efficacy of traditional Bhutanese treatments.

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

Womens' and Children's Health in Northeast Thailand

BACKGROUND

According to the Thailand Health Profile 2008-10, infant mortality rate (IMR, per 1,000 live births) appears to have been on a steady decrease from 84.3 in 1964 to 40.7 in 1985-1986 and to 11.3 in 2005-2006. Major pediatric problems in Thailand appear to be diarrhea, acute respiratory infection with pneumonia being the leading cause of death among all infectious diseases in children under the age of 5, leptospirosis, leprosy, rabies, dengue haemorrhagic fever, malaria, encephalitis, filariasis, HIV, TB hand-foot-mouth disease, and various types of cancers. According to the Thailand Health Profile 2008-10, Maternal Mortality Ratio (MMR) in Thailand has also declined from 374.3 per 100,000 live births in 1962 to 10.7 per 100,000 live births in 2009.

OBJECTIVES

(1) identification of the most common pediatric illnesses and (2) assessment of maternal health, mortality, and morbidity in the Northeast region of Thailand.

METHODS

Data were collected from Pediatrics and Obstetrics/Gynecology departments at Srinagarind Hospital in the city of Khon Kaen.

RESULTS

Our data showed that the category of pediatric illnesses with the most number of patients was neuro/psych (15.4%) with hydrocephalus being the majority of that category (22.2%). The second category of illnesses with the most number of patients was genetic disorders (14.5%) with thalassemia being the most common genetic disorder especially beta-thalassemia (23.5% of genetic disorders). The third pediatric illness most common was in the respiratory tract category (12.8%) especially pneumonia (46.7%). Among the data from Obstetrics, the number of C-sections performed were almost twice the number of vaginal births. The most common procedure in Gynecology was Total Abdominal Hysterectomy (TAH) which was performed 3.5 times more often than Laparoscopically Assisted Vaginal Hysterectomy (LAVH). The most common disorder in Gynecology was various cancers with Cervical and Endometrial Cancer (together 57% cancer) being more widespread than Uterine Sarcoma or Breast Cancer. In terms of morbidity, the most common illnesses were gestational diabetes and hemorrhoids (57% of other diseases). There was one incidence of maternal mortality.

Conclusions: Our results will be useful in orienting traveling medical staff to missions in the area to assist in providing more effective care to patients. Further studies will have to be conducted to fully assess the maternal health status in the Northeastern region including compliance with Antenatal Care and Family Planning visits.

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HEALTH POLICY

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Public Health Approach in the Evaluation of Two States' Antibullying Laws and Local School District Policies

OBJECTIVE

State legislatures have been actively adopting antibullying statutes, yet little is known about the impact of state statutes on school district antibullying policies. The objective of this study is to analyze the antibullying policy approaches in Illinois and Delaware in order to examine their incorporation of public health principles. The study will also review the magnitude and characteristics of the bullying problem in both states following policy implementation.

METHODS

This is a descriptive, mixed-method case study of the antibullying policy approaches in Illinois and Delaware. The states were selected to represent different levels of centralization in school health policymaking, with Illinois using a more decentralized approach to policymaking and Delaware a more centralized one. The study includes a review of relevant state statutes and policies in the ten most populous school districts per state against criteria designed to assess the extent to which bullying policies have public health and preventive focus. 2009 and 2011 YBRSS survey years were used to analyze the bullying prevalence in the two states, both of which adopted their statutes in 2007.

RESULTS TO DATE

This study found that Illinois met 15 out of maximum 30 points criteria, while Delaware met 21 points. The Illinois statute incorporated public health elements in its definition of bullying, prohibition of bullying behavior, and specific identification of social groups susceptible to being bullied. The Delaware statute was also responsive to these criteria and had additional public health elements as comprehensive due process provisions, antibullying training and prevention, data and annual reporting requirements. Further review of school district policies revealed that the sampled districts in Delaware met a total of 85 cumulative points, while the policies in Illinois had a total of 69 cumulative points based on the assessment criteria of maximum 260 points. The analysis of YBRSS bullying data showed that Illinois had a higher prevalence of bullying among high school students than Delaware (19.3% vs. 15.98%, $p<0.001$).

CONCLUSIONS

This study's findings on the antibullying statutes and school district policies suggest that more comprehensive statutes result in more comprehensive local policies. Centralizing the policymaking on the state level in Delaware produced more complete district policies, which better incorporated public health approaches to tackling bullying. More research is needed to confirm that the centralized approach is more effective in producing public health-focused local antibullying policies with a subsequent effect in lowering the reported bullying prevalence rate among high school students.

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HEALTH POLICY

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Association between Hospital Network Affiliation and Pricing of Cancer Surgeries

BACKGROUND

Multi-hospital networks have become increasingly prevalent in the United States since 1990s. Paying attention to potential anti-competitive effects of these hospital collaborations among competing hospitals, Federal Trade Commission (FTC) and Department of Justice (DOJ) jointly issued antitrust guidelines for health care industry in 2004. Theoretically, hospital networks can have not only anti-competitive harms but also pro-competitive benefits. Hospital networks can harm competition by leveraging enhanced market power to raise prices, simultaneously hospital networks can also promote competition by improving efficiency and quality of health care with better clinical and financial integration. In 2011 considering potential pro-competitive gains, FTC and DOJ issued an antitrust enforcement statement that accountable care organization (ACOs) will be exempt from a mandatory antitrust review due to the benefits of clinical and financial integration. However, little scientific evidence exists on the competitive effects of clinical and financial integration within hospital networks

OBJECTIVES

This study explores the effects of clinical and financial integration within US hospital networks on pricing of colorectal cancer surgeries (colectomy). Colorectal Cancer is selected, because it is associated with well-defined surgical procedures in patient-level databases. Moreover there is a paucity of research on the economics of cancer.

METHODS

13,688 single colectomy cases are identified from the MarketScan Database (data from 2002-2007) which covers 11 million enrollees in US for private and public employers, and insurers. A generalized linear regression model is adopted to evaluate the net-price effects of clinical and financial integration, controlling other patient, hospital, plan and market characteristics.

RESULTS

Price regressions showed that different degree of integration has different net-competitive effects on colectomy price. The colectomy price in moderately centralized hospital networks was 6.7% lower than that of independent hospitals. Decentralized hospital network affiliation was associated with 4.7% lower price of colectomy.

CONCLUSIONS

Our findings partially support FTC and DOJ's decision not to require a mandatory antitrust review to ACOs with clinical and financial integration. Both loosely and excessively centralized hospital networks may have more anti-competitive harms than pro-competitive gains.

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The Organization and Structure of Teaching Health Centers

BACKGROUND

The Affordable Care Act (ACA) established the Teaching Health Center Graduate Medical Education (THCGME) program. The goal of this program is to support the expansion of primary care and dentistry residency training in community-based settings to improve the nation's access to well-trained primary care providers. Eleven Teaching Health Centers (THCs) were awarded in the first year of the THCGME program.

OBJECTIVE

To assess the organization and structure of the THC residency programs by examining the unique history, organizational characteristics, staffing, and partnerships of THCs that received first year funding from the Health Resources and Services Administration (HRSA).

METHODS

This research is a case study of nine of the eleven year one THCs that train primary care physicians. Data collection included an initial survey followed by on-site visits. Semi-structured interviews were conducted with health center leadership, residency directors, faculty, residents, nursing staff, and residency and health center finance staff. Interviews were also conducted with community board members, GME consortium leadership, and leadership at partnering hospitals and universities.

RESULTS

The findings show that the organizational structures of the nine THC residency programs are either aligned as a formal consortium model or as an independent program directly under the auspices of a health center. All THCs are characterized by partnerships between a health center(s), which acts as the primary care teaching site, and hospital(s), community providers, other health care delivery and training organizations, and a medical school(s). In the majority of THC residency programs the residents, faculty and support staff are employed by the health center, even in the case of THC programs that are consortium models. Many THCs had to hire additional staff to support the expanded or new residency program. In addition, some of the THCs have or are planning to renovate the facility space to support the residency program. Leadership of the THC residency programs display a mission of training residents, have strong relationships with training partners, and articulate a vision of the residency program, which supports the success of these programs.

CONCLUSIONS

THCs have adapted to existing environments and organizational cultures – both within their health centers, training hospitals, medical schools, and wider health systems. Their diversity demonstrates the wide range within which THC programs can be established, and highlights both the benefits and challenges to different organizational characteristics and partnerships.

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Germs are Germs, and Why Take a Risk?: Patients' Expectations for Prescribing Antibiotics in an Inner City Emergency Department

BACKGROUND.

Extensive use of potentially unnecessary antibiotics, has driven the emergence of resistant bacterial strains, posing a threat to public health. Physicians are more likely to prescribe antibiotics when they believe that patients expect them. However, the drivers of patients' expectations regarding antibiotics are not well understood, impeding intervention efforts. Methods. We examined patients' expectations regarding antibiotic therapy using Fuzzy Trace Theory – a theory of medical decision-making that focuses on how patients derive meaning from information. We surveyed patients visiting the emergency department of a large urban hospital between January and April 2013 using a set of 17 randomized Likert-scale questions and three free-response questions associated with hypotheses regarding patient expectations for antibiotics. Patients were surveyed after they had been seen by a clinician but prior to discharge. We examined whether patient expectations conformed to the dominant hypothesis that patients do not know the difference between bacteria and viruses. Responses were analyzed using principal component analysis. Results. 113 patients completed the survey, Our analysis found that the dominant factor driving patient expectations (10% of variance) was a perception that antibiotics are essentially riskless to the individual. Conclusions. Our findings suggest that recent public health campaigns that have focused on educating patients about the differences between viruses and bacteria omit a key motivation for why patients expect antibiotics. Educational interventions may be more effective if instead of focusing on key distinctions between viral and bacterial infections they emphasize the risks of inappropriate antibiotic use.

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Association Between Expenditures and Healthcare Delivery Models with Pediatric Health Quality Measures

BACKGROUND

The Children's Health Insurance Program Reauthorization Act (CHIPRA) was signed on February 4, 2009 which placed a greater emphasis on improving the quality of care delivered. One such mechanism was the creation of a set of 24 quality measures in children's healthcare covering a range of areas including prevention and health promotion, management of acute and chronic conditions, family experiences of care, and availability of care. Medicaid and CHIP currently insure over 43 million children.

OBJECTIVES

We examined five of the most frequently reported measures related to prevention and access and explored associations with state and federal funding as well as with the model of care delivery.

METHODS

State quality measure and care delivery data was gathered from the CHIP Annual Report Template System from 2009-2011, the most recent years available. The CHIP expenditure data was drawn from the CMS-21 Expenditure Reports and Medicaid expense data was gathered using the Medicaid Statistical Information System. States report quality measure data utilizing either administrative or hybrid methodologies, the former being based exclusively on claims and the later also using the review of medical records. We elected to separate our bivariate correlation analyses of quality measures and expenditures by these two methodologies.

RESULTS

We identified significant correlations between the selected measures and both state and federal expenditures. Results tended to be more significant in the group of states utilizing the hybrid methodology despite the generally higher power of the administrative analyses. We also identified that those states providing greater pediatric care through a managed care model, as opposed to fee-for-service, have significantly higher proportions of their enrollees attend recommended well-child care visits and tend to have greater primary care provider access.

CONCLUSIONS

These findings to such fundamental relationships between quality measures and spending and care delivery can provide a meaningful basis for future analysis and decision making in health policy. Healthcare spending continues to be a pressing issue and controvsey persists over whether incresed consumption of healthcare actually leads to improved outcomes. A recent study of more than 20,000 children aged younger than 3 ½ noted that those who missed half or more of recommended well-child visits were up to two times more likely to require hospital care (Tom et al., 2010). It is also interesting to note that while children represent half of Medicaid enrollment, they correspond to just 20% of the costs. (Medicaid Actuarial Report 2013).

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Investigating Incidental and Secondary Findings in the Research, Clinical, and Direct to Consumer Contexts

BACKGROUND

Incidental findings are data gathered from medical procedures or laboratory tests that were beyond the aims or goals of the particular laboratory test or medical procedure. Incidental findings can occur while receiving clinical care, in the course of conducting and participating in research, and while undergoing direct-to-consumer (DTC) testing. Each of these modalities comes with its own set of special considerations, which take into account the relationship between the practitioner (clinician, researcher, or provider of DTC testing) and the recipient of the finding, as well as other factors such as the feasibility of interpreting and returning results and the availability of limited resources to verify and discuss the importance of such findings.

OBJECTIVE

To investigate the modalities in which incidental and secondary findings can arise, in order to aid the members of the Presidential Commission for the Study of Bioethical in the development of the report "Anticipate and Communicate: Ethical Management of Incidental and Secondary Findings in the Clinical, Research, and Direct-to-Consumer Contexts."

METHODS

Literature-based research was performed using a combination of peer-reviewed literature, archival sources, and policy analysis on incidental findings in the contexts of clinical care, biomedical research and the direct-to-consumer industry. Information was also gathered from expert testimony during the thirteenth Public Meeting of the Presidential Commission for the Study of Bioethical Issues.

RESULTS AND CONCLUSIONS

The subject of incidental findings is still a contentious issue in bioethics, especially in the realm of genetic research. As the cost of genome sequencing continues to fall, its utilization is expected to increase significantly, thereby increasing the possibility of incidental findings. Much of the current literature points toward the need for consensus on how to identify and mange incidental findings in various contexts. The Commission's work takes important steps toward that goal by gathering input from experts in the field and coming to recommendations through a process of democratic deliberation. "Anticipate and Communicate" provides an important additional source of authority that can help to guide the practice of research institutions as well as individuals.

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Reducing Healthcare Costs by Preventing Avoidable Emergency Department and Inpatient Encounters.

OBJECTIVE

Ambulatory Care Sensitive Conditions (ACSC) are acute care diagnoses that could potentially be prevented by enhancements in primary care. Some ACSCs can be treated in multiple settings, including outpatient, emergency department (ED), and inpatient settings. The Agency for Healthcare Research and Quality (AHRQ) is utilizing the incidence of ACSC encounters outside of the primary care clinic as a quality measure of healthcare systems. The aim of minimizing ACSC encounters outside of the primary care setting is to reduce costs by preventing visits in higher-resource settings, while also reducing the incidence of adverse health outcomes. We study how payments and charges for these ACSC visits differ by three hospital-based settings.

METHODS

We conducted a secondary analysis of data (2005-2010) from the Medical Expenditure Panel Survey. We used multiple linear regression models to examine differences in the mean adjusted payments and charges for ACSC visits by clinical setting and further divided payments and charges into physician and facility components.

RESULTS

From 2005-10, ACSCs comprised 14% of inpatient, 12% of ED, and 5% of outpatient visits. After adjusting for patient demographics, clinical condition, and comorbid conditions, charges for inpatient ACSC visits were 8-times higher ($27,718 versus $3,407) and payments 11-times higher ($8,644 versus $808) when compared to an ED visit. By comparison, charges for ACSC ED visits were 2-times higher ($3,407 versus $1,727) and payments 4-times higher ($808 versus $212) relative to ACSC visits managed in outpatient hospital-based clinics. Across all clinical settings, hospital facility fees account for 83-96% of the charge differences and 86-97% of the payment differences.

CONCLUSIONS

Finding ways to manage ACSC hospital-based visits in less resource intensive settings could generate considerable savings. The greatest magnitude of per visit savings involves the reduction of ACSC inpatient hospitalizations. Across all hospital-based settings, facility fees is the major driver of expense.

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An Evaluation of the Effects of Substance Abuse and its Relationship to Health Policy

OBJECTIVES

To learn from patients about the spiral of addiction and the process of recovery. To learn about health policy and the intricacies behind policy making.

GOALS

To gain a better understanding of substance abuse and recovery in order meet the needs of this patient population in identification, communication, and assistance towards recovery. To bring an understanding of addiction and treatment to my learning at the House of Representatives. To attend briefings and present summary statements to congressional staffers. To prepare press clips. To research literature and prepare policy briefs.

CONCLUSIONS

At The Betty Ford Center, I learned from patients through stories, questions, and discussion and from professionals in medical student settings. While I expected to learn from patients and met this goal, I was unaware that I would learn to see addiction as a family, rather than individual, disease. Learning from the head of the children's program at Betty Ford helped me understand the way children create stories to interpret why a parent or sibling continues to use. I saw unraveled individuals and families work to improve their situations. In lectures we learned about recognizing the signs of addiction and I engaged patients in discussions about their relationships with their physicians, what would create trust in their physicians, and what had physicians done or said which was detrimental to their patients.

In the congressional office, I read constituent mail to decipher what issues and perspectives were important to various constituents, met with constituents, wrote letters to constituents in response to their concerns, attended briefings, researched bills, and spoke with staffers to learn about the politics behind certain bills. I learned about the delicate balance between personal beliefs, party objectives, and the wishes of a diverse group of constituents to prepare for campaigns. I met most of my objectives, except for preparing press clips, because my knowledge base was better utilized by the office in other ways. I learned about what made certain bills more or less likely to pass and what steps the minority could take it bettering legislation. I attended briefings and presented summaries to staffers. I was able to attend multiple briefings on chemical dependency and steps taken to combat it on the local,

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Concerns of Store Managers about Use of Employee Restrooms are addressed by Restroom Access Legislation

INTRODUCTION

Restroom access legislation allows individuals with inflammatory bowel disease and other medical conditions emergency access to employee bathrooms in retail stores. This legislation passed in 15 states and failed in Virginia. A variety of concerns have been expressed. This study evaluated retail store managers concerns about restroom access laws and reviewed the legislation that has been passed to determine if it has addressed the concerns of retail store managers.

METHODS

Managers of all Washington, D.C. retail stores with employee bathrooms within one mile of the medical center were surveyed. Managers were interviewed about customer access to employee bathrooms. If access was not possible, the reasons were obtained. A database, maintaining store and manager confidentiality, was created. Copies of restroom access legislation available through Westlaw were obtained and reviewed to determine if manager concerns for bathroom denial were addressed. Qualitative evaluation and quantitative analysis using Fisher Exact test (significance set at $p<0.05$) were performed. The study was approved by the university institutional review board.

RESULTS

Thirty-one retail stores, with 16 male and 15 female managers, had dedicated employee bathrooms. Twenty-four of 31 managers (77.4%; 13 male) indicated that an individual with medical needs could not use an employee bathroom. There was no significant difference ($p=0.6851$) in the rate at which male and female managers denied bathroom access. Twenty-two of 24 (92%) managers indicated that store policy restricted restroom use. Further questioning revealed that 13 (54%) had concerns about safety, 10 (42%) about property loss, 1 (4%) about the potential for abuse, and 1 (4%) about the potential for affecting their 'high end' clientele. Fourteen states have passed Restroom Access Legislation. Legislation from eleven states was reviewed. All of the legislation indicates that an individual must have an eligible medical condition and that a public bathroom is not immediately accessible. Additionally, employee bathroom access does not have to be granted if there is a health or safety risk or security concerns. In 7 states, individuals who make false requests can be fined or charged with a misdemeanor.

CONCLUSIONS

Most local retail stores would not allow an individual with medical needs access to dedicated employee bathrooms. Multiple reasons were offered. However, review of the legislation that has passed revealed that the majority of reasons for denial of bathroom access are addressed. Continued education about inflammatory bowel disease and details about proposed regulations may increase support for restroom access legislation.

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Men's Health Network Internship: A Health Policy Experience in Washington D.C.

OBJECTIVES

During the summer of 2013 I worked as an Intern for Men's Health Network (MHN), a national non-profit organization focused on improving the health of men and boys through advocacy and educational outreach. My objective was to expose myself to a unique health policy experience that combined advocacy opportunities on Capitol Hill with health outreach opportunities within the community. Through these experiences, in addition to attending congressional briefings, policy meetings, and conferences throughout the area, I hoped to enhance my understanding of health policy creation and implementation and identify ways that physicians can assert influence in these processes.

METHODS

I spent 8 weeks working as an Intern for MHN in their Washington D.C. office. I was involved in many aspects of the organization's day to day activities, from meeting with Congressional offices to discuss the House Men's Health Caucus to attending policy meetings and conferences on behalf of MHN to working at health fairs throughout Washington D.C. Splitting time between the MHN office, Capitol Hill, and throughout the community provided me with many valuable educational experiences.

RESULTS

Throughout my time at MHN I was immersed in discussions of health policy on a day to day basis and was able to learn a great deal about health care reform and policy creation on a national level. The out of office opportunities I was afforded allowed me to listen to and network with many influential people in the field of health policy and exposed me to varying viewpoints throughout the field. Working in close proximity to Capitol Hill gave me perspective on how general business is conducted throughout the U.S. Congress with respect to policy creation. I benefited greatly from the health outreach experiences I was involved in, which helped me to improve my overall body of health knowledge and my ability to convey health information. In addition to my diverse policy experience, I learned a lot about the general function of and unique funding and administrative challenges faced by nonprofit organizations.

CONCLUSION

The unique combination of advocacy and outreach opportunities I participated in during my time with MHN helped me enhance my understanding of health policy creation and implementation and develop ideas for ways in which physicians can assert influence in these processes. This will serve me well as a future physician and provide me with a solid foundation for future endeavors in the field of health policy.

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HEALTH POLICY

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Policy Recommendations for Addressing Drug Shortages in the United States

BACKGROUND

The healthcare system in the United States has experienced drug shortages that adversely affect patient care. A majority of these drugs are sterile injectable products that have been deemed medically necessary such as chemotherapeutic agents. The 2012 Food and Drug Administration Safety and Innovation Act (FDASIA) gave the FDA new authority to address drug shortages by requiring manufacturers to report potential or actual shortages to the FDA. FDASIA also empowered the FDA to take steps to prevent shortages such as providing assistance to manufacturers to address quality issues. While some agencies have attributed shortages to manufacturing delays, plant closings to address quality issues, and business decisions to close plants, others have argued that economic factors are at the core of the crisis.

OBJECTIVE

To assess the root causes of drug shortages, the impact of FDASIA on preventing shortages, and identify areas for potential research to better inform future policies.

METHODS

A literature search was performed to assess the available information on the primary causes of drug shortages. Confidential interviews were conducted with government and legislative staff, lobbyists, and other interested parties.

RESULTS TO DATE

New laws in FDASIA, such as the mandatory reporting of potential drug shortages by manufacturers, have allowed the FDA to significantly reduce new drug shortages in the U.S. However, due to ongoing drug shortages that continue for more than one year, the number of active shortages has continued to increase since 2007.

CONCLUSIONS

My research has shown that the current FDA policy is too reactionary and will not completely resolve the shortage issue. The FDA's reaction to anticipated and confirmed shortages has been to increase production by other firms, identify means to mitigate the dangers of products with quality issues, and expedite review of regulatory submissions. This has helped mitigate some shortages, but the fact that shortages still exist signals a fundamental flaw in the market. In theory, product shortages for life-saving drugs or even simple products such as potassium phosphate or saline should not occur due to the economic theories of supply and demand. Some economists and policy makers speculate that economic policy changes, rather than reactionary measures, may be the most appropriate avenue for achieving a long-term solution. Artificial price caps have forced some manufacturers to cease production. Drug pricing policies have also hampered incentives for multiple manufacturers to enter the market to create a reliable stream of high-quality products.

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Emergency Department Physician Assistants' Perceptions of Diagnostic Testing and Shared Decision-Making

OBJECTIVES

Physician assistants (PAs) are an increasing proportion of the EM workforce. Few studies have examined PAs' perceptions and motivations behind decision-making in the ED. We seek to understand EM PAs' perceptions and motivations for diagnostic testing and decision-making.

METHODS

The study population was all full-time PAs working in the George Washington University ED. All 14 PAs (6 with work experience over 5 years, and 8 less than 5 years) were included, with a response rate of 100%. We employed a 9-item questionnaire with a combination of closed and open-ended questions. Phone interviews were conducted by the first author, an EM resident trained by the second author, an expert in narrative interview. Data were analyzed using grounded theory methodology, with 100% agreement between the authors.

RESULTS

Most (88%) PAs with less than 5 years experience perceived emergency providers to order too many tests; 50% of those with more than 5 years did. The most common reasons for ordering tests were casting a wide differential, maintaining ED throughput, and avoding malpractice. The majority (57%) reported asking patients about their preferences regarding diagnostic testing some of the time, versus most of the time (14%), all of the time (14%), and none of the time (14%). Most (64%) reported learning about shared decision-making in PA school; none recalled formal training on the job. 57% perceived themselves to order the same number of tests as their peerss; 21% reported ordering fewer tests and 14% more.

CONCLUSIONS

Many PAs perceive emergency providers to order too many tests. Though PAs practice under attendings' licenses, there is some variation in self-perception of test ordering behavior. There is wide variation in how much PAs involve patients in decision-making regarding diagnostic testing. Formal continuing education in shared decision-making may increase PAs' involvement of patients and could reduce diagnostic testing.

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Unnecessary Surgery: Characteristics of Patients and Providers

BACKGROUND

The 2012 Institute of Medicine report estimates that the cost of unnecessary medical services, including unnecessary operations, in the United States (U.S.) is $210 billion annually. Unnecessary operations also represent a form of preventable harm. The objective of the current study was to identify characteristics of physicians and patients involved in unnecessary surgery.

STUDY DESIGN

We analyzed paid malpractice claims involving unnecessary surgery in the National Practitioner Data Bank (NPDB), from September 1, 1990 to July 30, 2010. Data were collected regarding year, type of settlement, payout amount, clinical outcome, patient characteristics, physician characteristics, and state licensure disciplinary action.

