



IRISH & AMERICAN PAEDIATRIC SOCIETY MEETING



48th Annual Meeting
Scientific Session – Thursday 22nd September 2016

07:45	Welcome and Opening of Meeting – President Rita M. Ryan		
Session I – Moderator: <i>Eleanor Molloy, Chair of Paediatrics, Trinity College and Associate Editor, Pediatric Research</i>			
8:00	Rita Ryan	Med Univ So Carolina (MUSC), Professor of Peds	Atrial Natriuretic Peptide Differentially Affects Surfactant Secretion by Human Alveolar Type II Cells According to O ₂ Concentration
8:15	Krishna Shah	Univ Kentucky Pathology fellow	TPN-Related Cholestatic Hepatopathy and Bronchopulmonary Dysplasia: Evolving Pathology Limiting Survival in Extremely Low Birth Weight Infants
8:30	Beverly Powell	Fairfax, Virginia, Developmental Peds	Neurodevelopmental Sequelae of Zika Virus in the Newborn
8:45	Beverly Powell	Fairfax, Virginia	Caritas : A Legacy of Caring from Skibbereen to the New World
9:00	<p style="text-align: center;">Thomas Cone Founders Lecture: <i>William (Bill) Keenan, MD, St. Louis University</i> <i>“Helping Babies Breathe”</i></p> <p><i>Introduction: Ward Rice, Cincinnati Children’s Hospital Medical Center, IAPS Council Member</i></p>		
9:45	break		
Session II – Moderator: <i>Tania Condurache, MD, MSc, Associate Professor of Pediatrics, Univ of Louisville, Kosair Children’s Hospital, Pediatric Hospital Medicine</i>			
10:15	Claire MacGeorge New member	MUSC	Use of Office and Emergency Care for Pediatric Constipation
10:30	Gary Hardiman	MUSC	A Systems Biology Approach to Understand Early Life Exposure to Endocrine Disrupting Chemicals
10:45	Tania Condurache, MD, MSc New Council Member	Univ Louisville	Parental and Healthcare Providers Attitudes Regarding the Indications for Antipyretics Before and After Implementation of an Educational Tool
11:00	Tania Condurache, MD, MSc	Univ Louisville	Human Trafficking: What Residents Need to Know
11:15	Liah McElligott Student	Student from Dublin doing research at MUSC	Feasibility and Utilization of a School-Based Telehealth Program Among Children with Medical Complexity
11:30	George Rodgers, MD, PhD	Professor of Peds, Univ Louisville,	Guns in America: Increased Security or Public Health Disaster? What Do We Know? A Literature Review
11:45	George Rodgers, MD, PhD	U Louisville	Low-Level Lead Exposure and Attention-Related Behaviors, Including ADHD: A Brief Historical Review
12:00	C. Anthony (Tony) Ryan	Cork Univ, Professor of Pediatrics	George Boole, Saucy Little Alice and Smallpox Vaccination: The Greatest Stories Never Told: A Story of an Uneventful Smallpox Vaccination

Atrial Natriuretic Peptide Differentially Affects Surfactant Secretion by Human Alveolar Type II Cells According to O₂ Concentration

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RATIONALE: We have previously shown that components of the NP system, including atrial natriuretic peptide (ANP) and its receptors (NPR-A and -C), are highly expressed in fetal sheep alveolar type II cells (ATII) and expression decreases dramatically after birth. Using murine MLE-15 cells, we also demonstrated that oxygen concentration regulates NPR-C expression. However, the relationship between ANP and varying O₂ concentrations on surfactant secretion [as measured by surfactant protein B (SP-B) secretion] from ATII has not been directly investigated. Understanding the effects of ANP on pulmonary surfactant release would better define the factors controlling the normal transition to air breathing. Since alveolar oxygen tension changes dramatically after birth and affects NPR expression, we hypothesize that ANP may regulate surfactant secretion in ATII cells differentially according to O₂ concentration.

METHODS: Primary ATII cells were purified from adult human lungs and cells were incubated in 1 of 3 O₂ concentrations: 21% (ambient air), 13% (closely matching levels in the alveolar space of healthy subjects) or 5% (hypoxia). At each O₂ concentration, cells were exposed to 1 of 4 treatment conditions: control, 1 nM ANP, 10 μ M terbutaline, or both ANP and terbutaline. After 20 hr of exposure to experimental conditions, culture supernatants were collected for SP-B analysis by western blot and cells were lysed for qPCR analyses. Experiments were repeated using lung samples obtained from different subjects (n \geq 3). Surfactant secretion assays were also performed from whole lung pieces placed in culture and exposed to these same experimental conditions (media supernatants normalized to tissue mass for analyses).