RESULTS

A total of 3,479 claims were identified. The inflation-adjusted mean payout for an unnecessary operation claim was $278,059. Out of the 3,479 claims, 1,077 were associated with one of the following clinical outcomes: emotional injury (1.9%), temporary injury (27.4%), permanent injury (60.5%), or death (10.2%). Surgeon mean age was 44.2 years, and mean time in practice was 26.4 years. Of surgeons named in unnecessary surgery claims 15.2% were named in a prior unnecessary surgery claim, 54% were named in a prior malpractice claim, and 11.9% had prior disciplinary action.

CONCLUSIONS

Unnecessary operations are associated with large payouts and patient morbidity and mortality. Approximately one in seven events involve a surgeon previously named in an unnecessary operation claim. The findings of this study identify a subgroup of both physicians and patients for targeted interventions aimed at improving quality and reducing costs in surgery.

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Perceptions and Motivations of Emergency Medicine Residents Regarding Diagnostic Testing: A Qualitative Study

BACKGROUND

Studies from the Institute for Healthcare Improvement estimate that 30% of diagnostic tests done are unnecessary. Little is known about trainees' perceptions of test ordering.

OBJECTIVES

We seek to understand Emergency Medicine (EM) residents' perceptions and motivations for ordering diagnostic testing.

METHODS

The study population was four classes of EM residents at George Washington University. All 43 residents were included, with a response rate of 100%. We employed a 9-item questionnaire with a combination of closed and open-ended questions. Both in-person and phone interviews were conducted solely by the first author, an EM resident trained by the second author, an expert in narrative interview. Data were analyzed using grounded theory methodology, with 100% agreement between the authors.

RESULTS

Most residents (73%) perceived emergency physicians (EPs) to order too many tests, 27% believed just enough, and none too few. The most common reasons for ordering tests were fear of missing emergent conditions, fear of malpractice, and patient expectations. 16% of residents discussed diagnostic testing with patients most of the time, 72% some of the time, 5% all the time, and 7% none of the time. Nearly all respondents (98%) stated that they received no formal training in residency on how to involve patients in decision-making. The majority perceived themselves to order the same number of tests (70%) as their peers; 23% perceived ordering fewer and 7% more.

CONCLUSIONS

EM residents perceive EPs to order too many diagnostic tests, though they tend to self-report that they order the same number of tests as their peers. While patient expectation is cited as a major reason for ordering tests, most residents discussed testing with patients only some of the time. Incorporating shared decision-making into the residency curriculum may increase patient involvement, guide more tailored workup, and reduce unnecessary testing.

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A Joint Model of Persistent Human Papillomavirus Infection and Cervical Cancer Risk: Implications for Cervical Cancer Screening

To inform decisions about cervical cancer screening intervals, we develop a novel joint model for HPV and cervical cancer. We calculate the increase in precancer risk per year of continued HPV infection and compare implications for screening intervals of this joint model to those from population-average marginal models currently used for informing medical guideline development.

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Varying-Resolution Synteny Block Construction for Large-Scale Phylogenomics

Genome rearrangements (such as reversals, translocations, fusions, fissions) are evolutionary events that shuffle genomic material without alternating it otherwise. Since large-scale genome rearrangements are rare events, the minimum number of rearrangements between different genomes represents a good measure of their evolutionary distance and is often used for imposing their phylogeny. Comparative study of multiple genomes starts with construction of their synteny blocks (SBC) that represent genomic regions conserved across the genomes. Traditionally rearrangement analysis deals with large (low-resolution) synteny blocks since they shadow more frequent and tangled micro-rearrangements. Evolutionary distance based on rearrangement of synteny blocks inspires Ancestral Genome Reconstruction (AGR) problem, asking for architecture of ancestral genomes at the internal nodes of the evolutionary tree such that the total evolutionary distance (along the tree branches) is minimized. Genome rearrangements can be viewed as events that break a genome into fragments and "glue" these fragments in a different order. Genomic regions that are broken (used) by rearrangements are called breakpoints. Breakpoint reuse occurs when the same breakpoint is usedby two different rearrangements. Recent studies of rearrangements in mammalian genomes revealed that their breakpoints are not equally distributed across the genomes but rather tend to group in a small number of fragile regions. Fragile regions are prone to breakpoint reuses that represent a major obstacle for AGR tools, leading to inability of reliable reconstruction of ancestral genomes. Since synteny blocks form a basis for subsequent rearrangement analysis, their quality has a major impact on abilty to solve AGR. On the other hand, traditionally SBC and solving AGR are performed separately and independently. We propose a new approach for addressing the problem of SBC and challenges in subsequent AGR in conjunction. A crucial observation is that breakpoint reuses depend on the resolution of synteny blocks and thus may be eliminated by local increase of the resolution (e.g., a breakpoint used by two rearrangements in low resolution may be separated by a synteny block into two breakpoints in high resolution with no breakpoint reuse). In contrast to traditional fixed resolution synteny blocks, we show that varying-resolution synteny blocks more adequately describe rearrangement features of different genomic regions (both fragile and solid). We further propose a method for eective use of varying-resolution synteny blocks in rearrangement analysis of multiple genomes that allows us to reconstruct their evolutionary history even in regions with high breakpoint reuse (particularly for mammalian genomes).

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Producer Label Claims are Associated with Antibiotic Resistance among E. coli Contaminating Retail Turkey Meat

E. coli is a commensal organism of the human and animal gastrointestinal tract and a common contaminant of retail poultry products. The use of antibiotics during food-animal production is associated with increased prevalence of antibiotic resistance among bacteria isolated from these products. Alternatives to conventional food-animal production include raising poultry without antibiotics or organically and both of these production practices have strict guidelines regarding antibiotic usage. In this study, we compared the prevalence of antibiotic resistance among E. coli isolated from retail turkey meat raised conventionally, without antibiotics, or organically, purchased twice monthly at nine grocery stores in Flagstaff, AZ from January-December 2012. The overall prevalence of E. coli contamination (91%) did not differ significantly by production category. However, resistance to 5 of 12 antibiotics tested was significantly more prevalent among isolates from conventional products when compared to products raised without antibiotics or organically. Furthermore, conventionally raised products were significantly more likely to be contaminated with multidrug-resistant E. coli (59%) than were products raised without antibiotics (23%) or organically (28%). Our results suggest that reduction, or elimination, of antibiotic use during turkey production—as assessed by producer labels claims regarding antibiotic usage—is associated with significant reductions in antibiotic resistance among contaminating E. coli.

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Comparing Science Policy Choices in Chemical Risk Assessments Across Organizations

Environmental and public health organizations including the World Health Organization (WHO) and the U.S. Environmental Protection Agency (USEPA) develop human health risk values (HHRV) that set 'safe' levels of exposure to non-carcinogens. Even when evaluating the same scientific data, the HHRVs from different organizations often disagree. This analysis evaluates specific science policy choices made in the context of setting HHRV and differences in these decisions observed across organizations. These choices include the selection of principal study, critical effect, the point of departure (POD) approach and numerical estimate, and the use of uncertainty factors (UF). By systematically evaluating each choice while recognizing connections among choices, the objective is to elucidate the most common sources of agreement and disagreement across organizations. In setting the UF, organizations typically use default 10X values, reduced values (often 3X), or chemical-specific adjustment factors. A common reason for using a reduced UF with a lowest observed adverse effect level (LOAEL) POD is that the observed critical effect is considered minimally adverse. If chronic studies indicate that subchronic POD are more sensitive, a full 10X UF may not be required for a subchronic principal study. While older assessments often use default values, the use of PBPK modeling and human study data is becoming increasingly common, resulting in reduced UFs to account for interspecies and intraspecies extrapolations. To account for database deficiencies, organizations may invoke a database UF for concerns such as the lack of a specific study type or potential carcinogenicity. This analysis also examines cases where given the same or similar toxicological data, one or more organizations set an HHRV but other organizations do not. Included in the analysis are HHRV from the following organizations: USEPA, WHO, Health Canada, RIVM (Netherlands), and the U.S. Agency for Toxic Substances and Disease Registry.

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Use of guilt appeals in public health social marketing: A meta-analysis

OBJECTIVE

In social marketing, the use of guilt appeals is instrumental to influencing prosocial behavior, such as positive health behaviors. Yet, empirical evidence has yielded inconsistent results: in for-profit contexts, guilt appeals are found to have a non-linear effect on attitudes, intentions, and felt guilt. In contrast, guilt appeals in health contexts positively affect these outcomes. Furthermore, varying levels of guilt intensity were observed to have a curvilinear relationship with attitude and behavior change in some contexts. Research has yet to assess the relationships between guilt appeals of varying intensity levels as well as aroused guilt across multiple studies. The current study was a meta-analysis of all published work examining relationships between guilt appeals of varying intensity with feelings of guilt and anger, as well as with attitudes and intentions. The study also explored whether source intent or context (for-profit or prosocial messaging) moderated these relationships. The objective was to further inform the use of guilt appeals as a social marketing tactic that can affect positive health attitudes and behaviors.

METHODS

A meta-analysis research method was used, in addition to a quantitative and qualitative review of every experimental study examining the effects of guilt appeals on outcomes. Experimental conditions, including guilty intensity and varying contexts (social or commercial marketing), were extracted into an Excel spreadsheet for coding.

RESULTS TO DATE

A qualitative analysis yielded results that added insight to effectively using guilt appeals. Moderate/high guilt appeals were found to be more effective in creating attitude and behavior change in prosocial as opposed to commercial marketing. However, high guilt should be used cautiously given the risk of defensive processing, and low guilt can sometimes be insufficient in driving attitude and behavior change. Forthcoming statistical analysis will examine variations across coded levels of guilt intensity within prosocial or commercial contexts.

CONCLUSIONS

Health communications is an essential component of the public health field, and proper use of effective communications techniques can have profound influence on health attitudes and behavior. Although guilt appeals have been seen as controversial or counterproductive within the context of commercial marketing, this technique is beneficial within the context of prosocial, not-for-profit social marketing. Guilt appeals have been found to influence behavior change in contexts such as drunk driving, emergency preparedness, and smoking. Knowledge of using appropriate levels of guilt intensity in specific contexts can add significant value to the existing tactics of public health communications and marketing scholars.

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Self Determination Theory: Exercise Causality Orientations Differ by Primary Exercise Participation

Self-determination theory (SDT; Deci & Ryan, 1985) has gained considerable support for explaining how motivation influences exercise behavior. SDT posits that behaviors lie on a continuum of self-determination and that environmental factors can affect the level of self-determination experienced. SDT also states that one's causality orientations (i.e., autonomy, control, and impersonal) influences their proclivity to perceive and orient themselves in different environments; and, individuals possess varying levels of all three orientations. With respect to exercise behavior, many health and fitness centers offer their members a variety of different environments in which to exercise. However, causality orientations with regard to individuals' exercise choices have remained unexplored. Therefore, the purpose of this study was to determine the extent to which health and fitness club members' exercise causality orientations differ depending on the exercise environment in which they primarily participate in (i.e., group exercise, personal training, or independent exercise). Data was gathered from health and fitness club members (N = 267) through a secure-online survey, which included the Exercise Causality Orientations scale, the International Physical Activity Questionnaire, and items measuring specific exercise behaviors. For each of the three exercise environments, autonomy was the predominant orientation. A one-way ANOVA indicated significant differences between exercise environments for autonomy orientation ($p < .01$), control orientation ($p < .01$), and impersonal orientation ($p < .01$). Post hoc testing further indicated that independent exercisers report significantly higher levels of autonomy orientation than both group exercisers ($p < .001$, $d = 0.88$) and personal training exercisers ($p < .01$, $d = 0.51$). Of the three exercise environments, independent exercise offers the lowest level of oversight therefore allowing exercisers to express the highest levels of self-determined behavior. Control orientation was highest among personal training exercisers; however, both personal training ($p < .001$, $d = 1.04$) and group exercisers ($p < .001$, $d = 0.82$) reported significantly higher control orientation than independent exercisers. Personal training sessions and instructor-led exercise classes are environments which provide external mechanisms to regulate exercise behavior. Lastly, group exercisers reported significantly higher levels of impersonal orientation than both personal training ($p < .01$, $d = 0.57$) and independent exercisers ($p < .01$, $d = 0.48$). In sum, the results of this study support the theoretical tenets of SDT thereby providing health and fitness clubs with a theoretical framework for understanding how members regulate their exercise behavior in different exercise environments in order to promote sustained exercise behavior.

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Marijuana Use in Glaucoma: A survey of perceptions among glaucoma patients in an urban glaucoma clinic in Washington, DC

OBJECTIVES:

To identify factors that could lead to intentions to use marijuana (MJ) among glaucoma patients population given the legal status of medical MJ in DC since 2010.

METHODS:

204 glaucoma patients completed a survey that included items related to demographics, perceived severity of glaucoma, past MJ use, perceptions toward MJ (legality, side effects, safety/effectiveness, false beliefs), perceptions toward current glaucoma management (satisfaction, ability to pay for treatment) and intentions to use MJ for glaucoma. Medical records were reviewed for disease severity.

RESULTS:

Intentions to use MJ in this sample were generally low (Mean = 2.36 in a 1 to 5 scale). Previous recreational use of MJ was reported by 50% of the sample, 4.5% reported previous use for glaucoma and 3% had use MJ for other medical conditions. Younger age, prior knowledge of MJ use in glaucoma, recommendation to use MJ from family member or a friend, prior use of MJ for glaucoma or for recreational purposes and perceptions toward MJ and current glaucoma management were significantly correlated with intentions, while disease severity was not. A two-step linear regression analysis indicated that prior use of MJ for recreational purposes was a significant predictor of intentions to use MJ, but was no longer significant when perceptions were added in the model. Perceptions of legality, false beliefs regarding MJ and satisfaction with current glaucoma management were significant predictors in the second step. Perceptions that MJ should be legal were found to mediate the effects of past use and other perceptions.

DISCUSSION:

Our results show that prior use of MJ, false beliefs about MJ, perceptions MJ should be legal and less satisfaction with glaucoma management are significant predictors to use MJ. Surprisingly, neither the level of education nor the severity of glaucoma disease were found to be correlated with intentions to use MJ.

CONCLUSION:

It is important to understand the factors associated with patients' intentions to use MJ as a treatment for glaucoma. Such understanding will allow us to help our patients make informed and better decisions regarding their treatment. More studies in this area are needed.

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Factors contributing to subluxation, re-dislocation, and the need for additional surgery following closed reduction in development dysplasia of the hip.

BACKGROUND

A primary goal in the treatment of developmental dysplasia of the hip (DDH) is to achieve a stable, concentrically reduced hip with minimal morbidity in order to promote normal development of the patient's acetabulum and proximal femoral head and minimize the need for secondary procedures later in life.1 Closed reductions are usually attempted prior to pursuing an open reduction in patients with DDH. Unfortunately, some patients subluxate or re-dislocate following a closed reduction and others exhibit residual acetabular dysplasia, thereby requiring a secondary procedure, such as pelvic osteotomy. Nevertheless, there is little evidence to predict this.

OBJECTIVE

To identify radiographic parameters that might predict the need for secondary procedures. We hypothesized that the amount of coverage provided by the cartilaginous acetabulum represents an important factor.

METHODS

A retrospective review of patients who had undergone closed reduction for a dysplastic or dislocated hip at Children's National Medical Center between 2000 and 2010. Patients were excluded if their medical records and radiographs were inadequate or their hip dislocation was attributed to a cause other than DDH. Such causes include arthrogryposis, Down's syndrome, and cerebral palsy. 45 patients were identified as meeting the inclusion criteria. Intra-operative arthrograms were used to measure the cartilaginous coverage via the acetabular index (AI), center edge angle (CEA) and the acetabular cartilagenous angle (ACA). Statistical analysis was employed to determine whether a correlation exists between cartilagenous coverage and treatment failure.

RESULTS AND CONCLUSION

Of the 45 patients that had closed reductions, 10 patients required secondary procedures for persistent hip dysplasia of some form. Analysis is ongoing, however our findings thus far suggest that AI withstands as a helpful measure in evaluating the success of a closed reduction. The significance of CEA and ACA in predicting the outcome of a closed reduction has yet to be verified.

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SCHOOL OF MEDICINE AND HEALTH SCIENCES
OTHER INTERNATIONAL MEDICINE PROGRAMS

Non-invasive tests for liver fibrosis in patients with HIV and HCV co-infection and use of Sirius red as a quantitative index

BACKGROUND

HCV End-stage liver disease is a major cause of death in HIV-infected patients. Estimating the fibrotic stage of liver disease is usually assessed on liver biopsy. We have previously reported that non-invasive serum markers have good predictive value for the extent of liver fibrosis on histologic assessment (Metavir score) with Masson trichrome (MT) stain. Recently, a more precise quantitative method has been used to measure liver fibrosis by Sirius red (SR) stain and morphometry with few reports of its use in HCV-HIC co-infected patients.

OBJECTIVES

The objective is to determine the reliability of non-invasive markers to predict liver fibrosis in HCV-HIV co-infected patients and to determine if morphometric quantitation of SR staining in liver tissue can improve the predictive value of non invasive markers for liver fibrosis.

METHODS

Liver biopsies and clinical data were studied on 13 HCV/HIV co-infected patients (2012-13), data obtained from GWUMC EHR on average within 2 months of liver biopsy. Non-invasive markers analyzed were APRI (AST, platelets), FIB-4 (age, AST, ALT, platelets), and HGM-1 (platelets, AST, glucose). Liver biopsies were reviewed after MT stain to assign a METAVR score (F0-no fibrosis to F4-cirrhosis); the 13 patients had fibrosis scores of F0 (0), F1 (6), F2 (2), F3 (1), F4 (4). Seven biopsies were studied with Sirius red and morphometric analysis using ImageJ software.

RESULTS

The 13 patients had a mean age of 52, 85% male; 85% African-American. Results are shown for the 13 patients alone and aggregated with results from a previous cohort studied (total 57). In predicting the presence of significant fibrosis (≥ F2) on liver biopsy using MT stain, APRI had a positive predictive value (PPV) of 100% (AUC 0.837); Fib-4 had a PPV of 80% (AUC 0.972); and HGM-1 had PPV 83% (AUC 0.975). The aggregate data of the 57 patients found that APRI had an AUC on 0.84, Fib-4 had an AUC of 0.87 and HGM-1 had an AUC of 0.83. APRI had an AUC of 0.83 for cirrhosis (F4). Sirius red had 100% correlation with the Metavir score (AUC 1.0) and showed gradations of fibrosis in cirrhosis.

CONCLUSIONS

Non-invasive markers APRI, Fib-4 and HGM-1 are reliable non-invasive markers with a very good ability to predict liver fibrosis in HIV+/HCV+ patients. Sirius red quantitation of liver fibrosis is comparable to the Metavir score, with greater precision and range of possible results, which may prove useful in predictions for clinical complications in cirrhosis.

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An assessment of types of injuries incurred during turbulence

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INTRODUCTION

Commercial airplane travel is one of the most widely used forms of transportation that allocates resources and requires time to ensure the safety of its passengers. Despite the measures in place to prevent injuries, accidents do still happen. Turbulence continues to account for a large number of deaths and accidents for crew and passengers in flight. Episodes of turbulence result in the movement of unrestrained passengers resulting in physical injuries and death. In our retrospective study from data collected from RGW Cherry based Microsoft Excel, we examined the injury records from commercial flights in the attempt to contribute to forming a focused pattern for preparation of crew to prevent injuries from turbulence. Two independent authors reviewed the narratives of 3928 flights from April 1966 to December 2009 of which 206 narratives met the inclusion criteria of having injuries related to naturally occurring turbulence. These injuries were categorized into injuries flight crew, cabin crew, and passengers. Then the severity was divided into fatal, serious, and minor injuries to establish a pattern. A total of 28,300 persons were reported to have been on board during the in flight turbulence mishaps of which a total of 5 received fatal injuries, 325 received serious injuries, and 965 received minor injuries.

METHOD

The study data set was obtained from RGW Cherry based in Microsoft Excel. The data set included all collected airline mishaps from commercial airliners. Two authors independently reviewed all data set entries and identified those related to in flight turbulence. These were placed in a Microsoft Excel (XXXX,CA) spreadsheet. The narrative and injury data of each in flight turbulence event was examined in detail, allowing the authors to better understand the category, severity, and type of injuries encountered. The category of injury was divided into flight crew, cabin crew, and passengers. The severity was divided into fatal, serious, and minor injuries based on the identified injuries in the report. The type of injuries encountered was based on the reported injury pattern.

RESULTS

3928 mishaps were included in the data set spanning the time period of April 1966 to December 2009. After removal of those mishaps which did not include an descriptive details and mishaps involving Cargo transport planes only, all 2398 remaining mishaps were reviewed individually. Of these described commercial airline passenger mishaps, 211 met the inclusion criteria of having been related to naturally occurring in flight turbulence. 4 turbulence mishaps did not generate any injuries and were removed. 1 turbulence mishap resulted in 3 injuries but they were not categorized in any fashion, making this mishap uncodeable. The final database included 206 separate mishaps. A detailed review of the each in flight turbulence mishap demonstrated that 132 contained detailed injury type description and 74 did not. (Table 1)

TABLE 1. DATA SET DEVELOPMENT

Database of all Mishaps from 1966 to 2009 = 3928
Database of Commercial Passenger Airliner Mishaps with mishap information from 1966 to 2009 = 2398
Total in flight turbulence mishaps database = 211
In flight turbulence mishaps with sufficient data/injuries = 206 (total on board = 28,300)
In flight turbulence mishaps detailed injury type = 132

A total of 28,300 persons were reported to have been on board during the in flight turbulence mishaps of which a total of 5 received fatal injuries, 325 received serious injuries, and 965 received minor injuries. Table 2 outlines the injury severity by category. Table 3 outlines the

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Case Studies in Team Science

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BACKGROUND

The science of team science is the study of collaborative processes involved in team science initiatives and how these processes inform and improve team dynamics (Stokols, Misra, Moser, Hall, & Taylor, 2008). Evidence suggests that teams typically perform at a higher level, are more efficient, and are more productive than a single investigator or service provider (Hall, 2012; Hall, Feng, Moser, Stokols, & Taylor, 2008; Lotrecchiano, 2013). Collaboration would almost seem cliché except for the poignant fact that it is the way in which large scale research centers are focusing their attention in order to maximize outcomes and resources and maintain innovation. In the past two decades, science has seen a shift away from the lone researcher, to teams of individuals working together in varying levels of collaboration (Falk-Krzesinski et al., 2011).

OBJECTIVES

To assess the impact of team science on the operation of medical teams by analyzing three case studies: 1) focusing on pediatric nephrology group and determining how teams approach collaboration readiness, 2) focusing on a surgical perioperative group to learn how teams navigate problem solving, and 3) exploring leadership readiness amongst a team of pediatricians.

METHODS

A 10-item questionnaire including metrical and explanatory questions distributed to diverse research teams from the pediatric disciplines listed above investigated key aspects of team science. The results were analyzed and represented in a case study format (Stake, 1995) with the goal of providing insights and implications for medical research teams and their teaming dynamics (Eisenhardt, 1989).

RESULTS

Survey analysis of collaboration readiness within the pediatric nephrology group revealed that (70-90%) of respondents possessed the intrapersonal characteristics deemed vital to collaborative readiness; most respondents agreed on sharing data and credit, 60% agreed to sharing leadership, and 60% of respondents agreed that their institution meaningfully supported collaborative research initiatives. Navigation of problem-solving within the surgical perioperative team revealed that while members valued the team in concept and in practice, antecedent factors such as institutional support and lack of clear administrative leadership have led to some challenges and dissatisfaction. Exploration of leadership readiness amongst the team of pediatricians revealed that while there was no designated team leader, being team leader was only important for 40% of the respondents.

CONCLUSIONS

Our case study research has demonstrated that a survey assessment of collaborative team science principles could inform and potentially enhance the team collaborative process by measuring team dynamics theory building, exploring how to navigate problem solving and assessing leadership readiness in the iterative process of teamwork. This exercise could be a cost-effective and time saving step in the design and construction of medical research teams.

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Role of 5HT Receptors in Cardiovascular Control– Implications for Sudden Infant Death Syndrome (SIDS)

SIDS is the sudden death of an infant under one year of age which remains unexplained after a thorough case investigation, including performance of a complete autopsy, examination of the death scene, and review of the clinical history. SIDS victims succumb to cardiorespiratory collapse and experience a bradycardia that accompanies, or precedes apneas. Autopsy results indicate SIDS is highly associated with serotonin (5HT) abnormalities in the brainstem. Heart rate is determined mainly by the activity of parasympathetic cardiac vagal neurons (CVNs) in the brainstem that are surrounded by 5HT3 receptors. Yet there are few hypotheses, and little information, concerning when, and how, 5HT3 receptors are activated in CVNs and increase the risk of SIDS. In this study we directly address this important issue and test the hypothesis that hypoxia recruits trafficking of intracellular 5HT3 receptors to the postsynaptic membrane in CVNs.