RESULTS: SP-B secretion by lung tissue and purified ATII cells was highest when cultured at 13% O₂ (representative of the physiological alveolar space). Also, both ANP and the known secretagogue terbutaline (a β ₂-adrenergic receptor agonist) significantly increased SP-B secretion at 13% O₂ (however, as shown previously, this secretory effect was lessened when the two agents were combined). Conversely, neither agent significantly increased SP-B secretion in 5% or 21% O₂ cultures.

CONCLUSIONS: Our results indicate that ANP increases surfactant secretion by ATII cells at physiological O₂ concentration (13%). Differential effects of ANP on ATII may be due to β ₂-adrenergic signaling or O₂-related changes in NPR-A and/or NPR-C expression. Further understanding of the relationship among the NP system, β ₂-adrenergic signaling and O₂ tension may inform the pathophysiology and clinical treatment of early acute lung injury in neonates.

TPN-related Cholestatic Hepatopathy and Bronchopulmonary Dysplasia: Evolving pathology limiting survival in extremely low birth weight infants.

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Background: Ongoing advances in care of the premature neonate allows for successful outcome following very early delivery and/ or low birth weight. Nevertheless, in some cases, irreversible liver and lung pathology remain as major life limiting complications during infancy despite prolonged and sophisticated clinical team effort. The observed pathology at post mortem examination has changed over several decades and may help to identify newer approaches to management. We present 2 recent autopsy cases to illustrate hepatic and pulmonary pathology in the setting of extreme prematurity and summarize the current understanding of the deranged pathophysiology.

Case 1. 24 weeks 3 day, dizygotic female twin, extremely low birth weight (ELBW) 450 grams. Neonatal course complicated by chronic bronchopulmonary dysplasia (BPD) and intolerance to enteric feeds. At 90 days of age liver failure ensued with development of hepatosplenomegaly, thrombocytopenia, and cholestasis secondary to TPN. Age at death was 98 days (corrected gestational age 38 weeks and 3 days). At autopsy BPD findings in lungs had superimposed bile stained interstitial macrophages. Liver showed: canalicular and intracellular cholestasis; feathery degeneration of hepatocytes with multinucleation; persistent extramedullary hematopoiesis, and fibrotic end stage architecture with abortive lobular units, and disarrayed plates of hepatocytes.

Case 2. 26 weeks and 5 days singleton female gestation ELBW 509 grams had a prolonged hospital course of 216 days (corrected gestational age of 57 weeks and 6 days) characterized by chronic BPD with respiratory failure. Postmortem examination of the lungs, showed typical “new BPD” findings of widened interstitium with limited fibrous proliferation; architectural distortion secondary to alternating zones of hyperexpanded and under expanded alveoli; limited smooth muscle proliferation and squamous metaplasia; peripheral simplified alveolar spaces with underdevelopment (residual canalicular and saccular (pattern); focally decreased numbers of alveoli; and thin-walled ramifications of bronchiole-associated branches of pulmonary artery with associated decreased numbers of capillaries.

Discussion: Liver failure from end stage fibrosing cholestatic hepatopathy complicates TPN. Current pathogenesis emphasizes residual immaturity of the intrahepatic biliary secretory system limiting bile production, combined with reduced enterohepatic circulation of bile acids impairing bile uptake, production and release. On the other hand, pathogenesis of new BPD concentrates on evidence for interruption and impairment of normal lung growth and development, as underlying the deranged pathophysiology. In both conditions balancing needs for nutrition, oxygenation and corticosteroid therapy may influence the prognosis. Ongoing studies continue to focus on pathologic observations for development of newer management strategies.

NEURODEVELOPMENTAL SEQUELAE OF ZIKA VIRUS IN THE NEWBORN

BEVERLY ANN POWELL, MD, FAAP, FAIRFAX, VIRGINIA

BACKGROUND: In the past 6 months, cases of mosquito-borne Zika virus have spread from a remote area of Brazil throughout the Caribbean islands and Puerto Rico. With millions of Americans living in impoverished, overcrowded areas on the Gulf Coast, local transmission is expected to occur. What began as a mild, flu-like illness has evolved into a public health emergency due to severe effects upon the fetus & newborn exposed during pregnancy. Not since the rubella epidemic of the 1960's have as many children been affected by hearing impairments, birth defects & developmental disabilities.

METHODS: Review of literature about the neonatal and developmental effects of Zika virus over the past year. Information has evolved & includes a case report of an infant in DC with normal ultrasounds until the 19-20th week when microcephaly was detected. A more sophisticated scan revealed severe CNS abnormalities. The mother's blood tested positive for the virus 10 weeks after she was exposed during a trip to Central America. When and how the virus acts in the body, eg. how it crosses the placenta and blood-brain barrier remain to be determined. Current statistics from Brazil and Central America indicate that as many as 13% of infants exposed to Zika virus during pregnancy will be affected by microcephaly and other medical and neuro developmental problems.

RESULTS: As of July, the CDC is monitoring close to 400 women in the US, most of whom acquired Zika during travel to endemic areas and 300 pregnant women in Puerto Rico. Most pregnancies are ongoing. However, several infants have been stillborn or had multiple birth defects in addition to microcephaly. The brains of 6 infants showed a combination of CNS abnormalities: hydrocephalus, calcium deposits poorly-formed cortical structures, abnormal eye development, clubfoot & other musculoskeletal abnormalities. In addition to microcephaly, surviving infants may have significant developmental disabilities and neurologic problems, eg. seizure disorders. Over time it may present as a spectrum of problems ranging from complex handicaps to coordination problems or mild learning disabilities.

Unlike other viral illnesses, Zika virus is the only one known to be sexually-transmitted. In a recent case, a woman who was asymptomatic until the day after unprotected sexual contact passed the virus to her partner.

CONCLUSIONS: Public health officials, including the CDC and WHO, have cautioned women of child-bearing age to avoid travel to areas where the Zika virus is prevalent. For those in Brazil & Puerto Rico putting off conception until the epidemic is under control & using birth control were advised. However contraceptives are not readily available in poverty-stricken areas and the population is predominantly Catholic, which makes it difficult to implement those recommendations. Until a vaccine is developed, in approximately 2 years, mosquito control with DEET and similar measures are advised (especially during the summer months in the South & Gulf coast states). In addition to ultrasounds to monitor head size, clinicians should look closely for calcifications like those seen in other viral illness affecting the CNS. The AAP recently issued guidelines for primary care physicians caring for infants at-risk for sequelae of the Zika virus. Early intervention programs are gearing-up for additional referrals. These will be shared with the group.

CARITAS : A LEGACY OF CARING FROM SKIBBEREEN TO THE NEW WORLD

BEVERLY POWELL, MD, FAAP, FAIRFAX HOSPITAL, FAIRFAX, VA

BACKGROUND: Catherine, the future Mother Xavier, Mehegan & her sister, Margaret left Skibbereen from the port of Queenstown, now Cobh, in 1842. They sailed on the Governor Douglass and disembarked in lower Manhattan on 5/28/42.. Catherine was the youngest of her parents' 10 children and was 17 on arrival in the US. As with other emigrants she contacted Fr. O'Hara of St. Patrick's church for assistance in finding lodging & customers for their needlework.

METHODS : Review of the archives of the Sisters of Charity of Saint Elizabeth, personal travel to Skibbereen and Cobh where a "famine ship" is located, other memorials of victims of the Great Famine and interviews with Sisters who served as Missionaries to China between 1935 and 1951, when they endured attacks by the Japanese and persecution by the Communists.

RESULTS : Catherine lived with her sister, Margaret for 3 years until she married and moved to Australia. Her parents sent a brother to bring her home but he decided to stay in the US where there were more opportunities for employment. On February, 1847, Catherine entered the Convent of Mt. Saint Vincent in New York. She was sent to establish a branch of the Sisters of Charity in Newark, NJ, in 1859. Legend has it that, with 4 other sisters and \$ 5, she traveled to Convent Station (on the Lackawanna RR) to establish a Motherhouse there in July, 1860.

When she emigrated to the US, Irish Catholics did not have the opportunity for education , unless they enrolled in Protestant schools and took religious instruction. Mother Xavier was therefore devoted to caring for foundlings, providing health care, services to women & elementary education. After opening high schools and an Academy for young women, in 1899, the Sisters of Charity received a charter for the first 4-year liberal arts college for women in NJ. It has consistently been recognized for it's programs of excellence.