To test this hypothesis we are utilizing a 5HT3 receptor ligand that is tagged with a fluorochrome that allows real time imaging of 5HT3 receptor localization, density and trafficking. A fluorescent retrograde tracer, (cholera-toxin (CTB) Alexa Fluor 488), was used to identify CVNs in brainstem slices after injecting the fluorescent tracer into the fat pads at the base of the heart. Brainstem slices containing CVNs were incubated with the 5-HT3 receptor ligand conjugated to a different fluorochrome. The 5HT3 receptors surrounding CVNs were imaged during both control and hypoxia conditions with confocal microscopy. Our preliminary results suggest hypoxia elicits trafficking of 5HT3 receptors to the postsynaptic membrane in CVNs. The increased density of postsynaptic 5HT3 receptors would make CVNs highly responsive to 5HT, increasing the risk of bradycardia and bradyarrhythmias, indicating this receptor trafficking could be responsible for the decrease in heart rate that occurs with hypoxia and the lethal bradycardia that occurs in SIDS victims.

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The Impact of Condition-Specific Camps on Resiliency and Adaptive Behavior of Children with Neurofibromatosis

OBJECTIVES

To assess the impact of condition-specific camps on the resiliency and adaptive behavior of children with Neurofibromatosis.

METHODS

A three-year study conducted by Children's National Medical Center showed that a condition-specific camp for epileptic children could increase social interactions, responsibility, and communication in campers. This hypothesis has been expanded to the week-long Neurofibromatosis summer camp. Research was conducted at Camp New Friends through surveys taken before camp, via Ipads at the end of camp, and three months following camp via the online survey tool Qualtrics. The Price-Emory Resiliency Scales , designed to identify and quantify core personal qualities of resiliency in youth, were used. The survey questions were written at a third-grade reading level, with developed T-score ranges. The survey consists of three scales: the Sense of Mastery, Sense of Relatedness, and Emotional Reactivity.

RESULTS TO DATE

In coordination with the Resiliency Scales, the 38 participants were divided into three age ranges: 9-11, 12-14, and 15-18. The mean T-score for the sense of mastery for the youngest age group rose from 32 before camp to 41 post-camp. The mean T-score for sense of relatedness rose from 27 to 29. The mean T-score for emotional reactivity went from 51 to 59. The 12-14 age group had similar results: sense of mastery went from 39 to 45, sense of relatedness went from 46 to 53, while emotional reactivity dropped from 54 to 52. The 15-18 age group had sense of mastery rose from 47 to 51, sense of relatedness stayed at 45, and emotional reactivity rose from 48 to 53. The three-month post-camp surveys will be analyzed for comparison.

CONCLUSION

Resiliency reflects how an individual is able to overcome both internal and external stresses. Children with Neurofibromatosis obstacles include chronic pain, disfigurement and learning disabilities. The resiliency changed before camp to after camp, especially in the youngest age group. The three-month post-camp survey should provide further information to deem if their resiliency has changed since summer camp.

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Quantitative Muscular Ultrasound (QMUS): Pilot Data on Interrater Reliability of Gray Scale Analysis Technique

BACKGROUND

Gray scale analysis of ultrasound images has been proposed as a method to assess muscle morphology as it relates to sarcopenia. However, distinguishing parenchymal abnormalities by gray scale analysis is reported to be operator-dependent.

OBJECTIVE

The purpose of this pilot study was to examine the interrater reliability of gray scale analysis by defining regions of interest (ROI) in 3 different ways: 1) full image (FI), 2) single muscle (SM), and 3) peak echogenicity of 1 cm2 within a muscle (SQ).

METHODS

Four investigators completed a total of 120 gray scale estimates from 10 images randomly selected from a database that included longitudinal views of the trapezius, pectoralis major, deltoid, brachioradialis, rectus femoris, and tibialis anterior muscles. Scans performed by a single examiner using a 13-6 MHz linear array transducer with standardized machine settings were obtained from healthy participants (25.1 ±1.5 yrs). Adobe Photoshop was used to obtain gray scale histogram mean values for each ROI. Reliability of the 3 methods was assessed using intraclass correlation coefficients (ICC 2, k) and standard error of the measurement (SEM).

RESULTS TO DATE

The gray scale mean values obtained by the 4 investigators ranged from 61.4-61.8 for FI, 46.2-47.4 for SM, and 66.4-97.7 for SQ. Investigators demonstrated excellent interrater reliability with the FI and SM methods yielding an ICC 2, k of .99 (95% C.I. = .96-.99, p<.001; SEM = 1.3-1.6), whereas the SQ method demonstrated poor reliability (ICC 2, k =.53, 95% C.I. = .18-.83, p<.001; SEM = 17.1).

CONCLUSIONS

Our pilot data demonstrate that the FI and SM techniques were the most reliable of our 3 gray scale assessment methods, and displayed comparable results. Given that the SM method captures only the muscle of interest, this approach to gray scale estimation may be considered the preferred technique. Additional research is warranted to confirm and extend these findings in a larger sample.

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Inferior Vena Cava Size is Not Associated with Shock Following Injury

BACKGROUND

The inferior vena cava (IVC) collapses with shock but may also be collapsed in volume depleted patients in the absence of shock. The speed and availability of CT make IVC measurement an attractive diagnostic modality for shock. The purpose of this study was to determine if IVC size following injury is associated with shock.

METHODS

Retrospective data were collected on 272 trauma patients admitted to an adult trauma center from January 1st to December 31st, 2012. Patients who met the highest level activation criteria and underwent an abdominal CT scan during their initial resuscitation were included. All images were reviewed by 2 attending radiologists and concordance was assessed using the Pearson correlation coefficient. The transverse (T) and anterior/posterior (AP) diameters of the IVC were measured to calculate a T-AP ratio. ANOVA and chi-square were used to assess for a relationship between this ratio and various indices of shock.

RESULTS

The mean age of the study cohort was 50 ± 21, mean ISS was 14 ± 9, 74% were male and 96% sustained blunt trauma. The IVC was round in 68 patients (25%) and collapsed in 68 patients (25%). There was no significant association between IVC size and shock index, blood pressure or hemoglobin. Similarly, there was no association between IVC size and the need for urgent operation, angiography, emergent transfusion, hospital length of stay or mortality.

CONCLUSION

There is no correlation between IVC size and shock following injury. Therefore, measurement of IVC size by CT scan may not be a reliable method to determine the presence of shock in patients following trauma.

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

Balancing service and academic responsibilities in an interprofessional environment with underserved communities

INTRODUCTION

Providing opportunities to participate in interprofessional service learning in the health care professions is a shared goal of clinical training graduate programs at the George Washington University. The Program in Physical Therapy (PT) and Physician Assistant (PA) Studies provide a course designed to introduce to community health care, learn collaboratively, and apply their skills to underserved populations. There is an inherent tension between the passion for service and the commitment to academic rigor. The purpose of this study was to examine the priorities and reflections of students as they approached this time management professional development dilemma.

METHODS

Ninety-four students were enrolled in the combined course (60 in PA; 34 in PT). Six planned interprofessional sessions: one collaborative teaching and teambuilding session; four interprofessional team clinical experiences with Special Olympics FunFitness screenings; and one debriefing session. Due to the government shutdown and adverse weather conditions, three of the four clinical experiences were cancelled. Several SurveyMonkey surveys were used to address student, curricular and service preferences. The survey contained both qualitative and quantitative data.

RESULTS

87% of students responded to the first survey (54/60 PA students, 28/34 PT students). 62% of respondents said the event should continue, but 14.6% thought the event should continue as planned. While the majority of students wanted to continue with the community event, them 76% wanted to make it optional. A second survey was sent to determine how many people would attend the event. When given the opportunity to participate in the event, 5 students (8.5%) agreed to participate (4 from the originally scheduled group, 1 from another scheduled group).

DISCUSSION

Because of the low response the event was cancelled. The students repeatedly stated a desire to continue with the event, citing reasons such as “the athletes are looking forward to it”, the event being a great “interdisciplinary environment”, and “it’s a good cause”. However, the majority voted to make it optional or cancel the event mainly due to being “swamped with work.”

CONCLUSION

This data suggests that the community service aspect is important to students, but balancing community service with school demands is a deterrent to involvement.

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Congruence and divergence in assessing individual and group readiness for change in an academic medical education steering team

BACKGROUND

Academic medical centers conducting research, implementing innovation, and advocate for environmental solutions (Gazewood, Rollins, and Galazka, 2006). Competing cultural values within these large-scale learning environments require that education strategies conform to internal and external needs (Vera and Crossan, 2004). Assessing readiness for change is critical to successful change management. Identifying to what degree a group is ready for change and isolating what interactive group mechanisms have the greatest potential to endure change will result in more successful strategic planning and functional change management.

OBJECTIVE

This research searches for individual and group culture congruence and divergence, using the Organizational Culture Assessment Instrument (OCAI) (Cameron and Quinn, 2006) to quantify readiness for change on the individual and group levels.

METHODS

Nine members of an academic medical center education steering team completed the OCAI. 6 group dynamic areas and 4 culture contexts were measured. Each domain contributes to a composite of the group as well as shows individual now and preferred culture preferences. The degree of change was determined by the difference between the now and preferred culture perceptions of the group. Positive and negative differences indicated a direction for change towards an increase and a decrease in importance, respectively. To determine whether there was a balance of positive and negative differences in now and preferred perceptions, a Wilcoxon signed-rank test was performed.

RESULTS:

Results from the Wilcoxon signed rank test indicate significant findings in all domains except for one. For organizational characteristics, a significant change towards a more person-oriented group and a significant decrease for structured group is reported. Participants indicated a significant readiness for an increase in nurturing leadership and for a decrease in leadership grounded in results-orientation. With regards to organizational glue, participants indicated a significant change for more commitment to innovation and less emphasis on achievement. For the overall strategic emphasis, participants reported a positive readiness for change towards human development and participation and a decrease in focus on competitive actions. Finally, participant's perception for success criteria indicated a significant change for more development in teamwork and decrease in outpacing the competition.

CONCLUSIONS:

Results in this study indicate a significant agreement among team members across five of six domains regarding the need for change and the directionality of change. However, this type of assessment could also reveal a lack of readiness for change, suggesting the need to establish more of a common understanding among stakeholders prior to engaging in the planning process.

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Genetic Polymorphisms Associated with Muscle Damage and Exertional Rhabdomyolysis

BACKGROUND

Skeletal muscle breakdown is a normal process that occurs with exercise and exertion. However, after bouts of intensive and/or prolonged exercise, excessive muscle breakdown can occur resulting in exertional rhabdomyolysis (ER). While its clinical significance is well understood there is still a search for genetic susceptibility to elucidate the cause of the inter-individual risk for development of ER.

PURPOSE

We sought to determine the influence of Single Nucleotide Polymorphisms (SNPs) within the Collagen Type 5 Alpha 1 gene (COL5A1), Tumor Necrosis Factor alpha gene (TNFa), Solute Carrier Organic Anion Transporter 1B1 gene (SLCO1B1), Interleukin 15 gene (IL15), Interleukin 15 Receptor Alpha gene (IL15RA) and Adenosine Monophosphate Deaminase 1 gene (AMPD1) on an individual's susceptibility to ER due to their known influence on muscle catabolism. We hypothesized that individuals possessing certain alleles at these particular loci would be more likely to exhibit higher Creatine Kinase (CK) levels before and after exercise and thus have an increased risk of developing ER.

METHODS

DNA was isolated from 156 individuals (78 men and 78 women) between the ages of 18 and 40 years with no history of weightlifting or muscle disease. These individuals underwent an exercise regimen consisting of two sets of twenty-five eccentric bicep curls and were assessed for their CK levels, muscle strength, and muscle soreness. The DNA was genotyped using a Taqman allelic discrimination assay from Life Technologies (Carlsbad, CA); the following SNP's were analyzed; rs12722 (COL5A1), rs2229135 (IL15RA), rs108330 (IL15), rs176027290 (AMPD1), rs4149056 (SLCO1B1), and rs1800629 (TNFβ). Genotyping was performed with standard thermal cycling conditions, with genotypes determined with 7900HT Real-Time PCR system. Hardy- Weinberg equilibrium (HWE) was determined using a β2 frequencies to those expected. Normality of each quantitative trait was tested using the Shipiro-Wilk normality test. Mean measurements were compared to SNP genotypes using analysis of covariance (ANCOVA) methods, followed by Sidak post hoc analysis to control for multiple comparisons, adjusting for weight, age, and gender.

RESULTS

Higher baseline CK levels were associated with women carrying a copy of the T allele for rs1800629 (TNFβ) (CC (N=65; Baseline CK=4.33 U.l-1 ± 0.05), CT/TT (N=12; Baseline CK=4.60 U.l-1 ± 0.11) p=0.037) and two copies of the G allele for rs2229135 (IL15RA1) (GG (N=59; 4.43 U.l-1 ± 0.05), GA/AA (N=19; 4.21 U.l-1 ± 0.09) p=0.040). In addition, a non-synonymous variant in the SLCO1B1 gene (rs41490560) with the C allele was associated with increased strength loss and muscle soreness post-exercise over time for every time period recorded. (Strength loss p=0.030; Soreness p=0.045)

CONCLUSION

The significantly increased levels of muscle strength loss and soreness post-exercise with individuals carrying the C allele of the SLCO1B1 polymorphism suggests there is increased muscle damage from muscle exertion. Previously, individuals with this allele have been seen to suffer from ER when taking statin drugs due to the gene's effect on drug metabolism. However, these results could potentially illustrate the role of the SLCO1B1 polymorphism in ER without the influence of statin drugs. In addition, the higher baseline levels of CK in individuals with at least one copy of the T allele (TT/CT) at rs1800629 in the TNF-β gene may reflect the negative effect of TNF-β in decreasing protein synthesis and increasing muscle turnover. This SNP may be responsible for increasing levels of TNF-β which induces an increased rate of muscle degradation, leading to higher than normal CK levels. IL15RA polymorphisms also have an effect in muscle metabolism, explaining the observed levels of baseline CK. These receptors have been seen to have a role in preventing degradation of skeletal muscle through inhibition of apoptotic signaling pathways. The current study suggests that this SNP may be responsible for a mutation inhibiting its normal function, causing increased muscle atrophy and thus higher CK levels. The TNF-β and IL15RA polymorphisms exhibited sexual dimorphisms as well, possibly due to females expressing higher levels of the gene products as seen in previous studies.

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Assessing Readiness: A Model for Understanding Individual Motivation and Deterrents to Team Collaboration

BACKGROUND

Teams of researchers and scientists attempting to solve complex problems are required to work with contributors with variable collaboration skills (Hall et al., 2008). Collaboration is a cooperative effort between two or more entities striving towards a common goal (Frey, Lohmeier, Lee, & Tollefson, 2006) and is a major objective in many funded projects. The sustainability of many programs depends upon the continued successful collaboration between contributors (Frey et al., 2006), which may be influenced by individual readiness to enter into scientific teams (Gajda, 2004). To date no comprehensive assessment tool of individual readiness has been compiled that captures individual motivations to doing collaborative science. Such assessments requires an measurement of both motivators and deterrents to individual willingness to collaborate. This project provides the theoretical basis and framework for a hierarchy of indicators for individual readiness to collaborate in teams found in the team science and interdisciplinary collaboration literature.

OBJECTIVES

To construct an operative model and instrument by which individual-based motivators and deterrents to collaboration may be measured and analyzed.

METHODS

A review of the team science literature was used to compile a list of motivators and deterrents to collaboration (Eigenbrode et al., 2007; Hadstrom, 1964; Salazar, Lant, & Kane, 2011; Stokols, Misra, Moser, Hall, & Taylor, 2008). The indicators identified were aligned with collaboration theory that suggests four levels of formal integration (cooperation, coordination, collaboration, and coaduation) ranging from low to high (Bailey & Koney, 2000; Gajda, 2004) along with a hierarchy of needs (Maslow, 1954; Sarma, ven der Hoek, & Cheng, 2004). These parallel theories were used to organize 55 indicators onto a hierarchical spectrum denoting cooperation (low) to coaduation (high) level collaborative involvement (Bailey and Koney, 2000).

RESULTS

A conceptual framework captures the relationship between the Bailey and Koney (2000) model for collaboration and the individual-based motivators and deterrents identified in the team science literature along side a hierarchy of participant needs (Maslow, 1954). This conceptual framework will inform the development of an assessment tool for measuring individual readiness in scientific collaborations.

CONCLUSIONS

Although, many authors have proposed models of collaboration, it has been difficult to translate these into instruments that objectively measure the degree of collaboration between entities (Frey, 2004). Our model aligns reported individual motivators and deterrents to collaboration to a hierarchical model for collaboration at the group level. Next we will design a psychometric measurement tool of an individual's readiness for collaboration based upon our framework.

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Cardiac Arrest in and Elderly Patient with Severe Aortic Stenosis Having Occiput-C4 Decompression and Fusion

BACKGROUND

Cardiovascular complications can pose a significant risk to patients who are undergoing noncardiac surgery. Some of the major clinical predictors of perioperative risk include recent myocardial infarction (MI) or severe angina, recent percutaneous coronary intervention (PCI), significant arrhythmias, decompensated heart failure , and significant valvular disease. Because of the potential for severe consequences, cardiac risk assessment for noncardiac surgery is an important process.

OBJECTIVE

To assess the importance of risk stratification and optimization of a patient with a cardiac history undergoing noncardiac surgery.

CASE MATERIAL

Our patient was an elderly male declared high risk for perioperative cardiovascular events given his prior MI, EF=37%, and severe aortic stenosis (AS). The patient was aware of risks and desired to proceed with surgery. At the conclusion of the surgery, when the patient was turned from prone to supine, cardiac arrest occurred. He was resuscitated in the operating room and transported to the ICU on a Levophed drip. Over the course of his hospital stay, he made a full recovery, and was discharged home three weeks after surgery.

DISCUSSION

Worldwide, more than 200 million patients undergo major noncardiac surgery every year, and this number continues to grow. One million people die annually following noncardiac surgery, and 4 % of patients suffer an adverse cardiac event in the perioperative period (3). As anesthesiologists, we must be able to risk stratify patients and intervene when possible to decrease morbidity and mortality.

CONCLUSION

This is a case in which a high risk cardiac patient elected to undergo major surgery, which ultimately resulted in cardiac arrest as a perioperative complication. CPR was successfully initiated, and the patient was transferred to the ICU, where he was treated and released. While little could be done to optimize this patient further for surgery, it is important for Anesthesiologists to be able to stratify patients into various risk categories, optimize the patients for surgery, and to recognize and anticipate complications and be prepared to treat them.

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How Adolescents Cope in the Emergency Department

BACKGROUND

Coping methods utilized by adolescents range from passive mechanisms such as distraction to adaptive mechanisms such as problem solving. Stressors in an adolescent's life include treatment in the Emergency Department (ED).

OBJECTIVE

As there is limited data on how adolescents cope while in the ED, the purpose of this study is to inquire about coping mechanisms used by adolescents during emergency treatment.

METHODS

We surveyed a convenience sample of adolescent patients (ages 12-18 years) in the ED with an adapted Adolescent Coping Orientation for Problem Experiences survey (A-COPE). Patients were excluded if they were non-English speaking, were in police custody, had altered mental status or were hemodynamically unstable. Accompanying parents/guardians were invited to complete a separate survey.

RESULTS

Of the 91 adolescents and 91 parents/guardians who were approached, 62 adolescents and 45 parents completed the survey. There were 61% female participants, with a mean age of 15 (+/-2). The majority of respondents were of non-Hispanic Black ethnicity (61%). Of the 62 adolescents, 74% had prior ED visits in the past year and 34% identified a chronic illness, most commonly asthma. Reasons for emergency treatment included: acute complaint (45%); chronic, worsening problem (32%); injury from an accident (16%); injury due to assault (3%). The most common responses to stress were: sleeping (96%), following parents' requests and rules (95%) and listening to music (91%) at least sometimes. Adolescents reported hardly ever/never smoking (83%) or drinking alcohol (88%). While in the ED, 57% reported boredom, 57% felt safe and 33% experienced stress. The majority of adolescents (95%) felt supported by their parents. Adolescents agreed that music (82%), focusing on getting better (79%) and viewing television (72%) would minimize their stress in the ED.

CONCLUSIONS

Parental support and listening to music may alleviate adolescents' stress in the ED.

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A New Clinical Test for the Diagnosis of Humeroradial Joint Lesion in the Presence of Lateral Elbow Pain: Single-Case Design wit

BACKGROUND & PURPOSE

Lateral epicondylosis is one of the most common causes of lateral elbow pain, however, in some cases patients may show minimal to no improvement. The reason may be that many pathologies can present with similar symptoms. Presently there is not a valid and reliable clinical test, which can be utilized to differentiate between lateral elbow pain secondary to extensor tendopathy and/or arthropathy.

CASE DESCRIPTION

A 38-year-old left hand dominant male recreational athlete with seven month history of left lateral elbow pain. Primary complaints included loss of elbow range of motion, crepitus and evidence of painful locking. Physical examination showed limited and painful range of motion, positive humeral radial joint distraction test, positive humeral radial joint plica compression test, and pain with resisted wrist extension, radial deviation and ulnar deviation. The therapist diagnosed the patient with a loose body and arthropathy of the humeral radial joint. Patient was referred for further evaluation including diagnostic imaging. Plain radiographs and a CT scan demonstrated the presence of a loose body; CT scan showed evidence of joint space narrowing consistent with thinning cartilage. Left elbow arthroscopy with removal of loose body was performed.

OUTCOMES

Left elbow arthroscopy confirmed the presence of a loose body in the humeroradial joint with isolated Grade III chondral lesions on the radial head and capitellum. The patient completed six physical therapy sessions over a four-week period. At discharge, DASH score and DASH Sport Module score were reduced to 8.33% and 25%, respectively. At one year follow up a change of 13.33 and 68.75 points. The client was pain free with no limitations in mobility upon reassessment at 12 weeks and 1 year post op.

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Health Impact Assessment For High Volume Hydraulic Fracturing Via Long Laterals In Livingston County, New York

BACKGROUND

High volume hydraulic fracturing via long laterals is an unconventional process of natural gas extraction that utilizes the injection of hydraulic fluids into vertical and horizontal wells in order to retrieve gases from underlying shale formations. Reports have been made that such a technique may have health consequences for residents nearby. The purpose of this study was to do a health impact assessment for Livingston County, NY – one of many areas in western NY where fracking is predicted to begin.

METHODS

Using GPS coordinate systems, all public water wells, schools, summer camps, lakes, and rivers were mapped out. Based on depth and thickness of the Marcellus Shale layer, proximity of these coordinates to potential drilling sites was determined. A literature review of previous studies on the health effects of hydraulic fracturing was performed and used in conjunction with the analysis of wind patterns, geography, and demographics in order to assess how the establishment of hydraulic fracturing may affect residents of Livingston County.

RESULTS

From an economic perspective, hydraulic fracturing could bring more than $5,000 additional income to landowners and farmers who may lease out their land. In the Southern portion of Livingston County, the Marcellus Shale and Utica Shale Formation are deeper and thicker than in the north, running 1,000 feet deep, 50 feet thick and 6,000 feet deep, 150 feet thick respectively, making it the most likely area for hydraulic fracturing to take place. In addition to the Genesee River, there are 3 major summer camps, 2 public schools, and 10 towns containing approximately 10,660 residences in the southern area of the county that are at increased risk of water, air, and soil contamination that can potentially result in an array of health manifestations including cancer, chronic lung diseases, and congenital abnormalities. Risk from air pollution is magnified in the eastern portion of the county because of prevailing wind patterns from the west. Its lower geographic elevation and surrounding contours also puts the county's major water shed, Conesus Lake, at particular risk from sedimentary and toxic runoff that may result from the construction of well pads at higher elevations. There seems to be a substantial increased risk of environmental health concerns that would be introduced following high volume hydraulic fracturing in Livingston County, NY.

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Epithelial-Mesenchymal Cross Talk: In Vivo Xenograft Model of Asthmatic Airway Epithelium promotes Fibroproliferation and Airway

RATIONALE

Recently, we made progress in mechanistically dissecting the cause/effect relationship between inflammation and airway remodeling in the lung. Our initial observations using in vitro normal airway epithelium, demonstrated that wound repair is associated with mitotic synchrony and the lack of an inflammatory response. In contrast, wound repair in asthmatic epithelium is associated with poorly synchronized mitosis and a pro-inflammatory/fibrogenic response. We therefore hypothesized that poorly synchronized epithelial mitotic regeneration induces underlying fibroproliferation and matrix deposition.

METHODS

Human normal and asthmatic airway epithelial cells (n=5 per group) were seeded into freeze-thaw denuded rat tracheas harvested from male Fisher 344 rats. Tracheas were ligated to tubing at both ends and implanted subcutaneously in the flanks of female nude BALB/c mice. Grafts were flushed weekly with Ham's F12 to remove excess mucus and maintain a patent lumen. Grafts were harvested at 2, 4, and 6 weeks after seeding.

RESULTS

Xenografts were compared between asthmatic and non-asthmatic epithelia for evidence of fibroproliferation. Grafted epithelial cells generated a differentiated epithelium containing basal, ciliated, and mucus expressing cells. Compared to non-asthmatic and acellular control grafts, asthmatic xenografts showed limited ciliated and goblet cells by Masson's trichrome and PAS staining. Specifically, the non-asthmatic epithelium was on average more differentiated with a greater area of graft coverage at 6 weeks compared to that generated by asthmatic cells (1,982 vs. 963 pixel area/unit length of basement membrane). The mean number of mucus cells present within the asthmatic airway epithelium was increased (27 PAS+ cells/unit lengthof basement membrane) compared to non-asthmaticcells (15 PAS+ cells/ unit length). In addition, there was evidence of matrix remodeling in the cellular compared to acellular xenografts. However, there were notable differences between asthmatic and non-asthmatic matrix remodeling. Collagen analysis using traditional histological methods (Masson's trichrome and Picrosirius Red) consistently showed more abundant and dense accumulation of collagen in asthmatic xenograft matrix. In addition, multiphoton fluorescence microscopy using second-harmonic generation (SHG) showed accumulation of fibrillar collagen in asthmatic xenograft matrix.