MISSIONARY SPIRIT: In 1924, when China was under attack by Japan and conditions, esp. for the women and children were very poor, Mother Superior decided to send a band of Sisters to provide medical care, food, education and to start an orphanage for children whose parents had been killed in air raids or due to illness or hunger. During WW II they saved members of the Air Force who had been shot down. Between 1935 and 1951, conditions were treacherous under the Communists and, along with Missionary priests, Sisters were forced to fled for their lives. Sister Carita has documented their experience in HAVOC IN HUNAN.

CONCLUSION: IN 1998 a monument to the memory of Mother Xavier and her accomplishments was placed by the main entrance to Abbey Cemetary near a mass grave to famine victims. The inscription gives her birthdate, entry into the Convent of Mt. Vincent & founding of the Sisters of Charity of Saint Elizabeth. From Skibbereen, her good works improved the lives of thousands of women and children – initially in New Jersey – and later as missionaries in China. Her efforts continue to have positive influence in the areas of higher education, medical care, spirituality & more recently ecology.

Standardized approach for revision of a global educational program: Inputs towards revising Helping Babies Breathe 2nd Edition

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Background:

Helping Babies Breathe (HBB) is a skills-based curriculum of neonatal resuscitation (NR) shown to improve early neonatal mortality and stillbirth rates in low-resource settings. Since HBB's launch in 2010 through a Global Development Alliance (GDA), including the American Academy of Pediatrics, more than 300,000 providers have been trained in 77 countries globally with translation of materials into 26 languages. Despite these successes, performance gaps need to be addressed. As educational programs should be developed with input from all levels of educators and providers, we sought to use a standardized approach to make revisions to HBB 2nd Edition (HBB-2) to address gaps and improve instructional impact.

Design/Methods:

Inputs for HBB-2 revisions included the 2015 ILCOR guidelines; a summary of published literature and project evaluations by the Survive and Thrive (GDA); and an Utstein-style implementation meeting of key stakeholders. Program officers/HBB providers responded to a survey about HBB learning materials and ways to improve them. Selected program officers and frontline providers carried out 2 rounds of Delphi review of revised materials.

Results:

Scientific changes included de-emphasis of oropharyngeal suctioning, expectant management of infants with meconium-stained amniotic fluid, and increased emphasis on effective/timely bag-mask ventilation. The GDA and Utstein inputs increased sensitization to QI, including ongoing identification of gaps in care and critical monitoring targets in facilities. Frontline providers (N=102) suggested emphasis on building competence in NR skills, systems for ongoing practice, and improving support for facilitators. Delphi review further emphasized communication and reinforced the importance of facilitators seeking partnerships with Ministries of Health, professional societies and in-country educational institutions.

Conclusions:

Revision of educational programs benefits from wide user input. HBB-2 will emphasize systems for low-dose/high-frequency practice, mentoring and development of facilitators, and ongoing QI. Next steps include: hands-on use of modified approaches by expert panels and field testing of further modified materials in resource-limited environments in Africa and Asia.

USE OF OFFICE AND EMERGENCY CARE FOR PEDIATRIC CONSTIPATION

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Background: Pediatric constipation is a common and costly problem that is increasingly being managed in Emergency Departments (ED). Primary care visits can be an important marker of having a relationship with a primary care physician and recognizing constipation as a chronic condition. Little is known about patterns of seeking care in the office setting prior to and following ED visits for constipation. The objectives of this study were to determine the frequency of constipation diagnoses in children in a large commercially insured population and to determine the frequency of an office visit in the month before and after an ED visit for constipation.

Methods: Data was extracted from the Truven Health MarketScan[®] database which consists of medical claims for millions of privately insured children in the United States from 2012-2013. Children with an ED visit for constipation were identified by primary ICD-9 diagnosis codes 564.00-564.09. The presence and timing of clinic visits in 30 days prior and 30 days following, additional ED visits, in addition to demographic variables, were extracted. A chi square test was used to compare group frequencies.

Results: Within the MarketScan[®] database, 448,440(2.6%) out of a population of 17.0 million children aged 0 to 17 years were identified with constipation in at least one setting. Of these, 65,163 (14.5%) had an ED visit for constipation, comprising the study population of interest. Of the children seen in the ED, 34% had an outpatient visit in the month before the ED visit, occurring at a mean of 10.2 (SD 8.4) days prior. Children under age 1, females, and children living in the Northeast were more likely to have had an office visit in the 30 days prior to the ED visit ($p < 0.0001$ for all comparisons). Of the children with ED visits, 36% had an outpatient visit in the month following their ED visit. The mean time to the outpatient visit was 8.8 days (SD 8.1) after the ED visit, with 28% of these visits having a constipation diagnosis code. A total of 1467 (2.3%) children who were seen in the ED had an additional ED visit for constipation within the following 30 days. However, 45% of all children with an ED visit had no office visit in the 30 days before or after the ED visit.

Conclusion: Constipation is a common problem that led 65,163 children in this privately insured population to seek emergency care, and nearly half had no outpatient visit either before or after their ED visit. A better understanding of the practice patterns and risk factors for using the ED will better inform interventions to encourage more clinic-based care for this common problem.

A SYSTEMS BIOLOGY APPROACH TO UNDERSTAND EARLY LIFE EXPOSURE TO ENDOCRINE DISRUPTING CHEMICALS

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Background: Endocrine disrupting chemicals (EDCs) including plasticizers, pesticides, detergents and pharmaceuticals, affect a variety of hormone-regulated physiological pathways in humans and wildlife. Many EDCs are lipophilic molecules and bind to hydrophobic pockets in steroid receptors, such as the estrogen receptor and androgen receptor, which are important in vertebrate reproduction and development. Indeed, health effects attributed to EDCs include reproductive dysfunction (e.g., reduced fertility, reproductive tract abnormalities and skewed male/female sex ratios in fish), early puberty, various cancers and obesity. A major concern is the effects of exposure to low concentrations of endocrine disruptors *in utero* and *post partum*, which may increase the incidence of cancer and diabetes in adults. *The working hypothesis is that physiologically relevant levels of EDCs have subtle yet profound effects on the developing embryo by interfering with the natural progression of endocrine and developmental pathways.* Critical life stages exist during early development when hormones dictate the differentiation and development of tissues. Perturbation of this delicate hormonal balance by exogenous estrogens can have irreversible effects on endocrine-sensitive organs. A significant challenge in hazard assessment is accurately relating chemical impacts across species and stratifying effects or modes of action (MOA) that are likely to be detrimental to human health. One recent strategy is the adverse outcome (AOP) pathways framework that organizes mechanistic and/or predictive relationships between initial chemical–biological interactions, pathways and networks, and adverse phenotypic outcomes. The approach considers the toxicant, the macromolecular interaction, cellular responses, organ responses, organism responses and population effects.

Methods: We have exploited the zebrafish model as a proxy for human health assessment in the context of early life exposures. Zebrafish embryos were exposed to two EDCs, Bisphenol A (BPA) and 17 α -ethynylestradiol (EE2) at environmentally relevant concentrations. High throughput RNA sequencing was performed on the zebrafish transcriptomes at the 24h and 96h developmental time-points. We developed improved Gene Ontology and network analysis tools for Big Data analyses that are readily integrated and adapted to the AOP framework. In order to examine the data, we humanize the zebrafish data outputs. We first annotate the sequence reads by mapping to the *Danio rerio* (zebrafish) genome. This is performed by exploiting Ensembl's homology to append a human Entrez gene ID to the mapped reads. The rationale behind this approach is that the degree of annotation available for human is considerably greater than for zebrafish, and this permits a more sensitive systems level interrogation (particularly in the context of pediatric health assessments).

Results: The studies presented here in Aim 1 were centered on a series of early life exposures of zebrafish to two EDCs (BPA and EE2) at environmentally relevant concentrations. Amongst biological processes significantly altered by EE2 exposure 24 hpf (number of genes; significance) were visual perception (64, $0.12E-05$), sensory perception of light stimulus (65, $0.15E-05$), sensory perception (123, $0.10E-01$), neurological system process (173, $0.99E-03$), system process (269, $0.26E-01$) and photoreceptor outer segment (5, $0.94E-05$). Amongst cellular component terms photoreceptor outer segment (5, $0.94E-05$) was highly significant. Phenotypic assessments revealed alterations in eye size and visual responses. Differences in eyes between exposed compared to controls were highly significant (p -values < 0.0005).

Conclusions: A significant challenge in hazard assessment is accurately relating chemical impacts across species. We have exploited the zebrafish model coupled to novel systems level analysis tools. Our data provides compelling evidence linking the prediction of a molecular initiating event to a visual disease outcome and highlights the utility of comparative genomics approaches in systems level analyses.