CONCLUSION

These findings are consistent with our hypothesis that the mitotic asynchrony of asthmatic epithelium alters the epithelial morphology and induces underlying fibroproliferation and matrix deposition. In addition, these preliminary data demonstrate the utility of this xenograft model in the effort to mechanistically dissect the cause/effect relationship between epithelium and airway remodeling in the lung.

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Availability and Accessibility of Student-Specific Weight Loss Programs on College Campuses

INTRODUCTION

More than 1/3 of college students are overweight/obese and in need to treatment resources. However, behavioral health services for the treatment of obesity have lagged behind other on-campus high-risk health behavior services such as drug and alcohol use.

OBJECTIVE

Assess the availability of student-specific weight loss services on the 10 large public university campuses, and compare the availability of student-specific weight loss services to non-weight related behavior services for traditional high-risk behaviors on 10 public university campuses.

METHODS

Three trained coders searched for student-specific weight loss programs (SWLP) on the websites of 10 public universities with the largest undergraduate student enrollment using 15 standardized terms. SWLP was defined as a free campus program specific to students with dedicated staff and resources. To compare ease of access to services, coders searched for traditional high-risk health services offered on university campuses (i.e., alcohol and other drugs, victim services, sexual health, and eating disorders) using 4 terms. Coders reviewed and discussed disagreements until consensus was reached. Website information was verified by a school official.

RESULTS

To date, 6 of the 10 schools have been coded. Only one offered SWLP, but with a fee. Despite only one school offering SWLP, 6 out of 6 had resources and information available (e.g., links to group fitness classes, nutritional handouts, campus dietitian). In contrast, 6 of 6 universities offered all of the non-weight related behavior services. An average of 8.7 minutes was spent searching for SWLP per key term compared with 5.2 minutes per key term for traditional health services.

CONCLUSIONS

Despite a need, the majority of large universities have not yet begun to offer dedicated weight loss programming as they do for other high-risk health-related behaviors. Online searches for programs were cumbersome and may suggest students relying on the Internet alone will struggle to find information about on-campus services. All schools had some nutrition and fitness resources, a necessary first step. However, advocacy from student groups and collegiate administrators is called for to provide treatment and reduce stigma regarding accessing resources.

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Health Services Scholarship Summer Project Medical Humanities Track

Qualitative evaluation of participant experience at the "Club de Pacientes" diabetes education program at La Clinica del Pueblo in Washington, D.C. I interviewed 8 graduates of the 16-week diabetes education program, eliciting their impressions of the group meetings. The majority of participants cited the community and social support they received through the group meetings as the most important benefit.

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Assessing HIV treatment failure in Migori, Kenya

BACKGROUND

Currently drug resistance assays, which are readily available in developed countries, are unavailable for patients with HIV who fail the first or second-line antiretroviral treatment in resource-poor settings such as Kenya. Most patients who fail the first and second-line treatments are left with no options, unless they opt for the expensive salvage therapy on their own. Therefore, preventing the first-line treatment failure is critical in resource-poor settings.

OBJECTIVES

To explore contributing factors of treatment failures in anti-retroviral treatment (ART) with a medical perspective and to explore the social, economic, and psychological barriers to effective HIV/AIDS treatment in efforts to improve treatment and reduce emergence of drug resistant strains of HIV.

METHODS

By working closely with the medical staff at St. Joseph Mission Hospital in Migori, Kenya, evaluations and/or feedbacks from local medical staff were gathered. Home visits of HIV patients were done with social workers. Patient records were retrieved and analyzed for data.

RESULTS

From January to August 2013, a total of 29 patients were identified as having failed the first- or second-line treatment at the clinic, and 26 patient charts were located for analysis. Poor adherence was the major documented reason for first-line treatment failure, as seen in 17 out of the 26 patients charts (65%), and the remaining 4 (15%) indicated a possible re-infection through unprotected sex with another HIV positive partner. Such finding was consistent with the medical staff's feedback. Reasons for poor adherence were multi-faceted, which included a lack of support and financial burdens. Barriers to effective HIV/AIDS treatment included social stigma against the infection and incomplete knowledge of the disease. Fear of consequences related to disclosure, psychological burdens such as denial, fear, self-blame and feelings of helplessness negatively contributed towards initiation and course of treatment. Poverty, unemployment and poor health literacy were also seen as barriers to treatment. Overall, there was a consensus among clinicians and social workers on the importance of disclosure in treatment outcome.

CONCLUSIONS

This research showed that many factors affect the HIV treatment, and poor adherence was a major contributing factor in treatment failure cases seen in Migori, Kenya. The issue of adherence seemed to be multi-faceted, which needs further exploration in the future studies, including better monitoring and intervention to minimize treatment failures and optimize outcomes. One proposed intervention includes using visual aids along with written instructions to aid understanding and better adherence of therapy.

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Investigating Etiologies of Infantile Spasms and its Association with Retinal Dysfunction

PURPOSE

Infantile Spasms (IS) a rare, age-specific childhood epilepsy and is sometimes associated with vision abnormalities. It affects one child out of every 2000-6000 live births. The aim of this study is to investigate etiologic factors of IS which are associated with an abnormal 3.0 Flicker ERG amplitude.

METHODS

Prospective, cross-sectional study of 254 patients with Infantile Spasms before antiepileptic treatment with Vigabatrin. Vigabatrin is associated with oculo-visual disturbances including defects in the full-field electroretinogram (ERG). The mean age was 9.52 months ± 20.53 (range 0.14 – 46 months). The primary outcome measure is the amplitude of the Flicker ERG adjusted for age. Age-expected values have been determined from a large normative dataset. Flicker ERG amplitudes are defined as abnormal if they are outside the 95% confidence interval of the age-expected distribution for healthy subjects (< -0.21 log μV). Preliminary analysis included a linear regression analysis for each etiology to assess the association between the age-adjusted Flicker ERG amplitude and the age of the patient.

RESULT

The Flicker ERG amplitude was reduced in patients with Infantile Spasms that had a history of hypoxia-ischemia (Intercept = -0.85 μV, P = 0.06) and a developmental anomaly of the brain (Intercept = -0.84 μV, P = 0.08). This abnormality did not recover with age.

CONCLUSION

Preliminary results show that children with Infantile Spasms with a history of hypoxia-ischemia and a developmental anomaly of the brain show dysfunction in the Flicker 3.0 ERG that does not recover with age.

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Emergency Department Ultrasound Diagnosis of Bowel Obstruction

BACKGROUND/OBJECTIVES

A large number of patients presenting with symptoms of bowel obstruction undergo an ultrasound exam of the abdomen to rule immediate threats including free fluid, and a AAA. While performing these exams, we have encountered evidence of bowel obstruction that have raised the question of how accurate ultrasound can be in the diagnosis of bowel obstruction.

This is a prospective, observational study to evaluate and compare the test characteristics of point-of-care ultrasound and other imaging modalities to subsequent pathology in patients with probable bowel obstruction. In current practice, patients with possible bowel obstruction, usually receive a flat/upright radiograph of the abdomen. If this is positive for obstruction, surgery is consulted, the patient is admitted, and an abdominal CT is performed to identify the cause, location, and possible strangulation. If the initial radiograph is negative, a CT is frequently obtained because the sensitivity of plain radiographs for intestinal obstruction is in the range of 46-78%. In other cases, the treating physician goes directly to CT. The sensitivity and specificity of ultrasound has been shown in multiple studies to be comparable and sometimes superior to X-rays in diagnosis of SBO.

METHODS

Included in the study are adult patients presenting to the ED with symptoms suggestive of bowel obstruction, including abdominal pain, vomiting, and/or constipation, AND moderate to high EDP pre-test assessment of bowel obstruction, who will receive further imaging by abdominal CT or abdominal radiographs. The study's measures are: comparative accuracy of EDP ultrasound versus alternate imaging modalities of obstructed or strangulated bowel; time interval from presentation to completion and interpretation of each of the imaging modalities; correlation of US findings with clinical and biochemical markers; and comparative accuracy between providers.

RESULTS:

This study team currently has preformed 39 exams of the 145 set as the study endpoint. So far the preliminary results show a sensitivity and specificity of 66%, 80%, and a PPV and NPV of 50% and 89% respectively. Not enough data has been collected for this numbers to be conclusively powered.

CONCLUSIONS:

While it is still too early in the study to make solid conclusions, initial data shows that EDP POC Ultrasound performed in the GWED has a sensitivity comparable to plain radiographs, and a high NPV. Completion of the patient enrollment and future subgroup analysis may yield results conclusive enough to question the routine use of plain radiographs for ED diagnosis of bowel obstruction when POC ultrasound is available, and whether a CT scan is necessary after a negative ultrasound.

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The Importance of Addressing Spirituality in the Patient-Doctor Relationship

The aim of this project is to evaluate the impact of addressing spirituality in the patient-doctor relationship. Spirituality in this context is defined as whatever gives a person transcendent meaning in life and can include religion, nature, art, family, or community. Spiritual beliefs can affect patient treatment and prognosis and is therefore essential to understand from a physician's point of view. Previous studies have shown that patients want their physicians to address spiritual concerns in a variety of contexts ranging from grave illnesses to routine histories. Most physicians do not explicitly ask about spirituality or religious beliefs when taking a social history, but this study aims to show that addressing spirituality in the patient interview improves the patient-doctor relationship and clinical outcomes.

The mention of spirituality in the patient interview has been standardized previously by Dr. Christina Puchalski (1999) via the FICA tool measuring Faith/beliefs, Influence of Faith, Community, and Addressing beliefs in care. The objectives of the study are quantifiable via surveys and post-patient interview questions. The surveyed population includes adults in a primary care and palliative care setting. Questionnaires measure patients' general health, impact of spirituality on patients' life and health, whether spirituality has previously been discussed by a healthcare professional, and in what scenarios patients would like healthcare professionals to discuss spirituality.

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Models of Transition Medicine among large academic pediatric centers in the US

PURPOSE

Due to improvements in pediatric medicine, youths with chronic conditions are increasingly living into adulthood. How can healthcare providers ensure continuity of care as patients transition from a pediatric to an adult care setting? Pediatric hospitals are developing new and innovative transition medicine care models to care for these young adults. Here we survey large pediatric academic institutions to describe several representative models of transition medicine delivery.

METHODS

A sample of 6 children hospitals was chosen. Representatives from these hospitals were interviewed about their transition model, including services and practices using a standardized semi-structured interview format. Topics included health care transition process, barriers and how they have been addressed, method(s) of communication of services to institution and community at large as well as details regarding clinical structure, staffing, funding and training of transition personnel.

RESULTS

Boston, Cincinnati, and Nemours all have an inpatient pediatric service for transitioning young adults. Boston, UCLA, and Baylor all have outpatient transition clinics held in the adult hospitals, whereas Cincinnati, Hasbro and Nemours hold outpatient clinics in the pediatric hospitals. All of the hospitals sampled transition patients at 21 years old, with the exception of Boston children's which allows complex patients to transition at 35 years old and non-complex patients to transition at 25 years old and UCLA which transitions patients at 25 years old. The research demonstrates that Boston Children's is the only hospital of the six hospitals compared that transitions patients from the pediatric side, adult side and utilizes an inpatient consult transition service.

CONCLUSION

These six hospital systems are all responding to the needs of our young adult patients with chronic conditions. Many are expanding their available services (i.e. hiring providers trained in internal medicine) to care for these older patients safely within the pediatric setting. Other hospital systems are putting into place more care coordinating services to transfer these patients to appropriate adult medicine providers in the community. Understanding how other institutions have responded to these challenges successfully and barriers experienced is important to consider when designing how this institution will respond to transitioning youth. Overall, it is important to partner with key departments within the hospital for the transition program, expand the workforce to include care coordinators and social workers as many nonclinical tasks are involved, and recognize that HCT is provided on an ongoing basis as needs and priorities change.

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Reaching the Most Vulnerable: Homeless Street Outreach in Downtown Washington DC

According to data collected by the Community Partnership for the Prevention of Homelessness annual Point in Time survey on January 31, 2013 there were 6,865 homeless people in the District of Columbia on this given night. Of those homeless 4, 010 people were found to be staying in emergency shelters, 512 people were staying outside (unsheltered), and 2,343 people were staying in transitional housing. This project focused on working along side the homeless outreach workers of Pathways to Housing DC in the Downtown and Golden Triangle business districts to explore the strategies used to reach out to those staying unsheltered on the streets. This exploration revealed the importance of these outreach workers in building the meaningful connections to those both recently and chronically homeless. The connections provided the homeless who were encountered with a variety of service from basic needs (getting government identification or allowing them to shower) to connecting them programs for long term supportive housing. As documented in the same Point in Time survey data there was a 1.2% drop in homelessness from 2012 to 2013. Rapid re-housing programs and permanent supportive housing has increased the number individuals in long term supportive housing by 21% and the number of formerly homeless families in long term supportive housing by 9% during this same one year period. The successes of these programs run by the Deptartment of Human Services, HUD, and Department of Veterans Affairs indicates the huge impact that expansion of these programs could have on helping to solve homelessness in Washington, DC. Over the past several years the movement to end homelessness has made huge strides, and outreach programs like Pathways to Housing DC are critical key to reaching those people most in need.

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Development of a Sexual Risk Screening Tool for Adolescent Patients within a Pediatric Emergency Department

BACKGROUND

Adolescents comprise 50% of all sexually transmitted infections (STIs) and many adolescents utilize the emergency department (ED) as their only access to health care. Despite their increased vulnerability to STIs, adolescents are not screened for sexual risk during many of their ED visits, and STIs go undetected. Therefore, the development and of a sexual risk screening tool could help identify and test adolescents most at risk for STIs in a standardized, efficient, and confidential manner.

OBJECTIVES

To develop a computerized sexual risk assessment tool for adolescent patients in a pediatric emergency department.

METHODS

This survey was previously developed through the use of a Delphi panel of adolescent and ED experts for content and cognitive interviews with adolescent ED patients took place prior to uploading onto a computerized platform. The computerized survey was then tested for ease of delivery, functionality, and satisfaction, and retested for understanding. Forty participants (14-19 years) were enrolled in the study, with selection stratified by age group, gender, and presence of potential STI-related complaints.

RESULTS

In assessing ease of delivery, we found that 100% (95% CI 66.0, 133.0) felt the developed computerized screening tool was "easy/very easy to use"; and 54.3% (95% CI 25.0, 83.6) "liked/liked very much" the survey. In evaluating its functionality, 88.6% (95% CI 77.5, 99.7) addressed no concerns about parents seeing their answers. 76.5% (95% CI 61.5, 91.5) preferred using the computer for providing sexual health information rather than written questionnaire or face-to-face interview. Only 44.1% (95% CI 26.5, 61.7) of patients were asked about sexual activity by ED physicians and of them, 93.3% (95% CI 36.7, 150.0) stated it was either easier or the same to answer the questions on the computer. Based on participant feedback, no survey items required revision.

CONCLUSIONS

Our developed computerized sexual health screening tool was well received and preferred by adolescents for sexual risk assessments. Implementation of this tool may help identify at risk youth and increase STI detection.

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Evacuations from Ships at Sea: A Review of Cases from a Telemedical Advice Service

BACKGROUND

Our Department of Emergency Medicine has been providing telemedical support via Maritime Medical Access to ships at sea for over 25 years. Our unique relationship as the sole source of advanced medical advice to these ships result in our being consulted whenever a mariner becomes ill or injured and requires anything more than the standard first aid measures of onboard medical providers. We hypothesize that the vast majority of cases can be managed onboard, with a small minority requiring evacuation or diversion.

OBJECTIVES

To characterize cases in which the telemedicine physician recommended evacuation or diversion to the nearest port.

METHODS

A retrospective chart review was performed of our telemedicine database. Patient demographics, distance from port, chief complaint, details of medical assessment, whether a diversion or evacuation was recommended, and category of illness were recorded.

RESULTS

366 cases were reviewed. In 27 cases the telemedicine physician recommended immediate evacuation, and in 5 additional cases diversion to the nearest port, representing 32 total cases for study population (8.7%). The population was 81.8% male. Mean age was 47.6. Cases of potential cardiac disease represented 12/32 cases (37.5%), including 9 cases of chest pain and/or dyspnea. Four out of 32 cases each were caused by wounds/skin infections and abdominal problems (3 cases of abdominal pain, 1 case of vomiting/diarrhea). Other evacuations and diversions resulted from genitourinary problems (testicular pain, 1st trimester bleeding), trauma/injury (extremity injury, wrist laceration in suicide attempt, sciatica, and suspected compartment syndrome), and others including DKA, hypothermia, flulike illness, hernia, dental abscess, and suspected stroke. In the 18 cases where time to next port was recorded, 6/18 (33.3%) were >5 days away, 3 were 1-5 days away, and 10/18 (55.6%) were <24 hours away from their next port

CONCLUSIONS

Significant medical problems occur in the austere maritime environment, resulting in the telemedicine physician recommending evacuation/diversion to nearest port in 8.7% of cases, however the telemedicine physician can manage the vast majority of cases onboard by providing diagnostic assistance, treatment recommendations, and follow up support. Further study should target telemedical strategies to increase the accuracy of disposition.

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A Patient-Centered, Electronic Care Planning Tool to Facilitate Team-Based Care

BACKGROUND:

The Phyllis Jen Center (PJC), a teaching practice that provides primary care services to 20,000 complex patients, is transitioning to team-based care (TBC), a central component of the patient-centered medical home (PCMH). Currently, information sharing, documentation, and task assignment are not standardized at the PJC. Furthermore, no adequate information technology (IT) solutions exist to support team communication and coordination, which are central to PCMHs. Multidisciplinary PJC team members proposed that a novel electronic care plan (ECP) platform could alleviate these critical needs and improve the TBC transition.

OBJECTIVES:

To identify the crucial components of an ECP tool and to test an ECP platform with those components to facilitate TBC for high-risk diabetic patients.

METHODS

Pre-pilot interviews evaluated team members' perceptions about a potential ECP tool, preferences for ECP features, and ease of key processes. This informed the development of an ECP pilot for high-risk diabetic patients, which was simulated on one PJC clinical team; a post-pilot interview assessed team experiences.

RESULTS

In pre-pilot interviews, team members prioritized an ECP's ability to:

- Provide a real-time summary of a patient's comprehensive care needs and who is assigned to address those needs.
- Display a patient's pertinent background information (e.g. best contact, transportation).
- Facilitate within-team task assignment and referrals.
- Help organize tasks, both by user and patient.
- Minimize duplicative documentation or work.
- In the pilot, use of an ECP platform improved the ability:
- To see tasks team members were doing for a patient.
- To access pertinent background information for patients.
- To keep track of their own tasks.
- For within-team task assignment.

CONCLUSIONS

We have identified 5 critical components for design of an ECP platform. We demonstrate that an ECP can enhance within-team communication, coordination, and information-sharing, which are central to the PCMH. Crucial factors for adoption include avoiding information duplication, integration within existing IT systems, and clear accountability mechanisms.

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Cross-cultural assessment of bipolar disorder and manic episodes using idioms of distress: A mixed methods study in rural Nepal.

BACKGROUND:

There is a lack of research on cross-cultural idioms of distress for bipolar disorder in Nepal. Screening and providing treatment options for bipolar disorder is limited from a cross-cultural perspective. In Nepal, there is not a single idiom or term that captures the features of bipolar disorder. Translation (Nepali to English and vice versa) of certain symptoms is problematic, and people who show manic symptoms are sometimes consequently funneled into improper or inadequate care and treatment plans as a result.

OBJECTIVE

To identify locally relevant idioms of distress for a range of bipolar disorder symptoms and appropriate terms for a bipolar disorder mania that can be used for self- and family-report severity assessment based on the Young Mania Rating Scale (YMRS).

METHODS

A mixed methods study using qualitative methods and quantitative surveys assessing comprehension and familiarity with mania related idioms. Interviews were done with key informants, and interviews with questionnaires were conducted with people referred to us as having manic-like symptoms, or with a family member if that person was not able to conduct the interview. Nepali respondents rated their familiarity with range of terms related to bipolar disorder. All interviews were recorded with permission for later assessment and verification.

RESULTS

No idiom consistently and comprehensively captured bipolar disorder or mania. One idiom, 'bojhu', was variably interpreted and could be used from everything to frequently lying, to rapidly fluctuating mood, to psychosis. Regarding YMRS items, YMRS01b (laughing), YMRS05 (irritable), YMRS09 (threatening others), and YRMS10 (poor hygiene) were understandable questions and recognizable symptoms. YMRS01 (too happy), YMRS02 (restlessness), YMRS03 (sex interest), YMRS11 (unaware of one's problems) were either poorly worded questions or rare symptoms.

CONCLUSIONS

There is no single idiom that is both reliable and valid that captures bipolar disorder or mania. 'Bojhu' has been interpreted as equitable to bipolar disorder by some Nepali respondents, but it is clear that it is more of a catch-all term with variable interpretation, presentation, treatment options, and resolution patterns. Symptom scales for bipolar disorder or mania will need to address multiple symptoms. Specific psychiatric symptoms of mania such as elevated mood, increased motor activity/energy, hypersexuality, and poor insight require further ethnographic and cultural psychiatry research to identify locally salient terms for self- and family-report measures.

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HIV-1 Elite Controllers Generate a Strong Anti-HERV-K (HML-2) Capsid Humoral Response

Human Endogenous Retroviruses (HERVs) comprise about 8% of the human genome. Although these ancient viral sequences are considered to be silent, HERV-K (HML-2) proteins are expressed in some disease states. During HIV-1 infection, HERV-K mRNA transcripts and viral proteins can be detected.

Using a set of 164 overlapping "15mer" peptides in a peptide-based ELISA assay, we identified 8 immunogenic domains. To understand the potential impact of an anti-HERV-K (HML-2) antibody response on HIV disease progression, we assessed how HIV-1 infection modified the humoral response against HERV-K (HML-2) Gag. No significant differences were found between HIV-1 infected (n=40) and uninfected (n=40) subjects for 6 out of the 8 epitopes. However, the antibody response against one nucleocapsid domain was significantly decreased ($p<0.001$) while another response against the QP1 protein significantly increased during HIV-1 infection ($p<0.05$).

When infected subjects were further classified into elite controllers (EC, n=20) or viremic non-controllers (VNC, n=20), new differences emerged. Responses against p15 were significantly reduced in EC compared to VNC ($p<0.05$) or uninfected subjects ($p<0.05$). Furthermore, the responses against two domains on capsid were significantly increased in EC compared to uninfected ($p<0.001$ and <0.05 respectively) and VNC ($p<0.01$ and $p<0.05$) but no differences were observed between VNC and uninfected. In addition, we found a significant correlation between ($r=0.6791$, $p=0.0076$) the humoral and cellular immune response against HERV-K (HML-2) Capsid in controllers.

These results suggested that EC develop a strong cellular and humoral response against HERV-K (HML-2) Gag, mainly directed against the capsid. These antibodies could be contributing to viral control.

FUNDING

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

Cocaine induces HIV gene expression by activating NF-kB and selective epigenetic modifications

BACKGROUND

Injection and non-injection illicit drug use and abuse remain significant cofactors for HIV infection and transmission. Cocaine promotes human immunodeficiency virus (HIV) gene expression, replication and disease progression. As a result, HIV-infected individuals who abuse cocaine can experience a more severe and rapid onset of AIDS than non-abusing individuals. NF-kB is one of the critical components that drive HIV transcription and replication following the integration of the virus into the cellular genome. The effect of cocaine on the activation of NF-kB and other co-factors, may give some insight to mechanisms behind cocaine-induced HIV replication.

OBJECTIVES

To determine the underlying molecular mechanisms that cocaine utilizes in order to activate NF-kB and subsequent activation of HIV replication.

METHODS

HIV-infected HMO6 microglial, THP1 or Jurkat T-cells were treated with 5 μM cocaine for 30 minutes to 72 hours; in order to mimic both acute and chronic cocaine intake. Cell nuclear extracts were prepared and western blotting was performed to analyze NF-kB and mitogen and stress stimulated kinase one (MSK-1) phosphorylation. Chromatin Immunoprecipitation (ChIP) assays were done on cocaine-stimulated THP1 cells to determine the recruitment of key transcription factors at the HIV long terminal repeat (LTR).

RESULTS

Cocaine enhances the phosphorylation of NF-kB at serine residue 536 and stimulated the activity of MSK-1 by triggering its phosphorylation at tyrosine residue 581. Activated MSK-1 subsequently catalyzes the phosphorylation of NF-kB at position 276. ChIP analysis show that this phosphorylation event augmented the interaction of NF-kB with histone acetyl transferases (HATs), and their subsequent recruitment to the HIV LTR. HATs in turn catalyzed the acetylation of core histones which induced transcriptionally active chromatin structures that allowed the access to transcription machinery at the HIV LTR and facilitated the initiation phase of transcription. MSK-1 also catalyzed the phosphorylation of serine residue of histone H3 at position 10. Phosphorylation of H3S10 enhanced the recruitment of P-TEFb to the HIV LTR and facilitated the elongation phase of HIV transcription.

CONCLUSION

Cocaine facilitates HIV transcriptional initiation by enhancing the recruitment of HATs at HIV LTR via NF-kB phosphorylation at S276 residue and HIV transcriptional elongation by facilitating the recruitment of P-TEFb via histone H3S10 phosphorylation. Thus, cocaine facilitates both the initiation and the elongation phase of HIV transcription, which subsequently results into enhanced HIV replication.

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DNA-PK inhibition potently represses HIV Transcription and Replication

BACKGROUND

Despite the use of highly effective antiretroviral therapy, the presence of latent or transcriptionally silent proviruses remains a major hurdle in HIV eradication. Following any interruption in highly active antiretroviral therapy (HAART) regimens, even in patients who have suppressed the infection for years, there is a rapid increase in HIV veremia. This is due to the initiation of HIV transcription and replication in the latently infected cell populations. The status of HIV transcription dictates the prevalence of either productively replicating or latent HIV proviruses. Therefore, in order to tackle the problem of latent HIV reservoirs, it is prerequisite to define all the pathways that regulate HIV transcription. Here we demonstrate the important role of DNA-dependent protein kinase (DNA-PK) in HIV transcription and replication. The inhibition of DNA PK results into almost a complete block of HIV replication in primary CD4+ T cells.

OBJECTIVES

To define the importance of DNA-PK in HIV replication with the use of small molecule DNA-PK inhibitors.

METHODS

Cells harboring a latent HIV provirus with luciferase gene as reporter were pre-incubated with varying doses of three DNA-PK inhibitors – NU7441, NU7026 and IC86621, followed by stimulation with 10ng/ml TNF-β for 30 minutes to 56 hours. HIV transcription and replication was assessed by luciferase and reverse transcription (RT) assays respectively. Chromatin Immunoprecipitation (ChIP) assays were done to determine the effect of the inhibitors on the recruitment of key transcription and epigenetic factors at the HIV LTR. Finally, western blots were performed on cell lysates to analyze the precise phosphorylation state of RNA Polymerase II (RNAP II) C-Terminal Domain (CTD), a crucial event essential for transcription to proceed.

RESULTS

Inhibition of DNA-PK severely impaired HIV transcription and replication, establishing the important role of DNA-PK. The results were confirmed in primary CD4+ T cells. DNA-PK inhibition also resulted in severe impairment of RNAP II CTD phosphorylation following stimulation. ChIP analysis showed that DNA-PK inhibition led to reduced recruitment of P-TEFb to the HIV LTR and eventual establishment of transcriptionally repressive chromatin structures, which consequently repressed HIV gene expression.

CONCLUSIONS

Our results confirm the important role of DNA-PK in HIV transcription and replication. These findings provide strong evidence that supports the use of DNA-PK inhibitors as supplements to HAART regimens, to further enhance their effectiveness in restricting HIV replication.

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HIV-1 Virions Incorporate Subunit 5 of Cellular Minichromosome Maintenance Complex (MCM) which Modulates Viral Replication in the Newly Infected Cells

The early post-entry events of HIV-1 infection occur within reverse transcription complexes (RTCs), or pre-integration complexes (PICs), which are derived from the viral cores entering the target cell. RTCs/PICs contain multiple host proteins incorporated into the virions during virus assembly in the original virus-producing cells. Although the importance of some of these proteins for infection has been shown, the role of many packaged cellular factors is still unknown. We previously showed that the subunit 5 of the hexameric minichromosome maintenance (MCM) complex, which exhibits DNA-binding helicase activity in the cells, displayed a significant level of incorporation into the cores of virions assembled from T lymphocytes. This level of incorporation in T cells was markedly higher than that in macrophages, despite a higher concentration of this factor in the macrophage cytoplasm.

To assess the mechanism of incorporation of the MCM5 protein into the nascent virions, as well as to characterize the role of virion-incorporated MCM5 on viral infection of new target cells.

HIV viral cores were isolated from virus produced from various cell lines and subjected for proteomics to identify incorporated proteins. MCM5 incorporation was confirmed by western blot. MCM5 siRNA and drug treatment with Genestein and Trichostatin A were used to knock down MCM5 or reduce its functional activity, respectively, to study the effects of its depletion. Overexpression of MCM5 via DNA vectors was also used to study the effects of MCM5 upregulation. Finally, co-immunoprecipitation using MCM5 or HA-tagged MCM5 was used to identify HIV proteins interacting with MCM5.

Here, we demonstrate the specific incorporation of MCM5 into HIV-1 virions through binding with the HIV-1 Gag polyprotein. HIV-1 virus produced from cells where MCM5 had been knocked down or inhibited was characterized by decreased reverse transcription in newly infected T cells, though not in the macrophage model cells (PMA-activated THP1). Overexpression of MCM5 in producer cells led to its increased incorporation into the viral particles. Interestingly, reverse transcription in cells infected with such virus was also decreased, about four- to five-fold in late cDNA accumulation, resulting in reduced viral DNA integration and the overall efficiency of infection.

These data suggest that MCM5 is non-randomly incorporated into the virus through association with the HIV-1 Gag polyprotein. We conclude that MCM5 incorporation into the virions is a tightly regulated process. While normal levels of MCM5 facilitate the next round of HIV-1 infection, the presence of MCM5 in the viral particles beyond this level in either direction results in restricted virus replication in newly infected cells.

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Where We've Been, Where We Are Now, and Where We Need To Go

In 2009, an estimated 784,701 people were living with HIV infection and 476,732 were living with AIDS in the United States.10 One in twenty individuals in Washington, DC are HIV+, reporting more than 19,864 cases of AIDS.5,20 Patients with AIDS may "demonstrate a considerable degree of functional impairment and may require multiple rehabilitation interventions." 13

With the current statistics indicating increases in life expectancy for persons with HIV/AIDS, healthcare providers are increasingly faced with the task of addressing disability within this population. Despite this growing need, traditional rehabilitation disciplines, including physical therapy (PT), are underutilized for those living with HIV/AIDS.18 The need for rehabilitation for this population has been validated, however many barriers currently exist, such as access/delay of care, cost, adherence, stigma, and lack of provider education.

Whitman Walker Health (WWH) has been at the forefront of healthcare for those diagnosed with HIV/AIDS, and is now a full-service community health center poised to provide care to those with and without HIV/AIDS. WWH currently provides a variety of medical, mental health, dental, pharmaceutical, research/legal, and testing services. According to Joanne Sincero, WWH Wellness Coordinator, patients are currently referred to PT at off-site locations. In the near future, the facility plans to expand its comprehensive care and include services such as PT.

Members of GW Interdisciplinary Student Community-Oriented Prevention Enhancement Service (ISCOPES), "a health focused service-learning initiative"8, participated in the WWH 27th Annual AIDS Walk Washington. Participants toured WWH, and received information about HIV/AIDS in DC and services onsite. AIDS Walk Washington provided an opportunity for those involved to interact and unite for a common cause.

Though PT students' attitudes and knowledge regarding persons with HIV/AIDS improved after a five-hour AIDS education seminar, willingness to work with this population did not change.1 The nature of HIV/AIDS is complex, especially for novice practitioners. As such, education on management of this population should be a larger part of health sciences curricula. We recommend that treatment of this population be addressed in multiple courses throughout curricula, and that students be given more opportunities to interact with this population. The most important recommendation we can make is one of comprehensive care, including the Medical Team, Rehabilitation Team, Case Management and Social Support. Early initiation of PT will allow patients to maintain quality of life and functional independence at higher levels for a longer time, and decrease the potential for secondary impairments requiring more expensive medical management.

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Proteomic Analysis of HDL Particles from HIV-Infected and HIV-Negative Subjects

BACKGROUND

As HIV-infected patients in the United States are aging, coronary artery disease is becoming a growing problem in this population. The increased risk of coronary events in HIV-infected patients has been linked to low levels of HDL and apoA I as well as increased levels of small dense LDL and apo-B. Previous studies have shown that HDL levels are frequently elevated in patients receiving NNRTI based ART regimens. Phospholipid transfer protein and serum paraoxonase (PON) 1 and 3 are anti atherosclerotic proteins that are components of HDL. We examined up- or down regulation of these proteins in HDL particles from HIV-infected subjects in order to determine their potential role in atherogenesis.

METHODS

3 groups of HIV-infected subjects were included: treatment-naïve subjects infected for over 1 year, subjects on PI-based ART for over 1 year, and subjects on NNRTI-based ART for over 1 year. HDL samples from HIV-negative subjects not on statins were used as controls. HDL was isolated using gradient purification. We performed HDL proteomics, and functional testing measuring cholesterol efflux. The anti-inflammatory properties of HDL were determined by examining TNF induced expression of VCAM.

RESULTS

Serum was collected from 10 uninfected controls, 15 ART-naïve subjects, 15 subjects on NNRTI-based ART, and 5 subjects on PI-based therapy. The results are expressed as percentage difference from control values:

Group	ApoA1	ApoB	PLTP	PON1	PON3
ART Naïve	↓13	↑430	↓51	↓76	↓81
PI-ART	↓13	↑677	↓46*	↓72	↓92
NNRTI-ART	↓9	↑523*	↓44	↓74	↓80

All differences were statistically significant except for those with *. No differences were found in cholesterol efflux or anti-inflammatory function between the groups.

CONCLUSION

The decreased levels of PON1 and PON3 in HDL from HIV-infected subjects has not been heretofore reported. The significant reduction of these proteins as well as previously reported decreased levels of PLTP and increased levels of apo-B in HDL from HIV-infected subjects may contribute to an increased risk of atherosclerosis even in NNRTI treated individuals with elevated HDL.

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Identifying the essential region of a putative small RNA, SasR, from M. tuberculosis

BACKGROUND

Bacteria have specific mechanisms used to adapt to environmental changes. Traditionally, protein interactions have been thought of as the only regulatory mechanism enacted by bacteria as ways of environmental adaptation. However, small, non-encoding RNAs (sRNAs) have been recently discovered as playing novel regulatory roles within many different bacteria. sRNAs have not yet been found to exist in Mycobacterium tuberculosis, but our lab has identified a putative sRNA within M. tuberculosis called SasR (small, anti-stress RNA) that enhances the ability of enteric bacteria to grow and survive in the presence of reactive oxygen species (ROS) and reactive nitrogen intermediates (RNI). ROS and RNI are two of the mechanisms used by human macrophages to kill invading pathogens. The purpose of this study is to identify the functional region within SasR by generating mutations within the sequence. The phenotype of the mutations will be tested using recombinant Escherichia coli (E. coli) bacterial survival assays. We anticipate that alterations to the SasR sequence will disrupt the enhanced growth and survival phenotype. It is promising that this putative sRNA may be a factor that contributes to the survival of M. tuberculosis within harsh environments, such as that of the host lung macrophages where M. tuberculosis resides. Inhibition of this pathway could lead to the enhanced ability of macrophages to kill mycobacteria as well as other intracellular pathogens that may use a similar mechanism.

OBJECTIVE

To identify the functional region of the SasR sRNA that affects the fitness and pathogenicity of MTB using recombinant Escherichia coli (E. coli).

METHODS

1. Study Design: Laboratory Epidemiology
   a. Site-directed mutagenesis of the SasR sequence: Homologous oligonucleotides containing alterations within the SasR sequence will be designed and cloned into E.coli using a plasmid vector.
   b. Computer generated secondary structure analyses: The predicted secondary structures will be generated using the mfold server.6
   c. In vitro growth and survival assays in E.coli: rE.coli with SasR mutants will be compared to rE.coli without the SasR insert, to compare growth and survival when exposed to oxidative and nitrosative reactive agents.

2. Statistical Analysis Methods
   a. Standard Error: To determine the error of the means within the triplicate samples of each mutant.
   b. Student t-tests: To compare mutant fitness versus wild-type fitness to determine if there are statistically significant differences ($p < 0.05$).

RESULTS & CONCLUSIONS

This research project is currently in progress. We will complete preliminary analysis by the middle of March.

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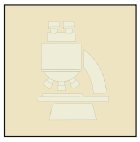

SCHOOL OF MEDICINE AND HEALTH SCIENCES
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Survival capability of Burkholderia pseudomallei in the presence of hos immune factors

BACKGROUND

Burkholderia pseudomallei is a Category B select agent that causes the emerging infectious disease meliodosis, which is a potentially fatal form of septicemia that occurs following exposure to contaminated soil or water. There is a high rate of mortality even with treatment, which demonstrates a need for studies to enhance the understanding of the organism's ability to cause disease. B. pseudomallei Bp82 is a recently developed B. pseudomallei 1026b purM mutant that is avirulent and is exempt from the select agent list. B. thailandensis is a closely related species to B. pseudomallei that coexists in the same environment but is not considered a human pathogen. Since Bp82 and B. thailandensis are BSL-2, non-select agents, we used both as surrogates to study B. pseudomallei pathogenesis.

METHODS

We performed growth kinetics and evaluated the persistence of the organisms grown in the presence of immune stresses. Specifically, we analyzed both log and stationary phases to evaluate the ability of the organisms to grow in the presence of reactive oxygen species (ROS) and reactive nitrogen intermediates (RNI). We also studied the ability of both organisms to survive within human macrophages. In addition, immune induction and phenotypic comparisons (i.e., biofilm formation, motility, and protease production) were performed.

RESULTS

Our preliminary results indicate that differences exist with regard to growth and survival between B. thailandensis and B. pseudomallei Bp82 grown in various immune stresses and growth phase conditions. Conclusion: The organism's ability to survive in the presence of inhibitory immuno-chemicals may ultimately enhance the organism's ability to persist in the human host; thus, increasing the likelihood for transmission.

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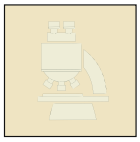

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Site-Specific Commensal Control of Human and Non-Human Primate Skin-Resident T Effector Function

Numerous studies have demonstrated a central role for Interleukin 17A (IL-17A) in the pathogenesis of autoimmune and inflammatory diseases, including Psoriasis and atopic dermatitis, as well as immunity to pathogens such as Staphylococcus aureus and Candida albicans. Yet, to date, the factors that control tuning of T effector function in human skin at steady state have not been studied. Our laboratory recently reported a non-redundant role for skin commensals in controlling dermal T cell function in mice. Specifically, commensals augment skin Interleukin 1 (IL-1) signaling and consequently dictate T cells' IL-17A production capacity. We have developed novel techniques to isolate and analyze lymphocytes resident in human and non-human primate skin. These techniques have enabled us to characterize skin resident lymphocytes at steady state, and to investigate the relevance of the mouse model to humans and NHP. Notably, we have shown that CD3+ T cells are enriched in areas of NHP skin with high density of appendages such as hair follicles, a primary site of commensal colonization. Fluorescence microscopy of NHP skin has revealed that T cells also preferentially localize to the epidermis and appendages, lending physiological plausibility to an interaction with commensals. Furthermore we have shown that T cells are two-fold enriched in the epidermis versus the dermis of human skin. Of T cells in human skin, IL-17A+ cells express IL1 receptor 1 approximately two-fold more frequently than Interferon gamma+ cells, suggesting that as in mice, human skin-resident T cells are particularly susceptible to control by IL-1. These findings open the door for investigations of commensal roles in the pathogenesis of psoriasis and atopic dermatitis, and the exciting prospect of differential immune regulation by commensals at different skin niches.

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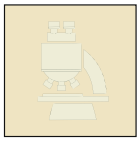

SCHOOL OF MEDICINE AND HEALTH SCIENCES
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Generating an in frame deletion of a Mycobacterium tuberculosis regulatory, small RNA

BACKGROUND

Mycobacterium tuberculosis (Mtb), the etiologic agent of tuberculosis (TB), is one of the few bacterial pathogens capable of residing and replicating within the toxic environment of the macrophage. Because TB can remain latent, evading and even thriving within the immune system, the development of active TB in persons with latent infections poses a continual threat of transmission. To survive and persist for long periods of time, Mtb has adopted mechanisms to resist various host defenses. While Mtb possess a complex array of genes to promote its intracellular survival and persistence, the molecular mechanisms affording the organism this ability remain unclear. Small, non-encoding RNAs (sRNAs) are known to play major regulatory roles within many different bacteria. Although several potential homologous sequences have been found to exist in the Mtb genome, a specific regulatory sRNAs has not yet been identified

RATIONALE

Our lab has identified a putative sRNA within Mtb called SasR (small, anti-stress RNA) that enhances the ability of enteric bacteria to grow and survive in the presence of reactive oxygen species (ROS) and reactive nitrogen intermediates (RNI). ROS and RNI are two of the mechanisms used by human macrophages to kill invading pathogens. Hence, the hypothesis of this study is that SasR is a sRNA in Mtb and plays a role in allowing the organisms to survive within the host macrophage. The purpose of this study was to generate an in-frame deletion of SasR using homologous recombination to verify that SasR is a sRNA that regulates virulence mechanisms within the organism.

METHODS

In this project, a SasR mutant was generated using Mycobacterium bovis BCG DNA and a suicide plasmid vector. Allelic exchange of the wiltype sequence was carried out to replace the SasR sequence with a nonsense sequence of the same length. The mutant BCG was compared to wildtype and a complemented mutant for their ability to grow and survive in the presence of oxidative species.

CONCLUSION

Preliminary data from previous studies demonstrated that the SasR mutant is affected in its ability to grow compared to wildtype and a complemented SasR mutant. Significance. New drugs and vaccines are critical to controlling the spread TB, especially considering the rise of drug resistant Mtb strains. Deciphering the mechanism of SasR may uncover a novel TB drug target. Moreover, if the SasR mutant is able to stimulate an effective immune response, it has the potential to serve as a vaccine candidate.

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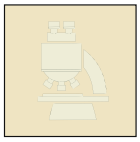

SCHOOL OF MEDICINE AND HEALTH SCIENCES

An Atypical Case of Atypical Pneumonia

Legionairre's Disease is an atypical pneumonia that accounts for an estimated 8,000 cases per year, rendering this the least-typical of the "atypicals." A 44 year old African American male with a remote previous medical history of MRSA bacteremia presented to the DC VA with one week of subjective fevers, fatigue, non-productive cough and myalgias. The patient admitted to using cocaine the night before his symptoms started. He also reported dark urine. On exam, the patient was febrile to 105.6F, tachycardic, tachypneic, saturating 95% on room air and had a nagging dry cough. He appeared lethargic and displayed altered mental status in the form of routinely losing focus and displaying an absence-like stare. His lung exam was positive for trace bibasilar crackles but was otherwise clear to auscultation without wheezes, rhonchi or clear evidence of lobar consolidation. A chest xray showed a diffuse pattern of infiltration, worse in the right lung. Bacterial blood cultures were drawn and sent to the lab, and a clean-catch urine sample was sent for urinalysis, urine culture, urine strep and urine legionella. The patient was started on Vancomycin, azithromycin and admitted to the floor for intravenous fluids and observation. 48 hours later, the urine legionella returned positive. Due to the patient's Fine Score for Community Acquired Pneumonia, and the complicating Rhabdomyolysis, the patient was switched to intravenous levofloxacin. On day 3 of hospitalization, the patient began having diarrhea and vomiting, an unusual symptom but presenting in the appropriate time-course to be legionella-associated. By hospital day 6, the patient's symptoms had resolved and the patient was discharged with two more days of PO levofloxacin. This case illustrates a classic presentation of Legionella Pneumonia as well as some of its more uncommon sequelae: diarrhea, vomiting, mental confusion and rhabdomyolysis. Early diagnosis, and differentiation, of rhabdomyolysis from Legionella-associated myalgias, and the selection of levofloxacin over azithromycin, due to the patient's FINE score, were critical to this patient's recovery.

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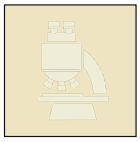

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Towards genetic manipulation of the molluscan embryonic cell line BGE: cytometric analysis and sensitivity to puromycin

BACKGROUND

The molluscan embryonic cell line, BGE remains to date the only established in vitro cultured snail cell line. Since the line was established in the 1970s by Eder Hansen, few studies have focused on profiling its cytometrics, growth characteristics or sensitivity to xenobiotics. Typically, BGE cells have the reputation of being difficult to propagate and maintain. Therefore, even though this snail cell line is a noteworthy resource that if widely used would provide needed data on schistosome/snail molecular biology, investigators have been reluctant to utilize the cells.

OBJECTIVES/METHODS

With growing interest in functional genomics including genetic transformation, transient and stable transfection, including retrovirus transduction, to elucidate molecular aspects of the snail Biomphalaria glabrata and schistosome host parasite relationship, and aiming to enhance the convenience of maintenance of BGE cells to facilitate studies on transgenesis of schistosomes, we cultured three BGE cell strains termed CB, SL and UK and deployed the xCELLigene (Acea Biosciences) technology to examine cell growth in real time.

RESULTS

This investigation revealed that the doubling time for the three strains of BGE was longer than for mammalian cell lines - longer than 45 hours in complete BGE medium supplemented with 7% fetal bovine serum at 25°C in air, with cell index slopes ranging from 0.003 to 0.017 (1/ hour) from hours 24 to 48 of assay. The diameter of these cells ranged from 12 to 16 micrometers. BGE cells were sensitive to the aminonucleoside antibiotic puromycin (from Streptomyces alboniger) from 5µg/ ml to 200 ng/ ml for all three strains. This notable sensitivity of BGE to puromycin, and quick kill time (< 2 days at 5 µg/ml) can be expected to facilitate use of this antibiotic, along with the cognate resistance gene (puromycin N-acetyl-transferase, PAC, from Streptomyces), for selection of transfected BGE cells harboring PAC driven by a snail gene promotor in cis with a reporter gene such as green fluorescence protein.

CONCLUSIONS

With increasing availability of sequence information of the genome and transcriptome of both the snail host and the schistosome, it is opportune and timely to optimize BGE cells as tools for deeper investigation of the schistosome/ snail host-parasite relationship, vector biology and indeed novel interventions.

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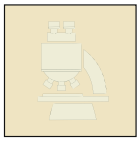

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Cryptococcal infection in HIV patients an Indian scenario

BACKGROUND

Cryptococcosis is a fungal infection that is caused by one of two species- Cryptococcus neoformans and Cryptococcus gattii. This infection targets the central nervous system, in many cases causing Cryptococcal meningitis (CM). Annually, there are over 900,000 cases worldwide and two-thirds of those cases result in death. Cryptococcosis has been reported as the most common opportunistic infection of the CNS of Indian patients with HIV. This infection is particularly devastating in individuals with immune deficiencies such as those suffering from HIV/AIDS. The recent trend about the prevalence of this infection is not studied. Here in India we attempt to study the trend of cryptococcal infection in HIV infected individuals for the past 6 years. The objective is to study prevalence pattern of cryptococcal infection and their relationship with CD4+ T Cell counts in South India. Materials and Methods: The study was carried out at one of the largest HIV referral centers in Chennai India. The walk-in clients and the hospitalized patients were included in this study. The specimen collection was carried out between Jan 2007 and Dec 2012. The walk-in HIV infected individuals and the hospitalized patients were included. These patients were screened for cryptococcal disease based on their signs & symptoms of cryptococcal disease and also on the discretion of the physician. Immunophenotyping: CD4+ and CD8+ T Cells measurements for these specimens were done on fresh whole blood.

RESULTS

A total of 253 (6.1 %) individuals were found to be positive for Cryptococcus Ag (CrAg) out of the 4093 total number of patients screened. The CrAg positivity was found to be inversely proportional to the absolute CD4+ T Cell counts. The numbers of cryptococcal infections are decreasing with the increasing number of CD4+ T Cell counts. There was a decreasing trend of cryptococcal infection up to the year 2011 and a slight increase was observed in the year 2012.

CONCLUSION

Cryptococcal infection in HIV infected individuals is still persisting; this could be due to late diagnosis of HIV and/or cryptococcal infection. An early detection of cryptococcal infection is mandatory to reduce its prevalence and mortality. Periodic screening of cryptococcal infection in HIV infected individuals is necessary to improve the quality of life and survival.

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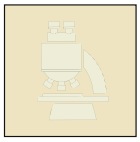

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Altered Thyroid Function Tests in Tropical Infectious Diseases

BACKGROUND

Human and animals studies have shown an association between tropical infectious diseases and altered thyroid function tests.

OBJECTIVE

To review the literature on thyroid function tests in humans infected with tropical infectious diseases.

METHOD

We reviewed the literature on thyroid function tests in humans infected with either trypanosomiasis, malaria, or leishmaniasis. Studies were limited to those published in the English language and those with a control group. Studies involving children or pregnant women were not included.

RESULTS

For trypanosomiasis, two smaller studies found that as compared to controls, infected individuals had higher levels of TSH with lower levels of free T4 and free T3. One larger study found the exact opposite results with lower TSH levels and higher levels of free T4 and free T3. For severe infections with falciparum malaria, two small studies from Southeast Asia found that infected individuals and controls had no statistically significant differences in TSH or free T4. Nonetheless, infected individuals did have 27% lower levels of total T4. For visceral leishmaniasis, one Brazilian study found that infected individuals and controls had no statistically significant differences in TSH, free T4 or total T3.

LIMITATIONS

Limitations include 1) a small number of studies in total with only one or two studies for two of the diseases 2) inconsistent results between the trypanosomiasis studies and 3) small sample sizes.

CONCLUSION

Clinicians may encounter altered thyroid function tests in patients who live or have traveled to areas of sub-Saharan Africa which are endemic with trypanosomiasis.