PARENTAL AND HEALTHCARE PROVIDERS ATTITUDES REGARDING THE INDICATIONS FOR ANTIPYRETICS BEFORE AND AFTER IMPLEMENTATION OF AN EDUCATIONAL TOOL

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Background/Objectives: Fever phobia is a phenomenon that still exists today among parents and healthcare providers alike, despite the decades worth of knowledge about the beneficial effects of fever in fighting infections. In this study, we sought to examine the attitudes of parents and healthcare providers in our hospital on the use of antipyretics in hospitalized febrile children.

Methods: Eligible participants in the study included: (1) pediatric residents, (2) nurses, and (3) primary caretakers of children ages 0-60 months hospitalized for ever of infectious source. The subjects completed group-specific, multi-item questionnaires via Survey Monkey and viewed a 10-minute educational presentation. Pre- and post- intervention comparisons of median temperature thresholds were performed using the Wilcoxon Signed Rank test; attitudes toward fever were compared using the McNemar test. In addition, 40 patient charts were reviewed to compare the overall usage of antipyretics for fever, before and after the implementation of the educational tool.

Results: sixty-eight parents, 38 nurses, and 22 residents viewed the educational presentation and completed both surveys. The median temperature considered a fever that parents would treat with antipyretics increased from 100.0 to 100.4 ($p= 0.002$) after the intervention. Forty-seven percent of parents, 72% of nurses, and 0% of residents would awake a child from sleep to treat a fever prior to the intervention, compared to 40% of parents ($p = 0.508$), 39% of nurses ($p= 0.07$), and 0% of residents (p -value N/A) after the intervention, respectively. Fifty-four percent of parents, 83% of nurses, and 91% of residents felt that fever was beneficial prior to the intervention, compared to 83% of parents ($p= 0.001$), 94% of nurses ($p= 0.05$), and 100% of residents (p -value N/A) after the intervention, respectively. Forty-one percent of parents, 11% of nurses, and 0% of residents would *always* treat a fever prior to the intervention, compared to 22% of parents ($p= 0.035$) and 0% of nurses and residents (p -value N/A) after the intervention. Sixty percent of parents felt that antipyretics could have harmful side effects prior to the intervention, compared to 95% after the intervention ($p < 0.001$). No reduction in the use of antipyretics was identified on a comparative review of 40 patient charts before and after the intervention.

Conclusions: The parent group benefited the most from our educational tool, specifically by learning that fever can be beneficial and does not always need to be treated, thus avoiding potentially harmful antipyretic side effects. The nursing survey results indicated improvement in their knowledge after the educational intervention; however, there was no significant change in the residents' answers before and after the intervention, suggesting that their knowledge of the topic was adequate. The nurses could benefit from more education on fever, especially given their role as first responders in administering antipyretics and educating parents about fever.

HUMAN TRAFFICKING: WHAT RESIDENTS NEED TO KNOW

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Introduction:

Human trafficking (HT), the fastest growing criminal industry in the world, affects 12.3 million people worldwide, 1.2 million of which are children. Despite its growing prevalence, healthcare providers (HCP) seldom recognize HT. Of the estimated 28% of HT victims seen by a HCP during their captivity, none were rescued. Very few residency-training programs offer formal training for the recognition, treatment and rescue of HT victims. Of the 101 victims of HT identified in KY in 2014, 44 were trafficked as children, reiterating the importance of equipping pediatric residents with the knowledge and tools to appropriately handle a potential HT victim.

Methods:

An evidence-based HT curriculum including epidemiology, and the role of HCPs in identifying, treating and rescuing child victims of HT, was developed for the pediatric residents at our institution. This IRB approved curriculum was administered to pediatric residents, preceded and followed by a knowledge quiz (pretest and posttest, respectively). Exposure to the topic and comfort level in recognizing victims of HT were also assessed. Pre- and post-test results (% correct) were compared using the paired t-test to evaluate the effectiveness of this curriculum in improving resident knowledge. The Wilcoxon signed-rank test was used to compare median exposure to the topic and comfort with identification pre- and post- intervention. A chi-square test was used to compare level of training to the exposure to the topic and confidence in victim identification pre intervention.

Results:

The pre-test, delivered to 80 pediatric and medical students, was completed by 41 respondents (60%). Of pediatric trainees, 75% had "little" exposure to the topic of HT; 22% had no exposure; 68% were not at all confident in recognizing a victim. The level of training was not associated with prior exposure to the topic, nor with comfort level in identification of a victim ($p = 0.08$ & 0.39 respectively).

Of the 15 respondents who completed the pre-test, curriculum module and posttest, 80% had little exposure, 20% had no exposure, and 66% were not confident at all in victim identification prior to the module. Median exposure and confidence scores increased consistently post intervention ($p=0.004$ & 0.005 respectively). Knowledge scores increased by 26% (95% CI 20% - 33%, $p < 0.001$) after participation in the curriculum.

Conclusion:

The educational curriculum was effective in improving knowledge, awareness, and confidence about HT among pediatric residents, who likely encounter unrecognized victims of HT in their clinical practice. A structured curriculum is helpful in improving knowledge and raising resident awareness of the topic.

Feasibility and Utilization of a School-Based Telehealth Program Among Children with Medical Complexity

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Background: Children with medical complexity, a small population of children with multisystem disorders, consume a disproportionate amount of health care resources as compared to other pediatric populations. Children with medical complexity have a higher rate of outpatient encounters and hospitalizations than other paediatric patients, and parent-rated quality of care is very low.¹ The value of care coordination in paediatric populations with chronic conditions forms an essential component in the quality of patient care and safety.² There is need for research into ways to improve care coordination and reduce the barriers to care that children with these complex conditions can experience. Improvements are especially needed in community based services and outpatient services. Lack of parent satisfaction points toward a need for improvement in the delivery of these services.³ The purpose of school-based telehealth is to improve access to health care and to reduce overall cost by addressing acute paediatric illnesses before they progress to ailments requiring emergency care or hospitalization. In addition, a carefully planned school-based telehealth program has the added benefit of coordinating care between subspecialists, the medical home and the school. The proportion of telehealth utilization among schools with a high proportion of children with medical complexity is unknown. By understanding how the utilization of this innovative model of care delivery among this complex population compare to that of other pediatric patients, further recommendations about programs targeted at these complex patients can be made.

Objectives: To demonstrate the feasibility of a telehealth program in a school with a medically complex student population and compare the utilization of such program to that of schools with mixed student populations.

Method: From August 2015 to March 2016 we identified eighty-four school-based telehealth encounters in thirteen schools. One school had a predominantly medically complex student population. Odds of utilization were calculated using a chi-square. Potentially confounding variables assessed include school size, enrollment in telehealth and free and reduced lunch status.

Results: It is feasible for students who attend a school with a high proportion of children with medical complexity to access care using a school based telehealth program and these children are 23.8 times more likely to the program compared to students in schools with a mixed population ($p < 0.0001$; CI 11.2, 50.6).

Conclusions: In this small paediatric population, school-based telehealth care is feasible and utilization is highest among students who go to a school for children with medical complexity. The magnitude of this difference supports the hypothesis that children with severe medical conditions use a school based telehealth program more than schools with a non-medically complex population. Continuous evaluation of this data over time could support the argument that a care coordination model for this population would significantly benefit from the addition of telehealth at the school based level as part of a care coordination team. Further evaluation is needed to fully address how school-based telehealth may improve the quality and value of care for children with medical complexity.

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GUNS IN AMERICA: INCREASED SECURITY OR PUBLIC HEALTH DISASTER? WHAT DO WE KNOW? A LITERATURE REVIEW.

George C. Rodgers, Jr. MD, PhD, Professor of Pediatrics, University of Louisville, Louisville, Kentucky, USA

Background: The United States, as a country, gained its independence thanks, in part, to guns in the hands of private citizens. The right of citizens to own weapons, including guns, is a long tradition enshrined in the US Constitution. This right derives from English Common-law. Over the last few decades, however, gun ownership has mushroomed, spurred on by claims that gun ownership increases personal and family security. This paper will explore the published literature relating to this claim.

Epidemiology of gun ownership and gun injuries in the US: There are now an estimated 350 million privately owned guns in the US. In 2014 there were 2490 firearm-caused deaths and 13,576 firearm-caused injuries in children in the US. Of these, 1455 were homicides, 929 suicides and 106 were accidental. Total gun deaths were 32,865 in 2014, two-thirds being suicides. The estimated annual societal cost is 174 billion dollars (2010 data).

Do guns provide added personal safety? Data show that guns in the home are 12 times more likely to kill a home visitor and 18 times more likely to kill a resident than they are to kill an intruder. Limited data suggest that successful self-defense efforts involving guns are unusual.