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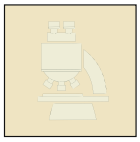

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Role of Inflammatory Transcription Factors and the Glucocorticoid Receptor in the Repression of MUC5AC Gene Expression by VBP15

OBJECTIVE

Overproduction of secretory mucins contributes to morbidity and mortality in lung diseases. Inflammatory mediators upregulate mucin genes, but there are few drugs that directly repress mucin gene expression. We have previously reported that IL1β upregulates the MUC5AC mucin gene via the transcription factors NFκB and CREB in lung epithelial cells and that the glucocorticoid Dexamethasone (Dex) transcriptionally represses MUC5AC expression by Dex/GR binding to two GRE cis-sites in the MUC5AC promoter. Glucocorticoids are commonly used to treat inflammatory diseases but have adverse side effects with long-term treatment due to GRE-mediated regulation. VBP compounds (ReveraGen BioPharma) are novel anti-inflammatories based on the lazaroid steroid backbone. They exhibit reduced GRE-mediated transcriptional properties but maintain anti-inflammatory activity through inhibition of NFκB. Thus, they have potential to minimize harmful side effects of long-term steroid therapy in inflammatory lung diseases. Therefore, we investigated the mechanism of VBP15 on MUC5AC gene repression in lung epithelial cells.

METHODS

Expression levels of MUC5AC and β-actin mRNA were determined by qRT-PCR in A549 or primary differentiated normal human bronchial epithelial (HBE) cells. Cells were pre-exposed to RU486 (GR antagonist), U0126 (CREB inhibitor), IMG-2000 (NFκB inhibitor), or IL1β and then to VBP15 or Dex. Immunofluorescence and chromatin immunoprecipitation (ChIP) were used to evaluate translocation of GR and VBP15/GR binding to the MUC5AC promoter, respectively.

RESULTS

VBP15 reduced MUC5AC mRNA abundance in a dose- and time-dependent manner in A549 and HBE cells. Repression occurred optimally between 6-18 h of exposure with 1mM VBP15 and was abrogated in the presence of 1μM RU486. VBP15 induced nuclear translocation of GR within 0.5 h in A549 cells. However, VBP15/GR did not bind the GRE3 site in the MUC5AC promoter, in contrast to Dex/GR. Unlike RU486, U0126 and NEMO inhibitors reduced baseline levels of MUC5AC mRNA abundance three-fold in both A549 and HBE cells. The IL1β-induced increase in MUC5AC mRNA abundance in lung cells was reduced by VBP15 and Dex.

CONCLUSIONS

VBP15 repression of MUC5AC gene expression requires GR. However, in contrast to Dex/GR, VBP15/GR does not bind the GRE3 site in the MUC5AC promoter. We hypothesize VBP15/GR represses MUC5AC gene expression via interactions with inflammatory transcription factors, e.g. NFκB and/or CREB. This is supported by results indicating inhibitors against CREB and NFκB reduced baseline levels of MUC5AC mRNA and VBP15 also reduced the IL1β-induced increase in MUC5AC mRNA abundance, suggesting that VBP15 may be effective in reducing mucin expression in inflammatory lung diseases.

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COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Characterization of the sodium calcium exchanger mutant ncx-6-/- in Caenorhabditis elegans

The gene ncx-6 belongs to the sodium calcium exchanger super-family of transporters; specifically ncx-6 belongs to the Ca2+/Cation exchanger (CCX) branch, and is responsible for calcium homeostasis. The human equivalent to the Ca2+/Cation exchanger is the Na+, Li+/Ca2+ exchanger (NCLX). NCLX proteins are broadly expressed in excitable cells, and localize to the mitochondrion. NCLX regulates a wide variety of cellular responses and dysfunction has been linked to Parkinson's disease, Alzheimer's disease, and cardiac arrhythmia, which is a leading cause for strokes and death associated with heart failure. Mutations in the ncx genes are not well understood since the viability rate of mutants is low. However, Caenorhabditis elegans mutants have been found to be viable and thus C. elegans represent a powerful new model organism for the investigation of sodium calcium exchangers. Here, we describe our characterization of a C. elegans ncx-6 mutation. The causative lesion within the ncx-6 gene in our mutant is defined by a premature stop codon and may represent a genetic null. We show that ncx-6 is expressed in a subset of cephalic primary sensory neurons and find that ncx-6-/- mutants exhibit defective sensory behavior. Currently, we are examining the temporal and spatial contribution of ncx-6 in the cephalic sensory neurons.

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NEUROSCIENCE

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Studying Synapstic Formations in the Basolateral Amygdala of Protocadherin 10 Heterozygous Mice

Protocadherin 10 (Pcdh10; OL-pc) is a protein in the cadherin superfamily of proteins essential in proper brain development. A heterozygous deletion of Pcdh10 results in an autistic phenotype as shown by the three-chamber sociability test. As Pcdh10 is highly expressed in the basolateral amygdala (BLA), a substructure of the amygdala associated with social behaviors, we aimed at gaining insight into synaptic formation in the BLA of heterozygote mice compared to wild-types. Various synaptic markers (Cadherin10, PSD-95, Gephyrin) were used to study the morphology and number of synapses in the BLA. To this date, the immunofluorescence experiments have been negative or inconclusive. Therefore, we continue to look for synaptic proteins that may be affected by the heterozygous deletion of Pcdh10. Understanding the molecular mechanisms in the brain that underlie social deficits will provide insight into autism spectrum disorders and might assist in the translation of the basic science into clinically effective treatments.

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Marker-less Neonatal Brains Registration and Parcellation

OBJECTIVE

Neonatal brain parcellation is needed in clinical research especially to discover abnormality at early age. The aim of this work is to develop an automatic method to parcellate/label the cortical surface of the neonatal brain at different stages of development. Current cortical parcellation methods are computationally expensive and require manual landmarks. As the brain undergoes significant changes in shape, size and structure during early development, it is difficult to apply these methods to parcellate neonatal brain. Therefore, we propose a novel automatic and fast method to parcellate developing brain cortex

METHOD/APPROACH

A newborn brain labeled atlas at 41 week gestational age (GA) is used to propagate labels of 90 anatomical regions of interest (ROIs) to a spatio-temporal atlas (S-TA), which provides a dynamic model of brain development at each week between 28-44 weeks GA. First, cortical surface labels of the newborn brain are propagated to an age-matched cortical surface from the S-TA. Then, labels are propagated to the cortical surfaces at each week within the age-range of the S-TA. This typically works by registering successive cortical surfaces of S-TA using a novel cubic inflation approach and energy optimization function. Rays are shot from each unlabeled surface point towards labeled surface along the point surface normal, and the intersection point determines the label. This process is optimized by looking for the closest intersection that have the same direction of the point and within a pre-specified margin. We evaluated the probabilistic mean and standard deviation of the point's distribution across labels between weeks. Also, we used labeled atlases of neonatal-1-2 years as ground truth to evaluate our method. A surface from each year is constructed and parcellated. Then, labels are propagated from neonatal to 1 year, then to 2 year surfaces using the proposed method; the results are compared with ground truth.

RESULTS

We propagated labels of 90 anatomical ROIs across S-TA of 28-44 GA in less than an hour per brain compared to 24 hours in average for current adults' brain parcellation methods. Point's distribution under each label is maintained with the same probability at different GA.

CONCLUSION

We presented a fully automatic, marker-less, and fast method for neonatal cortex parcellation. To our best knowledge, this is the first parcellation of the neonatal brain cortex that covers such a large age range between weeks 28-44 GA, and has the potential to renovate and accelerate early age diagnosis of brain disorders.

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Comparing the Modified Adaptive and Robust Filtering Algorithms for Detecting the SSVEP Responces

BACKGROUND

Brain-Computer Interfaces (BCIs) are technologies with the purpose of creating most reliable communication system between human brain and electro-mechanical devices. These systems initial applications were for medical purposes to help the paralyzed patients. Nowadays, the BCI systems are also employed in situations that controlling a device by human brain will be beneficial. Commonly, BCI systems are categorized based on their original brain source signals. The first group of BCIs is Event Related Synchronization/ Desynchronization (ERD/ERS) systems. This type of BCIs collects the brain waves generated in primary and somatosensory motor cortices. The second group of BCIs is based on collecting the evoked Steady-State Visual Evoked Potentials (SSVEPs). Third and less common group of BCIs is based on P300 potentials.

OBJECTIVES

Creating the interface between human brain and other electro-mechanical devices is crucial for developing BCI systems. This will be resolved by interfering brain signals with acceptable accuracy rate and reducing the inaccuracies and inefficiencies of the analysis methods. Nevertheless, research also shows that increasing accuracy causes the system lack of generality. Moreover, the systems which need training sessions and experts for set up are not desirable. This research attempts to modify algorithms and compare their accuracy and information transfer rates (ITR) for future online BCI systems without training sessions.

METHOD

Steady State Visual Evoked Potential signals are usually detectable when a person tries to look or focus on specific Visual Stimuli, flickering with constant rate above 4 Hz. These signals have components of stimulus frequency and its harmonics. Recently, adaptive filtering and machine learning algorithms for detecting the SSVEP responses have been introduced. In this research, a Multiple Input Multiple Output (MIMO) adaptive Kalman filter and a robust gauss-newton algorithm are modified to detect SSVEP responses evoked by LED stimulators with 10, 11, 12 and 13 Hz frequencies.

RESULTS

This research has mostly focused on modifying optimal analyses methods to reach faster computation time. To confirm the models' efficiencies, 20 subjects participated in a SSVEP experiment. Then, the MIMO models accuracy and ITR are obtained and compared for each test/subject. Robust and adaptive filters employ different criteria for detecting the original brain source signals from stimulators signals with similar components and measured brain signals. This research evaluates the efficacy of both models for future developments.

CONCLUSIONS

The models reliability is confirmed based on the outcomes of the tests. However, we aim to further develop processing or pre-processing steps to improve the system performance for critical situations where quick responses are required and human safety factor is considered.

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Glutamine and myoinositol metabolites reflect neuropsychological functioning in urea cycle disorders

BACKGROUND

Hyperammonemia is a serious condition ranging from reversible impairments of cognition and psychomotor activity to irreversible conditions of coma and death. Individuals with a urea cycle deficiency (UCD) are unable to metabolize nitrogen properly. The manifestation of neurological symptoms depends on the extent of ammonia exposure and the individual's biochemical mechanisms to maintain nitrogenous homeostasis and cerebral osmolality. Subclinical hyperammonemia in heterozygous individuals may not present with clinical markers, yet neuropsychological testing may allow for greater sensitivity when monitoring the cognitive and psychomotor sequelae of the disease.

OBJECTIVES

To correlate the brain metabolites of glutamine (gln) and myoinositol (mI) to neuropsychological tasks in symptomatic and asymptomatic individuals with a UCD.

METHODS

Forty-one controls and 38 UCD subjects (21 symptomatic; 17 asymptomatic) underwent 1H magnetic resonance spectroscopy to identify metabolites within the parietal white matter (PWM) and posterior cingulate gray matter (PCGM). UCD individuals were determined to be symptomatic or asymptomatic based on self-reporting and the individual's clinical presentation. Neuropsychological testing included the matrix-reasoning task and the performance IQ component of the Wechsler Adults Intelligence Scale (WAIS).

RESULTS

PCGM [mI] differed significantly as a function of clinical severity, $F(2,85) = 12.40$, $p<.001$. PWM [gln] differed significantly as a function of clinical severity, $F(2,87) = 8.27$, $p = .001$. Groups differed significantly in the matrix-reasoning task, $F(2,75) = 9.95$, $p<.001$. Groups differed significantly in performance IQ, $F(2,82) = 7.92$, $p=.001$. PCGM [mI] and the matrix-reasoning task were correlated with $r(73) = 0.554$, $p<.001$, while PCGM [mI] and performance IQ were correlated with $r(80) = 0.477$, $p<.001$. PWM [gln] and the matrix-reasoning task were correlated with $r(75) = -0.467$, $p<.001$, while PWM [gln] and performance IQ were correlated with $r(82) = -0.455$, $p<.001$.

CONCLUSIONS

As the main nitrogen scavenging compound, glutamine appropriately increased in asymptomatic and symptomatic individuals with a UCD. The myoinositol metabolite concentration, however, decreased across groups and actually correlated more specifically with the matrix reasoning task and performance IQ. Myoinositol is an osmolite regulator for intracellular glutamine, and in those chronically affected by a UCD, [mI] may reflect neurocognitive functioning more accurately than glutamine. The matrix-reasoning task and performance IQ may also serve as effective bedside tools used in the clinical setting to gauge the patient's hyperammonemia state and determine if further clinical evaluation is warranted.

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Analyzing the role of FoxD4 in neuronal differentiation using a mouse embryonic stem cell model

BACKGROUND

Glioblastoma multiforme tumors are characterized by a heterogeneous cellular composition, including a sub-population of stem-like cells that have been described as sharing properties with neural precursor cells and may be responsible for resistance to current therapies, tumor progression and recurrence. Understanding how neural stem cells are normally generated in an embryo, and how their differentiation into mature neurons and glia is regulated may provide insight as to how such stem cells escape current treatments and make glioblastoma tumors particularly aggressive. A search for early stem cell markers and regulators found that previous studies in Xenopus embryos had identified a transcription factor, FoxD4, which may be a key mediator for initiating neuronal differentiation in pluripotent stem cells. In this project, we have investigated the role of FoxD4 in neuronal stem cell specification in mouse embryonic stem (ES) cells.

OBJECTIVES

To investigate the influence of FoxD4 on neural stem cell identity and subsequent neurogenesis using a mammalian embryonic stem cell system.

METHODS

We used a neural differentiation model where mouse embryonic stem cells (mESCs) were differentiated into neurons in vitro. In this procedure, mESCs were moved from culture conditions that maintain pluripotentiality (grown on feeder layers and supplemented with Leukemia Inhibitory Factor) and allowed them to differentiate in suspension. Differentiating mESCs aggregate to form embryoid bodies (EBs), and after two days, EBs received a two-day pulse of Retinoic Acid to induce the formation of neuronal stem/progenitor cells. We found that EBs normally progress through sequential phases of differentiation, where they initially express immature stem cell makers (Nanog, Oct4, Sox2 and FoxD3), then immature neuronal precursor markers (Nestin and Sox1), and finally early neuroectoderm markers (N-cadherin and Zic1) and postmitotic neuronal markers (Tuj1 and Neurofilament). We assessed the role of FoxD4 in neuronal differentiation by blocking its expression in a stable mESC line and assessing the expression of these markers at key time points.

RESULTS

We found that FoxD4 is not essential for maintenance of pluripotentiality, but its absence, differentiating mESCs continue to express immature stem cell markers (e.g. Oct4, Sox2, Nanog, FoxD3) and fail to express neural differentiation markers (Zic1, N-cad).

CONCLUSIONS

This data indicates that knockdown of FoxD4 prevents ES cells from acquiring neural stem cell identity, and following the neuronal differentiation pathway.

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Hippocampal Activation during Preoperative Functional MRI in Adults with Epilepsy

BACKGROUND

Long-term, uncontrolled epilepsy can lead to cortical damage and impairment of neurocognitive functioning. Surgical resection of the epileptogenic region remains as one of treatment options for drug-refractory epilepsy. The preoperative assessment of memory and language function is an important guide to surgical resection that has been shown to minimize postoperative cognitive deficits. Functional magnetic resonance imaging (fMRI) is a noninvasive way to measure hippocampal activation, which may yield information for surgical planning. As memory fMRI is methodologically challenging, other methods to study hippocampal activation are necessary. One indirect method to study this is through use of established preoperative fMRI language tasks as proposed by Binder et al. (2008). They found that language fMRI predicted postoperative memory outcome in adults with temporal lobe epilepsy. Thus, we evaluated whether language tasks, such as a reading and listening (auditory comprehension) task, would reliably elicit hippocampal activation in adults with epilepsy compared to typically developing controls.

OBJECTIVES:

We aimed to assess whether reading and listening tasks would reliably elicit hippocampal activation in an adult epilepsy population. We also compared lateralization of hippocampal activation during these language tasks between patients and typically developing controls.

METHODS

The study was a retrospective cross-sectional review of fMRI data from 44 patients with epilepsy and 31 neurologically healthy controls. The reading and auditory comprehension language tasks were performed during a functional MRI session using a standardized protocol on a 3.0 T EPI BOLD fMRI. Image processing and data analysis was conducted in SPM 8. The region of interest for bilateral hippocampi was based on the Anatomical Atlas Library in the Wake Forest PickAtlas. We calculated a laterality index (LI) for the hippocampal ROI using the LI Toolbox.

RESULTS:

On an individual basis, 93.5% of the controls demonstrated hippocampal activation for the Reading task (threshold at p=0.05, uncorrected); 64.5% during the Listening task. For patients, 79.5% demonstrated activation during the Reading task and 75.0% during the Listening task. Categorical LI distribution for patients was mixed during reading and listening tasks (reading: 10 R, 15 L, 10 B; listening 16 R, 8 L, 9 B). Categorical LI
distribution for controls was similarly mixed (reading: 10 R, 11 L, 8 B; listening 10 R, 8 L, 2 B). The hippocampal laterality index between patients and controls did not differ for the Reading (p=0.73) or Listening (p=0.52) tasks.

CONCLUSIONS:

Our results support that the Reading and Listening tasks reliably activate the hippocampus on an individual basis at lenient thresholds. It was also found that the hippocampi were activated regardless of language lateralization or neurologic health. This equal distribution of hippocampal activation suggests that both hippocampi play important roles in these two language tasks.

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Using Bipolar Drugs to Reduce Chemotherapy Induced Peripheral Neuropathy

BACKGROUND

Paclitaxel is an effective chemotherapy agent for many types of cancers but it has a debilitating side effect of peripheral neuropathy. Previously a mechanism for this chemotherapy-induced neuropathy was shown to be due to a decrease in neuronal calcium signaling and a reduction in the calcium signaling protein neuronal calcium sensor 1 (NCS-1). In order to try to inhibit this side effect, a variety of compounds were studied to see if they could intercept this pathway and restore the calcium signaling levels. Previously both LiCl and ibudilast were found to improve the calcium signaling when administered along with paclitaxel. Importantly, neither protective agent affected the chemotherapeutic ability of paclitaxel. Two additional candidate compounds, valproic acid and chlorpromazine, are both used clinically to treat bipolar. It was hypothesized that these two other classes of bipolar drugs could also help restore the calcium signaling reduction induced by paclitaxel.

OBJECTIVES

To show the calcium signaling reduction in a neuroblastoma cell line (SHSY-5Y) produced by chronic incubation with paclitaxel and to see if the bipolar drugs, valproic acid and chlorpromazine, have the ability to prevent this reduction in calcium signaling when co-incubated in cells.

METHODS

Calcium signaling was assessed using live cell imaging of SHSY-5Y cells. The cells were incubated for 6 hours with 800ng/ml of paclitaxel and varying concentrations of valproic acid or chlorpromazine. The cells were then loaded with a calcium sensitive fluorescent dye, Fura-2. Fluorescence microscopy imaging techniques were used to measure the response of the cells to activation by extracellular ATP. To terminate the experiment, thapsigargin was added to fully empty the stores and to show viability of the cells.

RESULTS

It was found that cells incubated with 0.9mM valproic acid and 800ng/ml of paclitaxel for 6 hours had an improved calcium signal compared to cells incubated with paclitaxel alone. There was also an improvement with the addition of 0.8μM chlorpromazine. Incubation of cells with either valproic acid or chlorpromazine alone did not alter cellular responses.

CONCLUSIONS

Both valproic acid and chlorpromazine appear to be viable candidates as preventative measures for paclitaxel induced peripheral neuropathy. If co-administered with the chemotherapy, these drugs could help to reduce peripheral neuropathy. More experiments will need to be carried out to confirm the results and to further study the mechanism of action of these compounds.

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Microglia Activation after Cardiopulmonary Bypass

BACKGROUND

White matter (WM) injury is common after cardiopulmonary bypass (CPB) in neonates/infants with congenital heart disease (CHD). Our studies have shown that reduction of systemic inflammation is important to minimize the risk of injury. Microglia are key immune cells that play a central role in responding to a wide variety of insults in the brain, which is an organ known to be "immune privileged". However, response of the microglia after CPB is largely unexplored.

OBJECTIVE

To define reaction of microglia after CPB in a porcine survival model

METHODS

Juvenile Yorkshire piglets were randomly assigned to one of 3 different CPB induced brain insults including systemic inflammatory response syndrome (SIRS) and ischemia-reperfusion (I/R) injury; no surgery (Control; no insults), 34oC full flow bypass for 60min (Mild-CPB insult; SIRS), and 25oC circulatory arrest for 60min (Severe-CPB insult; SIRS + I/R injury). For cellular analysis, WM was subdivided into 7 regions: (1) corpus callosum; (2) internal capsule; (3) medial and (4) lateral periventricular WMs; and (5) superior, (6) middle, and (7) inferior frontal WMs. Microglia and the proliferation were immunohistochemically identified using specific antibodies Iba1 and Ki67. The antibody-positive cells in each WM region from a total of 14 brain samples were quantified using stereology system (Stereo Investigator, MBF Bioscience). The reaction was also compared with response of systemic leukocytes and IL-6 and neurological outcomes.

RESULTS AND CONCLUSIONS

In Control animals, there was no significant differences in microglial number between distinguished WM regions ($F=0.74$, $p=.62$). Conversely, the number after CPB was significantly different among WM regions ($F=2.46$, $p<.05$), as well as CPB groups ($F=9.53$, $p<.001$). Within 3 WM fiber categories (commissural, projection, and association fibers), the number was highest in association and lowest in commissural in each CPB group ($p\leq.05$). The results indicate an area-dependent response of microglia against insults. Severe-CPB caused significant increase in microglia number on post-CPB week 4, compared with Control ($p<.05$). WM proliferation, leukocyte number, plasma IL-6, and neurological outcomes were normalized at this time point. Microglia become area-dependently activated after CPB. The reaction persisted on post-CPB week 4. Microglia activation may be an important cellular mechanism underlying WM injury in children with CHD.

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Molecular Profiling Defining Biomarkers in Traumatic Brain Injury

Traumatic brain injury is the single greatest cause of mortality in the industrialized world for people under the age of 45. With the world becoming increasingly motorized, traumatic brain injury will have continue to grow as a global health issue. Traumatic brain injury is also a major health issue in wars. The Iraq War has become synonymous with traumatic brain injury. Improvements in medical technology and procedures have saved many lives from explosive blasts but have also resulted in greater number of traumatic brain injury. It is imperative that traumatic brain injury be identified early so that supportive long-term care can begin. There are currently no clinical biomarkers of TBI that can be used diagnostically. Molecular profiling of rats exposed to blasts was performed in order to determine viable candidate biomarkers. RT-PCR and ELISA along with computational analysis was done to complete the task. The results indicate several candidate biomarkers. IL2 and 13 were both increased in rat brain homogenates and plasma of blast models compared to controls. Increased in both could be considered a physiological response to the inflammatory cascades observed in traumatic brain injury. IL2 and 13 could be further examined in a clinical population as a possible diagnostic biomarker especially levels in plasma which are much less invasive then obtaining CSF, brain tissues, or performing CT scans or MRIs.

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Microglial degradation of cortical dendritic spines induced by lesion

BACKGROUND

Microglia, immune cells that play a protective and regulatory role in the Central Nervous System (CNS), become activated in response to insult or injury, and function to limit damage to the brain. 1 However, it has been postulated that after damage to the brain, there can sometimes be an exaggerated response by microglia leading to long-term activation of these cells that can be detrimental instead of protective.2

OBJECTIVES

In this study, we aim to determine if microglial activation offered protection to the brain after a lesion in vivo, or if it was destructive.

METHODS

We utilized GFP CaM-Tet mice to study effects of microglia in vivo. In these genetically modified mice, it is possible to induce a lesion within the specific regions of the brain based on tetracycline administration, which allowed us to form groups of mice that were lesioned and non-lesioned (L and NL, respectively). Additionally, a portion of neurons in these mice express GFP, allowing one to visualize the neurons. We then utilized a novel drug that is able to selectively eliminate microglia in the CNS to study the effects of microglia in the lesioned and non-lesioned mice. Thus, the NL and L groups were further split based on whether the mice were given the drug or not (3397 and Ctrl, respectively).

Using these parameters, we studied 4 groups of animals (Ctrl NL, Ctrl L, 3397 NL, and 3397 L). The animals were sacrificed, and brains were extracted. These samples were sectioned into 40 μm slices, and microglia within samples were immunofluorescently labeled to determine the effect of the drug. Confocal microscopy allowed visualization of microglia and neurons within the sections. One proposed measure of CNS health is the number and quality of dendritic spines, which are synapse forming structures in neurons. 3 Thus, we determined the number and type of dendritic spines per length of neurons in each group.

RESULTS

Our findings indicated a significant increase in dendritic spines in cortical neurons after a lesion when microglia were eliminated compared to the number of dendritic spines when microglia were present.

CONCLUSIONS

The implications of these findings are vast, and may confirm that long-term microglial activation plays a degradative role in the brain after a lesion. As more dendritic spines were present in the brain when microglia were eliminated, it is also possible that elimination of microglia enables increased synaptic formation, possibly indicating improved prognosis after lesions in the brain, including CVA's.

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Plasma IL-17A Level Stratifies Across Myasthenia Gravis Patient Subtypes

BACKGROUND

Myasthenia gravis (MG) is an autoimmune disease. Interleukin (IL)-17A is a proinflammatory cytokine produced by activated Th17 and other cells of the immune system. There is evidence that IL-17 is involved in the pathogenesis of MG.

OBJECTIVE

To assess whether plasma interleukin-17A (Il-17) levels prior to immunotherapy initiation are associated with clinical subtypes of myasthenia gravis (MG).

METHODS

The clinical course of patients with MG who had not received immunotherapy was prospectively monitored for a minimum 2 years in a standardized fashion with assessment of quantitative MG score (QMGS) and Osserman classification. IL-17A concentration was determined from plasma obtained at time of study entrance.

RESULTS

IL-17A levels prior to initiation of treatment were associated with more severe disease as assessed by Osserman classification and greater elevation of the QMGS. IL-17A concentration was greater among patients positive for AChR antibody. Interestingly, IL-17A levels were higher among patients with ocular MG who within 6 months of study entrance developed generalized MG. Higher levels of IL-17A differentiated women with early onset MG without a thymoma.

CONCLUSIONS

Elevated IL-17A plasma concentrations prior to initiation of immunosuppression appear to be a marker of disease severity in patients with MG and differentiates subgroups of patients.

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Metabolomic Response to Chronic Corticosteroid Treatment

Corticosteroids are often used for treatment of autoimmune and inflammatory diseases. Though they alleviate symptoms, they produce significant adverse effects and have variable therapeutic responses. Serum biological markers that are modulated by chronic corticosteroid use have not been identified. Myasthenia gravis is an autoimmune neuromuscular disorder caused by antibodies directed against proteins present at the post-synaptic surface of neuromuscular junction resulting in weakness. The patients with myasthenia gravis are primarily treated with prednisone. We analyzed the metabolomics profile of serum collected from patients prior to and after 12 weeks of prednisone treatment during a clinical trial. Our aim was to identify biomarkers that may be treatment responsive and be evaluated as potential markers of efficacy or adverse effects. Ultra performance liquid chromatography coupled with electro-spray quadrupole time of flight mass spectrometry was used to obtain comparative metabolomics and lipidomic profile. Untargeted metabolic profiling of serum showed a clear distinction between pre and post treatment groups. Chronic prednisone treatment caused up-regulation of membrane associated glycerophospholipids: phosphatidylcholine, phosphatidylethanolamine, phosphatidylserine, 1, 2-diacyl-sn glycerol 3 phosphate and 1-Acyl-sn-glycero-3-phosphocholine. Arachidonic acid (AA) and AA derived pro-inflammatory eicosanoids such as 18-carboxy dinor leukotriene B4 and 15 hydroxyeicosatetraenoic acids were reduced. Perturbations in amino acid, carbohydrate, vitamin and lipid metabolism were observed. Chronic prednisone treatment caused increase in membrane associated glycerophospholipids, which may be associated with certain adverse effects. Decrease of AA and AA derived pro-inflammatory eicosanoids demonstrate that immunosuppression by corticosteroid is via suppression of pro-inflammatory pathways. The study identified metabolomic fingerprints that can now be validated as prednisone responsive biomarkers.

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Role of Oxytocin Neurons in Obstructive Sleep Apnea Mediated Cardiovascular Disease

INTRODUCTION

In addition to the classic effects of the hormone oxytocin (OXT) on uterine contraction and milk ejection, recent work has suggested oxytocin can increase bonding and reduce responses to stress. OXT is released from parvocellular neurons originating in the paraventricular nucleus of the hypothalamus (PVN). Optogenetic stimulation of channelrhodopsin (ChR2) containing PVN fibers excites parasympathetic cardiac vagal neurons (CVNs) and this enhancement was diminished after application of the OXT receptor antagonist, OTA. This release of OXT may modulate the cardiovascular responses to stress and we have shown in vivo activation of PVN OXT neurons using designer receptors exclusively activated by designer drugs (DREADDs), resulted in decreases in resting blood pressure (BP) and heart rate (HR) in telemetry equipped animals. This work tests if oxytocin neuron activation can be beneficial in an animal model of obstructive sleep apnea (OSA), one primary, yet poorly understood cardiovascular disease.

METHODS

In order to examine the conditions required for OXT release from PVN fibers in brainstem slices, we dispersed within these slices CHO cells that were transfected with and express the human recombinant OXT receptor. Calcium changes within these cells were visualized as these cells were also transfected with the red fluorescent calcium indicator, R-GECO1. Activation of PVN OXT neurons in vivo was achieved by injecting into the PVN two viral vectors: one expressing Cre recombinase under an OXT promoter and the second a floxedexcitatory hM3Dq DREADDs. These animals were then implanted with a wireless telemetry device to monitor arterial BP and EKG activity. Animals received daily injections of clozapine-N-oxide to activate PVN OXT neurons expressing DREADDs, and the effects on resting HR and BP and after an 8 hour exposure chronic intermittent hypoxia-hypercapnia (CIH/H) were analyzed.

RESULTS

Our data shows photoactivation of ChR2 containing PVN fibers elicits a large increase in intracellular calcium in specific populations of OXT sensitive CHO cells. Only those CHO cells near the PVN fibers and synaptic endings and in close proximity to CVNs had increases in intracellular calcium upon photoactivation of PVN fibers. Additionally, our animal model of OSA is sufficient to induce hypertension and tachycardia in animals implanted with a telemetry device. Furthermore, selective activation of PVN OXT neurons in telemetry equipped animals decreases resting BP and HR.

CONCLUSIONS

This work supports and extends the hypothesis that excitation of parvocellular PVN fibers releases OXT at their brainstem CVN targets. We additionally found that selective activation of OXT neurons in the PVN decreases resting BP and HR. Ongoing experiments will examine the effects PVN OXT neuron activation has on the observed hypertension and tachycardia after 28 days CIH/H exposure.

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Cellular markers defining the Foxp2 neuronal subpopulation in the medial amygdala

BACKGROUND

Forkhead-box protein P2 (Foxp2) is a transcription factor highly linked to language production and speech coordination. Several of its transcriptional targets (e.g. CNTNAP2, MET) are autism risk factors and are involved in the regulation of dendritic growth and synapse formation. Recent studies have investigated the cellular role of Foxp2 in the basal striatum and cerebral cortex where it is critical for appropriate plasticity. In the cerebellum it is required for appropriate morphology, layering and plasticity. Additionally, Foxp2 is expressed in the multiple subunits of the amygdala. However, its function in neuronal cell processes and behavior in this region, specifically in the medial amygdala, has not yet been elucidated.

OBJECTIVES

The objective of the proposed research is to define the subpopulation of Foxp2 neurons in the medial amygdala by investigating cellular markers specific to this population.

METHODS

Immunohistochemistry was performed in the brain of male (n=3) and female (n=3) adult mice (1-3 months old) of the Dbx1-cre cell lineage. Antibodies for androgen receptor (AR), urocortin-3 (UCN3), thyrotropin releasing hormone (Trh), substance P (SP) and substance P receptor (NK-1) were used to determine co-labeling with Foxp2 and Dbx1-derived neurons (a second subpopulation of neurons in the medial amygdala). Co-labeled neurons were imaged using confocal microscopy and then counted with Image J and Photoshop. T-tests were performed to determine statistical significance for each condition.

RESULTS

There was a high degree of co-localization between Foxp2+ neurons and Trh+ neurons in both males and females. The other markers analyzed, such as AR, showed sexually dimorphic differences in their expression when co-localized with Foxp2.

CONCLUSIONS

Foxp2 neurons in the medial amygdala are defined by specific markers that show a sexually dimorphic pattern of expression and implicate this population in feeding and anxiety behaviors. Identifying the Foxp2 population in the medial amygdala provides the basis needed to understand its cellular role in this region of the limbic system and its involvement in autism, which is defined by amygdala dysfunction.

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Environmental Enrichment as a Means to Attenuate the White Matter Effects of Perinatal Hypoxia

Hypoxic damage to the developing brain is associated with permanent neurodevelopmental disabilities in preterm infants. This diffuse white matter injury results in the loss of both neuronal and glial cell populations, and causes a significant disruption in myelination that renders these infants susceptible to a plethora of cognitive and behavioral impairments. However, the cellular and molecular mechanisms underlying diffuse white matter injury are poorly defined. Here, we will utilize enrichment of the environment in an established rodent model as a potential means to attenuate the white matter effects of perinatal hypoxia. Environmental enrichment is a noninvasive combination of social and physical enhancement of surroundings that provides mammals with an opportunity for more complex social interactions and voluntary physical activity. By characterizing the cellular changes seen in white matter after hypoxic injury and subsequent environmental enrichment, we hope to determine if a critical window of cellular recovery exists. While considerable progress has been made in identifying and managing the cellular, molecular, and developmental mechanisms involved in premature birth, new strategies aimed at decreasing the considerable long-term neurologic sequelae of preterm survivors should be an important goal.

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An in-situ characterization of growth cone morphodynamics in a live-pathfinding axon

Understanding the molecular events that underpin cell motility in an endogenous environment is critical for many applications including rational treatments of cancer, and targeted CNS axonal regeneration. Although much is known about axon guidance, a clear picture that illustrates how gene products interact and what relationship these interactions have on the structure and motility of migrating axonal growth cones traversing their endogenous substratum remains generally unclear. To further the understanding of these processes, our lab has used the Drosophila melanogaster system to develop a novel protocol to live-image migrating axonal growth cones in an intact epithelium. We are using this new model of axon guidance to visualize and characterize the actin dynamics that drive the gross morphological changes that growth cones undergo as they path find during development. To understand the molecular signals that underlie these observed actin dynamics, we are investigating the mechanism by which the Abelson tyrosine kinase pathway contributes to these dynamic events.

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The Link between Acquired (Type II) Diabetes Mellitus, Obesity, and Enteric Microbes

BACKGOUND

Studies have shown that lean individuals contain a higher number of Bacteroidetes in their gut than obese individuals, who have a higher number of Firmicutes. It has been proposed that such compilation of microbial improves the ability of the host mammal to store and extract energy. A cohort study of C. difficile patients proved that it was possible to transplant healthy gut microbiota colonies of Bacteroidetes and Firmicutes from donor stool with a positive outcome for the patients; resulting in resolution of the C. difficile and a return of the patients' gut microbiota to a homeostatic level (Brandt, 2013, p.184). There has been an influx of scientific scrutiny regarding how gut microbiota effects a person's overall well being. Research is ongoing in regards to gut microbiota DNA and the effects it has on a host's body through models.

OBJECTIVES

To prove or disprove bacterial implantation of pure cultures of Bacteroidetes can change or modify metabolism in the gut to decrease BMI and improve glucose reuptake in Type II diabetic patients. Successfully proving bacterial implantation of Bacteroidetes will decrease BMI and improve glucose reuptake in type II diabetic patients can lead to an overall health change including but not limited to: body weight reduction, control of hypertension, decrease in medication usage and cost, control of and management of body's own insulin and end the need for expensive and invasive medical procedures, such as lap band surgery or bariatric surgery, to control obesity. Disproving bacterial implantation of Bacteroidetes will have an effect on gut metabolism, BMI, and glucose reuptake, may lead scientists to further study genetics as a causative factor of obesity and Type II Diabetes

METHOD

Data collected from the participants will include dependent variables (DV): height, weight, BMI (to be calculated), blood pressure, body temperature, and blood samples in order to determine their CMP and A1C levels. Initial stool sample will be obtained to determine the number and type of microbiota present. Stool sample will be checked for Lactobacillius, Clostridium, Fermicuties and Bacteroidetes. Participants will undergo stool transplantation of Bacteroidetes via nasal gastric tube. Stool samples will be collected throughout the study and compared to the initial sample. Blood pressure, body temperature, CMP, A1C levels, and additional stool samples will also be taken in order to determine the number and type of microbiota present at each time interval. The participants will be screened to for any signs of infection. At the 12 month mark, participants will return for the final examination. Protocol for the initial examination will be followed and data will be collected regarding height, weight, BMI (to be calculated), blood pressure, body temperature, CMP and A1C levels. A final stool sample will be obtained to determine the number and type of microbiota present.

RESULTS

Results are pending funding and research. No research has been performed as to date.

CONCLUSION

No conclusion can be drawn at this time

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The Cost of Obesity

There have been many attempts to alleviate the costs associated with the obesity epidemic. One of the problems that policy makers face is the fiscal aspect of obesity and its comorbid conditions. The cost of obesity is often presented as a monetary value; however, it is evident that many 'costs' cannot be easily enumerated, such as productive time lost or changes in self-esteem. The intention of this project is to find, review, and categorize direct and indirect obesity-related costs and identify areas lacking thorough research.

The direct medical costs and indirect costs perceived by patients and physicians were classified into four categories: medical costs (medications, treatment, insurance), consumer-related costs (food, clothing, gasoline, dietary supplements), psychological/personal costs (loss of mobility, quality of life), and societal costs (lost productivity, days off of work, workers compensation).

Here we quantify the extent of primary and secondary research available through PubMed in each of the four subcategories. We expected that the most thoroughly researched category would be direct medical costs. We hypothesize that since the obesity epidemic has become a world wide problem, many more countries, organizations, and institutions are researching this area. Among the best studied societal costs are absenteeism (days of work lost) and presenteeism (days of inadequate work performance). Personal and psychological costs impact almost all obese individuals, however, this category along with the consumer cost category was the least systematically studied. For example, many patients report difficulties finding long-term partners and troubles with intimacy. This is a type of cost that is not well studied and difficult to quantify, but is still significant to patients. Our review revealed the fewest number of articles in the consumer costs category. The lack of information in this area is significant, as many patients and doctors feel that these costs are a substantial part of the financial burden of obesity; however, they are not often taken into account in total obesity cost estimates. An example of one such overlooked cost is transportation, which is estimated to be about $103 million (men, $62 million; women, $41 million) higher for obese Korean adults. The data from this project can be used to assess the areas where health policies could take into account a greater spectrum of obesity-related costs. Synthesis of the extensive amount of data in this field will help direct research and support a more multidisciplinary approach to policy making.

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Adolescent Receptivity to Mobile Health Support for Weight Management

OBJECTIVES/BACKGROUND

Insulin resistance superimposed on obesity may hinder lifestyle change. Objectives were to discern whether obese adolescents are interested in receiving supportive text messages from healthcare providers and whether dyslipidemia, a common comorbidity of insulin resistance, influences interest.

METHODS

A RedCap survey was designed and administered to adolescents in a weight management clinic to evaluate receptivity to mobile health (m-health) communication between clinic visits, preferred type/frequency of contact, and concern about health/weight and confidence with regards to making positive health behavior changes. Multivariate Analysis of Variance (MANOVA) compared responses between subgroups depending on awareness of dyslipidemia.

RESULTS

43 adolescents (12-17 yr) participated. 44.2% had dislipidemia, 37.2% had normal lipids and 18.6% had not yet had labs performed. 77.1% with labs correctly identified their status as having/not having dyslipidemia; 22.9% were unaware of their health status. Level of concern about either weight or health was high (on a scale of 1-100, M=85.42, SD=17.83). 90% of participating adolescents wanted to improve health but only 27.9% were specifically concerned about health comorbidities of weight, independent of whether they had dyslipidemia and independent of awareness of this comorbidity 72.1% rated weight itself as their most important health concern and 53.4%, cited weight loss as their primary goal. Improving diet and exercise were tied for the second priority goal (27.9% each). Greater concern with either weight or health was correlated with greater confidence in ability to make achieve lifestyle goals (r=.40, p=.01). A MANOVA [F(7,21)=2.46, p=.05] suggested those most concerned about weight (vs. health comorbidities) had more confidence in making healthy lifestyle changes and felt that family members would help them to make these changes. 83.7% believed text messages would also help them achieve health goals. 54.8% wanted daily messages; 23.8% preferred every other day. Confidence in ability to achieve goals correlated with greater interest in receiving more frequent texts [r=.43, p<.01].

CONCLUSIONS

Overall, obese adolescents were receptive to the use of m-health to promote health behavior change. Receptivity was not influenced by insulin resistance, inferred by the presence of dyslipidemia. These adolescents reported high levels of concern with weight and health, but were more focused on weight. Level of concern correlated with both confidence in achieving goals and receptivity to m-health support. These findings suggest that healthcare providers should focus first on educating about health implications associated with obesity and addressing self-efficacy for change before engaging patients in a text messaging program.

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Emotion Regulation and Sleep: The relationship between suppression and sleep disruption

Multiple studies have suggested a relationship between sleep and emotion regulation. However, the causal link between these two behaviors has yet to be thoroughly examined and well understood. Much of the research has resulted in the opinion that one's ability to regulate emotions is dependent on one's sleep functioning. More recent studies have also proposed that the relationship between sleep and emotion regulation is bidirectional: sleep dysfunction negatively impacts one's ability to regulate emotion and visa versa. Additionally, research focused on emotion regulation has determined specific strategies for regulating emotion. However, the above research has not been integrated: studies have yet to consider whether specific strategies for regulating emotion are specifically linked to sleep dysfunction, and if so, which strategies link to sleep dysfunction and which link to sleep function. In an effort to expand upon this research, our study aims to provide further evidence for a positive relationship between sleep and emotion regulation and to examine whether specific techniques for emotion regulation correlate with sleep dysfunction. Our sample consisted of ninety-one undergraduate students from the University of North Carolina at Asheville. Students were recruited by offering psychology class credit for the completion of questionnaires. In an effort to identify possible confounding factors, each student was asked to complete several measures including Difficulties in Emotion Regulation Scale, the Structured Clinical Interview for DSM Disorders, the Positive and Negative Affect Schedule, the Pittsburg Sleep Quality Index, Beck Depression Inventory, Beck Anxiety Inventory and Alcohol Use Disorders Identification Test. Upon preliminary assessment of the data, our findings appear consistent with previous studies suggesting that improved sleep is correlated with improved emotion regulation whereas sleep dysfunction is correlated with emotion dysregulation. Unique to this study, is a preliminary finding which suggests a relationship between a specific regulating strategy and sleep dysfunction. Specifically, the data suggests that one's reliance on suppression as a technique for emotion regulation is positively correlated (r=0.3) with less sleep and increased sleep disruption. This finding may hold significant therapeutic implications. Specifically, two points of intervention are implicated. Possibly offering different techniques for emotion regulation to patients who rely on suppression may improve their sleep function. Also, improving sleep may help patients develop more effective emotion regulation strategies.

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Prevalence of Food Insecurity in Individuals with Serious Mental Illness Being Treated at Community Mental Health Centers

BACKGROUND

Food insecurity is defined as an individual's inability to obtain access to healthy, safe food, most often due to low socioeconomic status. Not knowing where your next meal is coming from can have a tremendous impact on a person's quality of life and overall physical and mental well-being. In 2006, the United States Department of Agriculture (USDA) developed a new system to measure food insecurity as either high, marginal, low, or very low food security. Food insecurity has been linked to increased instances of mental illness such as anxiety and depression, although the prevalence of food insecurity in the mentally ill and how this impacts quality of life has been largely unstudied.

OBJECTIVE

To assess the prevalence of food security in individuals with serious mental illness and how it impacts symptom severity, quality of life, and recovery.

METHODS

The study recruited 300 individuals (average age 48.4 ± 9.1 years) currently being treated for a primary mood or psychotic disorder from five community-based mental health centers or Core Service Agencies (CSAs) in Washington, DC. Each participant was given a comprehensive assessment that incorporated established measures of quality of life, degree of recovery, and current dietary practices. The primary measure of food insecurity was the USDA's Food Security Survey (FSS), which was analyzed using the Rasch model to assure its applicability to this sample population.

RESULTS

Of the 300 individuals assessed, 68.9% reported some degree of food insecurity, much greater than the amount of food insecurity in the average American household (14.5%) and the general population of Washington, DC, (12.0%). In addition, 46.8% of the participants admitted to very low food security, compared to 5.7% in the US as a whole. The Rasch analysis of the FSS showed good reliability in applying this scale to the sample population.

CONCLUSION

Compared to the average American household, food insecurity is dramatically increased in the mentally ill population. These results suggest that interventions designed to lessen food insecurity would be beneficial for this population and would likely result in an increased quality of life and faster recovery. Further research on this topic is justified.

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Innovative Approaches to Sarcopenia Screening Using Diagnostic Ultrasound: A Pilot Study

BACKGROUND

Sarcopenia is an age-related loss of muscle mass that affects more than 25% of individuals over the age of 65 and increases likelihood of developing a disability 3 to 4-fold. Despite these observations, sarcopenia is rarely subject to a systematic screening process as a part of customary geriatric care. Furthermore, the measurement of lean body mass (LBM) via dual energy X-ray absorptiometry (DXA) in older adults is often assessed only after a loss of functional independence. Assessment of LBM with ultrasound is 4 to 6 times less expensive compared to DXA and may serve as a viable alternative imaging modality.

OBJECTIVE

To validate a rapid, portable, cost-effective, sarcopenia screening method using diagnostic ultrasound appropriate for both hospital and community-based settings.

METHODS

Pilot data were obtained from healthy, young individuals (3 men and 5 women), age = 25.1 ±1.5 years) to test the proposed method of proxy ultrasound LBM assessment. DXA scanning was used to estimate total LBM, and aLM was calculated as the sum of LBM in arms and legs and scaled to height (aLM/ht2). Sonographic estimates of aggregate regional LBM were obtained using a portable, B-mode diagnostic US (SonoSite M-Turbo 1.1.2) with a 13.6 MHz linear array transducer to obtain muscle thickness at 5 selected axial and appendicular sites (dominant side only). All intra-session images were captured 3 times and the values were averaged prior to data analysis; scanner gain was maintained at the default setting, and image depth values remained consistent for each series of scans.

RESULTS

Sonographic estimates and analysis of aggregate regional LBM required approximately 30 min per person to complete. Mean LBM values for the study group were 50.2 kg ±11.4 kg, with an aLM/ht2 of 7.52 ±1.29 and aggregate muscle thickness value of 3.02 cm ±0.48. The coefficient of determination between aLM/ht2 and the proxy estimates of LBM determined from pilot data was, R2 = .93 (unadjusted,) $p < .01$.

CONCLUSIONS

These pilot data suggest that our method of estimating LBM is fundamentally sound and holds promise as an alternative body composition measurement technique. This line of inquiry is ongoing since regression models with the best fit may differ among men and women, and varied ethnic and racial groups. However, the early findings of our work indicate that our ultrasound technique is a feasible sarcopenia screening method that is rapid, portable, and cost-effective.

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Daily exposure to intermittent hypoxia improves upper extremity function in persons with incomplete cervical spinal cord injury

BACKGROUND

Neural plasticity is a significant contributor to motor recovery following incomplete spinal cord injury (iSCI). In animal models, intermittent hypoxia induces neural plasticity, strengthening synapses to respiratory motoneurons by a mechanism known as long-term facilitation. Hypoxia triggers oxygen-sensitive chemoreceptors in the brainstem, resulting in increased protein synthesis that augments neural activity throughout the spinal cord. We have found that daily acute intermittent hypoxia (dAIH; 5 consecutive days) also facilitates non-respiratory forelimb function in spinal-injured rats and walking function in spinal-injured humans. Similar facilitation has been suggested to occur in the upper limb of spinal-injured humans. However, no studies have addressed this possibility. The purpose of this study was to identify the potential benefit of dAIH training on promoting the restoration of hand function in persons with chronic iSCI.

METHODS

A randomized, double-blinded, crossover study was used to test our hypothesis that dAIH improves hand function in persons with chronic, cervical iSCI. Six male subjects with chronic, cervical iSCI (44±11 years old; injury between C5-C7) received mild exposure to dAIH consisting of 15 episodes of 1.5 min hypoxia (FIO2 = 0.09) alternated with 1 min normoxia (FIO2 = 0.21). Blood oxygen saturation, blood pressure, and heart rate were continuously monitored. Hand function was assessed at baseline, after the first and fifth days of the intervention, and follow-up within a week of the last intervention. Primary outcome measures were hand speed (measured by the Jebsen-Taylor Hand Function Test), dexterity (measured by the Box and Blocks Test), grip strength (measured by hydraulic hand dynamometers), and maximal aperture. All results were compared with daily exposure to normoxia (dSHAM).

RESULTS

Daily AIH appears safe and effective at enhancing hand function in persons with chronic, cervical iSCI. At follow-up, increases in manual dexterity (6.4±2.9%; p=0.001), pinch strength (6.8±4.7%; p=0.04), and dominant hand speed (14.5±5.7%; p=0.01) were evident only in the iSCI subjects following dAIH and not following dSHAM. However, there was no difference in grip strength and non-dominant hand speed between dAIH and dSHAM.

CONCLUSIONS

The results of this study suggest that dAIH may be a useful adjuvant to current rehabilitation therapies for persons with longstanding hand impairments due to chronic, cervical iSCI. Our results offer the first evidence that repetitive exposure to mild AIH may enhance hand function in persons with chronic iSCI, which is consistent with previous findings of respiratory and locomotor facilitations following dAIH.

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Active Music Therapy for Individuals with Alzheimer 's Disease

Brittney Jorgensen, Rachel Reoli, Michele Fry, Jessica White, Susan Leach

The number of nursing home residents is projected to double over the next decade. 60% of those residents will be diagnosed with Alzheimer's Disease (AD) or Dementia.1 Research has shown that patients with AD and behavioral and psychological symptoms of dementia (BPSD) benefit from cognitive stimulation in the forms of group interaction, music and active movement.2, 3 After volunteering at a local nursing home, the authors recognized the need for direction in engaging residents in more meaningful cognitive stimulation. Music was played and residents were encouraged to move/dance/sing. Within three weeks of initial implementation of this program, improvements in resident responses were noted, including decreased agitation and increased participation. Thus, the authors propose a six-month trial of regularly scheduled active music therapy three times/week, for a one-hour duration/session. Consistency of time and day will provide patients with a frame of reference, and help increase positive outcomes. To track patient progress, it is recommended that affective, behavioral, cognitive, and physical outcome measures be taken once a month for a six-month period and physiological outcome measures be taken pre and post active music therapy intervention. Expected outcomes for this patient population following these therapeutic interventions are the maintenance of current cognitive capabilities4, the prevention and/or reduction of clinical depression 4, 5, and the inhibition of aggressive behaviors.4, 5, 6, 7, 8. Activities involving music therapy are a form of cost-effective, low-risk, non-pharmacological intervention that lends itself to accessing implicit memory and learning, which is often preserved in persons with dementia. 8, 9, 10

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Abstract Category: Rehabilitation and Recovery Chronic Sacroiliac Joint And Pelvic Girdle Dysfunction Managed with Multimodal and Multidisciplinary Approach

BACKGROUND & PURPOSE

Sacroiliac joint pain and dysfunction affect 15-25% of patients reporting low back pain including reports of spontaneous, idiopathic, traumatic and non-traumatic onsets. The poor reliability and validity associated with diagnostic clinical and imaging techniques leads to challenges in diagnosing and managing sacroiliac joint dysfunction.

CASE DESCRIPTION

A 35 year-old nulliparous female with a 14-year history of right sacroiliac joint dysfunction was managed using a multimodal and multidisciplinary approach when symptoms failed to resolve after two months of physical therapy. The plan of care included four prolotherapy injections, sacroiliac joint manipulation into nutation, pelvic girdle belting and specific stabilization exercises.

OUTCOMES

The patient completed twenty physical therapy sessions over a 12-month period. At six months, the patient's Oswestry Disability Questionnaire score was reduced from 34% to 14%. At one-year follow up, her score was 0%. The patient's rating of pain on a numeric rating scale decreased to an average of 4/10 at 6 months and 0/10 at one-year follow up.

DISCUSSION

A multidisciplinary and multimodal approach for the management of chronic sacroiliac joint dysfunction appeared successful in a single case design at one-year follow up.

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The State of Lactation Support Programs Within Universities that House Accredited Schools of Public Health

BACKGROUND

In 2013, a report by the CDC highlighted the potential role universities can play in expanding workplace lactation support programs (LSPs) beyond traditional university employees (faculty and staff) to include students and community members . There is a lack of evidence as to how different universities institutionalize LSPs. Universities that house schools of public health (SPHs) should lead universities in the implementation of LSPs. The rising number of females in the workforce and the student body, as well as the need to respond to the national call to increase the proportion of employers that offer LSPs through the Healthy People 2020 initiative merits further investigation of LSPs within this setting.

OBJECTIVE

To determine the proportion of universities with accredited SPHs in the US that have adopted LSPs and describe the LSP components present within each adoptive school.

METHODS

A comprehensive scan of university web-based resources as well both secondary data and documentary material analysis was used to collect descriptive data on the complete targeted population of schools (N=48) and determine LSP adoption. Given the unique size and program communication strategies of universities, at minimum, a LSP was defined as having more than one dedicated lactation support space, a campus wide lactation policy, and/or a dedicated LSP informational website that provides access to and information on lactation support resources other than the location of rooms (e.g. breastfeeding classes and/or educational websites). Identified LSPs were divided into three groups: Adequate, Expanded, and Comprehensive based on the presence of defined breastfeeding space, support, and education components.

RESULTS AND SIGNIFICANCE

Results will collectively be used to inform current efforts to both increase, improve, and standardize LSPs within university settings in general and assess workplace lactation support provisions with the ACA, and will add to the metrics used to evaluate the Healthy People 2020 objective to increase LSPs in all workplaces. They also augment further research on the role SPH play in promoting campus wide LSPs.

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Quinoa Popularity in International Markets and the Association on the Nutritional Status of Indigenous Children Under-5 in the B

BACKGROUND

In recent years, the news media has blamed the popularity of quinoa on consumer trends in international markets' on inadvertently leading Bolivians to alter their eating habits, as they can no longer afford this nutritious food. The issue opens a door for discussion concerning the Indigenous People of the Bolivian Altiplano, who are the cultivators of quinoa, and the nutrition status of their indigenous children. Does the exportation of quinoa detrimentally affect the nutritional status of indigenous children under-5, particularly in the departments of Potosí and Oruro, where quinoa real is predominantly produced and exported to international markets?

OBJECTIVE

The aim of this case study is to examine the potential impact that the increased production and exports of quinoa may have on nutrition among children under-5 in indigenous, quinoa-producing communities.

METHODS

Quinoa production and export data from Bolivia's National Institute of Statistics was compared against chronic malnutrition data from DHS and the Multi-sector Zero Malnutrition Program at the national level, and in Oruro and Potosí. A case study on quinoa consumption was also reviewed among quinoa-producing households in Oruro and Potosí, and the UNICEF Conceptual Framework on nutrition will be applied to identify key determinants.

RESULTS

From 1990 to 2011, quinoa production increased by 49%, and from 2000 to 2013, quinoa export increased by 97% to international markets, while domestic consumption from 1999 to 2010 was estimated at 23%. Overall, at the national level, from 2007 to 2011, the chronic malnutrition rate among children under-5 decreased by 28%, and from 2008 to 2011, decreased by 29% in Oruro and in Potosí by 25%. Key determinants to malnutrition were revealed to be income; lack of diverse foods; mother's education level; quinoa processing; and labor productivity.

CONCLUSION

Current policy and programmatic interventions implemented by the Multi-sector Zero Malnutrition Program and the National Development Plan have been beneficial in controlling and lowering malnutrition rates among children under-5 at the national level, and in Oruro and Potosí. Chronic malnutrition continues to exist in Bolivia, but the linkage to consumer trends for quinoa in international markets is still unknown. Additionally, increased quinoa production and exports to international markets has not increased further chronic malnutrition rates, but has assisted quinoa-producing households to earn greater income to improve and sustain their families' livelihood.

To understand the impact of agriculture production on nutrition-- monitoring and evaluation techniques should be better integrated in agriculture and nutrition interventions.

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#EC: Implications for public health practice and research from a content analysis of tweets about emergency contraception

BACKGROUND:

Twitter, a popular social media, helps users around the world quickly share and receive information. The way in which health issues—especially controversial ones such as emergency contraception (EC)—are framed in Twitter can influence perceptions and judgments.

METHODS

This novel study applied chi-square and regression analyses to all English-language tweets about EC from March 2011 (n=3,537) representing posts from over 50 countries. Variables measured type of user characteristics (ie gender), content (ie news, humor), Twitter strategy (ie mention), and special date (ie St. Patrick's Day). Results: Tweets most frequently focused on news (27.29%), accessing EC (27.27%), and humor (25.61%). Compared to males, females mentioned birth control (c2 =9.18; p=.002) and EC side effects (c2 =5.10; p=0.024) more often than expected. Tweets with a humorous tone (31%) were shared most often, followed by those disclosing personal/vicarious experience (29%). News-related EC tweets had 2.27 times less odds of being shared compared to other tweets (p<0.001). Tweets had greater odds of being sent on the weekend if they mentioned a personal/vicarious experience (OR = 1.91; p < 0.001), sought advice (OR = 1.94; p = 0.01), or expressed humor (OR = 1.56; p < 0.001). Similar patterns were identified for tweets sent around St. Patrick's Day for personal/vicarious experience (OR = 1.59; p = 0.001), seeking advice (OR = 2.45; p = 0.001), and humor (OR = 1.47; p = 0.005). Conclusion: Study findings offer timely and practical suggestions for reproductive health professionals wanting communicate about EC via Twitter.

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Estimating the prevalence of Female Genital Mutilation (FGM) in the District of Columbia, Maryland and Virginia (DMV). To also examine OB/GYNs and Midwives knowledge and attitude on FGM and their level of preparedness when encountering these patients.

The purpose of the study is to determine the prevalence of FGM victims in the DMV area seeking treatment related to FGM, in addition to examining the physicians level of preparedness when encountering these patients. The study is qualitative retrospective research carried out through a series of anonymised questionnaries answered by OB/GYN's and Midwives (n=100).

FGM is a procedure that is deliberately done to remove the partial or total removal of the female genital organs, in some nations it is said to be related to culture and purity of a women. This procedure has shown to be more dangerous than health effective. FGM is common in underdeveloped Sub Saharan countries, however, due to the migration of people FGM is no longer restricted to countries that practice it traditionally. The influx of African immigrants to the United States has grown over the past years. Health care professionals who come across traditional practices like FGM are regularly faced with ethical dilemmas. If a patient who lives in America, asks a doctor to execute the female mutilation on their daughter, should the doctor or midwife do it? How about if the doctor or midwife knows that their refusal to performing the surgery will drive the patient to getting it done elsewhere, potentially at a less sterile and safe place, thus placing the patient at a much greater risk? Should the doctor or midwife have ethical responsibility to ensure that the patient is kept safe, even if safe means performing a procedure that has no health benefits whatsoever? The research is still ongoing, but data thus far reveals a high encounter of patients with FGM in DMV area, 50% of the physicians do believe there needs to be inclusive training on all aspects relevant to FGM here in the United States.

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Progress in Continuum of Care for Maternal, Neonatal and Child Health in Ethiopia 2005-2011: Findings from the DHS

OBJECTIVE

In 1996/1997, the Ethiopian Government launched the Health Sector Development Program (HSDP), a 20-year sector-wide approach to construct a more cost-effective and efficient national healthcare system (Federal Democratic Republic of Ethiopia 2007/08). In 2003, the HSDP was revised to include a single and integrated plan to improve Maternal, Neonatal and Child Health (MNCH) services. Many aspects of the HSDP capitalize on the continuum of care approach, concentrating on evidence-based interventions that emphasize the delivery of essential health services to mothers, infants and children (Barros 2012).

METHODS

This study uses EDHS 2005 and EDHS 2011 to compare performance and analyze progress in select service indicators in the MNCH continuum of care. The selected service indicators include antenatal care, assisted delivery, postnatal care, BCG vaccination, DPT3 vaccination and measles vaccination. For both EDHS 2005 and EDHS 2011, the analysis focuses exclusively on women who have children 2 years of age or under. An MNCH scoring rubric is developed to measure the concept of continuity across the selected services and examines if women and children in 2011 are receiving more services in the MNCH continuum of care than women and children in 2005.

RESULTS

The mean scores for the selected MNCH indicators as well as the continuum of care indicator improved across the board between 2005 and 2011. An increase in measles vaccinations as well as in women receiving 2 or 3 ANC visits is responsible for the majority of the improvements observed in the mean scores. Postnatal care remains extremely low in 2011, with barely 0.5% of Ethiopian mothers and infants receiving this service.

CONCLUSIONS

These improvements coincide well temporally with implementation of the HSDP III, which explicitly focused on improving MNCH. The HEP, and specifically the training and deployment of over 30,000 HEWs to disadvantaged rural communities, has played a key role in improving service access and utilization that has strengthened the MNCH continuum of care. Postnatal care is the key missing element needed to address the high maternal and infant mortality rates plaguing the country, as many of these deaths occur during the first week following delivery.

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Preventive Health Care for Adolescents with and without Special Health Care Needs: An Analysis of Two Rival Frameworks

OBJECTIVE

Adolescents with special health care needs (SHCNs) are particularly vulnerable to the negative health consequences of unhealthy lifestyle choices and damaging health behaviors, warranting a stronger focus on prevention in this group. The purpose of this study was to compare the receipt of guideline-based preventive services among adolescents with and without SHCNs. Our evaluation was structured to address two rival frameworks on the delivery of preventive care to patients with SHCNs. Under the first framework, competing demands during office visits dominate physician encounters and contribute to lower prevalence of preventive care in this group. Under the second framework, having a usual source of care and increased contact with the health care system facilitates more preventive screening and counseling.

METHODS

Using data from the 2009-2011 Medical Expenditure Panel Survey, we examined physical screening, anticipatory guidance, and time spent alone with provider, on a nationally representative sample of 4,700 adolescents, ages 12-17. We conducted multivariate logistic regression to test the strength of SHCN status as a predictor of preventive care and to identify factors that mediate observed variation in the receipt of preventive services.

RESULTS

A large majority of survey respondents reported that their adolescent received height, weight, and blood pressure screens in the past 12 months and a smaller majority reported that their adolescent received anticipatory guidance on physical activity and healthful eating. However, only 27% reported that their adolescent spent time alone with their physician at their last visit. Multivariate analyses found that having a SHCN was associated with receipt of preventive services and that increased frequency of office-based visits was the strongest mediator of this association. Competing priorities and having a usual source of care did not seem to mediate this effect.

CONCLUSIONS

We found that adolescents with SHCNs were more likely to report receipt of preventive services than their healthy peers and that increased interaction with the health care system may contribute to higher rates of guideline-based prevention in this population. Our findings suggest that policy-makers and practitioners focus on promoting parity in the delivery of preventive care between adolescents with and without SHCNs. They also suggest that the development of effective prevention promotion strategies may be challenging, as many adolescents do not interact with the health care system more often than is annually recommended. Policy makers may need to consider alternative preventative care delivery settings if they hope to reach a more inclusive population of adolescents.

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The relationship between sugar consumption and liver enzymes in reproductive age women

BACKGROUND & AIMS

Sugar-sweetened beverages (SSB) are widely consumed among women of reproductive age, but their association with liver metabolism and fat content are not well understood. Our objective was to determine whether there was an association between SSB, total added sugar, and total fructose intake with serum concentrations of liver enzymes as surrogate markers of liver fat content in premenopausal women without obesity or chronic disease.

METHODS

Participants (n = 259, mean age: 27.3 ± 8.2 years) were followed for up to 2 menstrual cycles and provided fasting blood specimens at up to 8 visits per cycle and four 24-h dietary recalls per cycle between 2005 and 2007. The complete metabolic profile, including alanine and aspartate aminotransferases (ALT and AST, respectively), was measured in morning fasting serum samples at all 16 visits. Linear mixed-effects models with random intercepts estimated associations between sugar intake and liver enzyme concentrations, adjusted for race, age, Mediterranean Diet Score, and total energy.

RESULTS

Average SSB consumption during the study (non-consumers, 0-0.75 cups per day, >0.75 cups per day) was not associated with ALT or AST levels overall (P =.31 and P=.32, respectively). When analyzed as time-varying measures, SSB (cups per day), sugar (grams per day), and fructose (grams per day) were also not associated with ALT or AST levels (all P > 0.16).

CONCLUSIONS

Sweetened beverage intake was not associated with short-term effects on liver enzyme concentrations in young healthy women. Investigation into the relationship between sugared beverage intake and effects on liver enzymes is warranted in populations with greater sugar consumption and/or established obesity.

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Assessing the Impact of Family Status, Family Cohesion, and Acculturation on Youth Violence among Immigrant Latinos

BACKGROUND/OBJECTIVES

Latino youth violence is an emerging public health concern. The objective is to assess the impact of family status, family cohesion, and acculturation on youth violence among Latino immigrants in Langley Park, MD compared with a control community in Culmore, VA.

METHODS

Constructs were generated from survey questions to represent family support and cohesion, acculturation, and youth violence. Bivariate and multivariate regression analyses were modeled to evaluate the relationships between family support and cohesion, acculturation, and violence, after adjusting for confounders.

RESULTS

After controlling for covariates, family support consistently reduced victimization (PE = -0.02, SE = 0.01, t = -2.64, p-value = 0.0085); increased non-violence attitudes and beliefs (PE = 0.32, SE = 0.05, t = 6.17, p-value = <.0001); and protected against fighting (OR = 0.83, 95% CI = 0.77, 0.89), gang knowledge (OR = 0.81, 95% CI = 0.77, 0.86), and feeling unsafe (OR = 0.90, 95% CI = 0.83, 0.98). Conversely, more acculturated youth reported greater victimization (PE = 0.02, SE = 0.00, t = 3.86, p-value = 0.0001); non-violent attitudes (PE = 0.08, SE = 0.02, t = 3.20, p-value = 0.0014); fighting (OR = 1.07, 95% CI = 1.04, 1.11); gang knowledge (OR = 1.08, 95% CI = 1.05, 1.11); and feeling unsafe (OR = 1.12, 95% CI = 1.07, 1.16).

CONCLUSIONS

Family support is associated with reduced violence engagement and risk behaviors among Latino youth. Results will inform the development and implementation of future youth violence prevention programs among ethnic minorities and immigrants.

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A Qualitative Study for the Development of a Text-based Smoking Cessation Program for Pregnant Women

BACKGROUND

Smoking during and after pregnancy remains one of the most common preventable causes of infant morbidity and mortality. According to national guidelines, a mainstay of treatment for tobacco dependence among pregnant smokers is regular, tailored, and intensive counseling. Text-based mobile health interventions have been shown effective in disseminating such counseling messages.

STUDY AIMS

The study Aim is to elicit qualitative feedback from pregnant smokers and recent quitters to supplement the development of a state of the art, interactive, and intensive text messaging program that promotes smoking cessation in pregnant women.

METHODS

Data was collected by structured interviews of pregnant smokers in Washington, DC, and were analyzed using thematic analysis. Participants were asked to discuss several social cognitive constructs that affect their smoking behavior and their ability to quit smoking during pregnancy. This study also collected general feedback for the program and prototype messages.

RESULTS

Three themes emerge: A desire for hard facts, music and stress, and continual support. Participants discussed that their baby was a major source of motivation for quitting smoking and recommended the program to include more facts on the effects of smoking on the baby. Skills for smoking cessation that were presented in the messages were received positively, and music emerged as a main resource that the participants used to handle stress. Overall the text-based intervention was regarded as a good method to guide pregnant smokers through smoking cessation, to provide encouragement, and be supportive. Our findings provide show that this intervention shows much promise for being an instrumental resource for pregnant women who desire to quit smoking.

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Impact of Clinical Practice Guidelines on the Treatment of Pediatric Femur Fractures

PURPOSE

Clinical practice guidelines (CPG) are increasingly becoming important in the practice of clinical medicine. The AAOS publisheda CPG on the treatment of pediatric diaphyseal femur fractures in September 2009 consisting of 14 recommendations on a variety of topics related to the treatment of these fractures. Despite the development of CPGs, there is little data on the clinical impact of these guidelines. We aimed to assess the impact on clinical practice of the CPG on the treatment of pediatric femur fractures.

METHODS

We performed a retrospective chart review of all patients presenting to a single pediatric tertiary care hospital for treatment of a diaphyseal femur fracture between 2006 and 2012. The patients were divided into a pre-CPG group (treated before Sept 2009) and a post-CPG group (treated after Sept 2009). The treatment of each patient was compared against the CPGto determine if the treatment recommendations had been followed. The groups were compared using the Fisher's exact test to determine if a significant change in treatment approach was found after the CPG was published.

RESULTS

A total of 361 patients were treated for a diaphyseal femur fracture during this time frame and were included in this study (143 in pre-CPG groups and 218 in post-CPG group). Average age of total group was 64 months (range 0-16.1 yrs). The % treated per the suggested and optional CPG recommendations are shown in the table. CPG recommendations lacking sufficient data for definitive clinical recommendation were not included.

CONCLUSION

In most situations the treatment of pediatric diaphyseal femur fractures did not significantly change after the pediatric femur fracture CPGs were published. It is unclear if this lack of clinical impact of the CPGs was due to surgeon disapproval of the CPGs, surgeon ignorance of the CPGs, or poor guideline development. Significance: Assessment of the clinical impact of CPGs is needed to determine the usefulness of the current CPG process and improve the CPG development process in the future.

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Bridging the Divide: The Komen-Community Assisted Mammogram Program and Its Impact on the Underserved in Maryland

The Komen-Community Assisted Mammogram Program working with Holy Cross Hospital seeks to increase detection of breast cancer in Montgomery and Prince George's Counties, Maryland by targeting women in the underserved community for mammography. This culturally sensitive program is unique in that each participant is provided with comprehensive breast care all within one hospital, including breast health education and links to free breast care services from screening to surgery. To evaluate the efficacy of this program, our goal was to compare breast cancer incidence across ethnic groups within our sample population to the national values and to assess the ability of the program to bridge health care disparities across socioeconomic barriers. From 2004 to 2011, the number of yearly screening mammograms and/or ultrasounds increased from 129 to 1120. Of the 3,467 total participants from 2004 through 2011, 271 (7.82%) were then referred to breast surgeons for consultations. Of those, 194 participants (5.60%) required biopsies and 39 (1.12%) needed a mastectomy or lumpectomy. In total, 31 women were diagnosed with breast cancer (0.89%). Broken down by ethnicity, breast cancer incidence in our study population was consistently higher than the national values. Our incidence rates were the following: 15/1053 African Americans (1.42%), 6/1937 Hispanics (0.31%), 6/259 Asians (2.32%), and 3/131 Caucasians (2.29%). Our study demonstrates that the Komen-Community Assisted Mammogram Program and Holy Cross Hospital can provide an effective breast health screening program and increase detection in underserved and low-income communities. Yet these at risk women have much higher rates of infiltrative disease on presentation as compared to women that have consistently had adequate access to healthcare. Providing continuous secondary prevention with earlier implementation could decrease latency to diagnosis and thus minimize the disparity in this measure of health status between insured and uninsured women.

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Infant deaths occurring on sofas

OBJECTIVE

Epidemiologic studies suggest that sofa sleeping increases the risk of sudden and unexpected infant death as much as 20-fold. The purpose of this study is to describe the demographic and situational risk factors for sofa-related infant deaths and compare them with other sleep-related infant deaths.

METHODS

This is a secondary data analysis of sofa-related infant deaths from 24 states during 2004-2012 contained in the National Center for Child Death Review (NCCDR) database. De-identified data were extracted for infant (≤ 365 days of age) deaths that occurred on sofas and similar cushioned products (armchairs, beanbags, futons). Variables analyzed included caretaker characteristics (e.g., alcohol and/or drug use), co-sleeping, objects in sleep environment, pregnancy history, sleep environment changes (e.g., new location), and position (e.g., prone). The data were compared to data on other sleep-related infant deaths in the NCCDR database. Frequencies were obtained using SPSS Statistics Data Editor 20.0 (IBM Corporation).

RESULTS

1,089 sofa-related infant deaths were analyzed. The majority of infants were 1-2 months of age (56.1%), male (60.7%), and Caucasian (55.8%). 76.7% of infants were co-sleeping at the time of the incident, compared to 54.7% of other sleep-related infant deaths within the NCCDR database. 23.1% of infants were in a new/different sleeping environment, compared to 12.7% of other sleep-related infant deaths. 28.1% of infants were placed for sleep in the prone position and 35.2% were found in the prone position. During pregnancy, 29.7% of mothers smoked tobacco, 9.0% used illicit drugs, and 1.7% had heavy alcohol use, compared to national percentages using the 2012 National Survey on Drug Use and Health of 15.9%, 5.9%, and 0.3%, respectively. 23.2% of primary caregivers had a history of substance abuse, including alcohol (6.9%), marijuana (10.4%), and other drug use (13.1%).

CONCLUSIONS

Sofa-related infant deaths exhibit the same risk factors as other known sleep-related infant deaths, such as position, co-sleeping, young age, tobacco smoke exposure, and sleep environment. There was a higher incidence of co-sleeping and new/different sleeping environment in sofa-related infant deaths compared to other sleep-related infant deaths within the NCCDR database. Additionally, mothers of sofa-related infant deaths had a higher incidence of tobacco, alcohol, and illicit drug use during pregnancy than national percentages. These results further support the evidence that parents should be advised against placing their infants to sleep on sofas and other similar furniture (e.g., futons).

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Self-administered HPV testing as a cervical cancer screening option for underscreened women in the U.S

BACKGROUND

Though significant gains have been made in preventing cervical cancer over the past 30 years, cervical cancer continues to cause morbidity and mortality among women in the U.S., particularly among those who are screened infrequently or not at all. Recognition of the strong causal relationship between persistent, high-risk HPV infection and cervical cancer has led to the use of HPV DNA tests in cervical cancer screening protocols. Currently HPV testing is used in conjunction with Pap tests, though there is increasing evidence to support the use of HPV testing alone as a primary cervical cancer screening test, particularly in low-resource settings. Novel screening devices which allow women to self-screen for HPV may offer opportunities to simplify the screening protocol and reach women who are not receiving recommended screening services.

GOALS AND OBJECTIVES

This research investigates the role of HPV self-testing in improving cervical cancer screening practices specifically among Hispanic and Arab women living in the United States – two populations who are consistently underscreened. The study investigates how these women respond to the option of self-administered HPV testing and how likely they would be to use self-testing as a first step in preventive screening. The findings will contribute to the development of clinically sound and culturally appropriate policies and systems intended to improve cervical cancer screening rates among women.

METHODS

This study uses survey methods and individual interviews to explore how women's attitudes towards, acceptance of, and sense of self-efficacy in using self-administered HPV tests may impact their likelihood to use the tests for screening.

RESULTS

Results of the study are pending and will be available at Research Day.

CONCLUSIONS

The research to date on self-administered HPV screening devices suggests that they may play a significant role in improving access to preventive and diagnostic screening for cervical cancer. The study's findings will help to identify and elaborate specific implementation challenges and policy implications associated with incorporating self-administered HPV testing into the cervical cancer screening protocol targeted at underscreened populations.

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