Effects of gun ownership rates on suicide rates: Using state-level data on gun ownership, Miller et al have shown a strong correlation between gun ownership rates and both total and firearm suicide mortality. Anglemyer et al have estimated a greater than threefold increased risk of suicide in homes with a gun present. It is estimated that for each 1% increase in gun ownership there is a 3.5% increase in the risk of suicide. Killias et al and others have shown a similar relationship between gun ownership and suicide rates internationally.

Effects of gun ownership on homicide rates: Monuteaux et al have shown a strong correlation between gun ownership rates and overall and firearm homicide rates and rates of firearm related assault and robbery. Miller et al have estimated that each 1% increase in gun ownership leads to a 2.4% increase in firearm-related homicide. The presence of a firearm in the home doubles the risk of a homicide in that home. Most firearm-related homicides are, in fact, domestic violence, and not related to other crime scenarios. Killias et al and others have shown similar relationships at an international level.

Effects of gun ownership on unintentional firearm deaths: A single study by Miller et al has addressed this issue. Using state-level firearm ownership data they showed a significant relationship between gun ownership and unintentional firearm death rates.

Conclusion: The data very strongly demonstrate that increased firearm ownership dramatically increases the risks of firearm-related death not associated with self-defense.

LOW-LEVEL LEAD EXPOSURE AND ATTENTION-RELATED BEHAVIORS, INCLUDING ADHD: A BRIEF HISTORICAL REVIEW.

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Background: Lead has been a recognized pediatric toxin for over a century. While most of the research on pediatric lead poisoning has focused on its impact on intellectual development, lead is known to have other toxicities in children, including neurobehavioral effects. The most studied of these effects is attention-deficit hyperactivity disorder (ADHD). ADHD has an estimated prevalence of 5-10% worldwide. Over the last three decades, research has also shown adverse effects from lead at lower and lower blood lead levels (BLLs). This review will summarize the data relating BLLs with the risk of ADHD in children.

History: Early published data on lead poisoning in children, starting around the turn of the last century, focused exclusively on the acute and potentially life-threatening presentation associated with severe toxicity. Over the last 4 decades research has focused on the effects of lead on intellectual attainment, specifically IQ and learning disabilities. The first clear description of significant behavioral problems associated with lead poisoning was a paper published in 1943 by Beyers. The first published clinical description of ADHD is generally attributed to Sir Alexander Crichton in 1798. This disorder has a long and fascinating history in the medical literature. More formal definitions, while still evolving, began with the DSM-II published in 1968. Mean BLLs in US children (1-5yo) have fallen over the last 50 years from the mid-teens to a current value of 1.3 mcg/dL. As a result of increased knowledge, the 'level of concern' as set by the CDC has also fallen from 40 mcg/dL set in 1971 to the current value of 5 mcg/dL.

Lead and Attention-related Behaviors: The first systematic study of lead and child behavior was that of Needleman et al in 1979. Using dichotomized dentine lead levels (instead of BLL) they showed a statistically significant association of lead with hyperactivity, distractibility and impulsivity, along with a number of other ADHD traits, in school-aged children. This study was the first to document lead-related behavior problems using both subjective (parent/teacher evaluation) and objective (neuropsychiatric testing) data. Since 1979 more than two dozen studies in the US, Asia, Europe, the Pacific, Central America and the Near East have documented significant associations of lead with attention-related behaviors and/or hyperactivity. Several large cross-sectional studies, two using the large NHANES database, have shown associations between lead and ADHD at BLLs of <1 mcg/dL, below the limit of detection for many assays. A National Institutes of Health comprehensive review (2012) concluded that there is 'sufficient' evidence for a causal association between lead and attention-related behaviors at levels <5 mcg/dL. Animal data also show dose-dependent effects of lead on behavior at BLLs comparable to those above.

Conclusion: Lead, at BLLs found in our current pediatric population, is a significant contributor to the development of attention-related behaviors, including ADHD.

George Boole, Saucy Little Alice and Smallpox Vaccination: the greatest stories never told: a story of an uneventful smallpox vaccination.

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Abstract:

Most parents clearly understand that childhood vaccinations for potentially lethal infectious diseases are safe, effective, and crucial to children's health. Decision making on whether to vaccinate or not to vaccinate is multifactorial and complex. While doctors use scientific evidence and research to promote vaccination in vaccine hesitant and vaccine resistant parents, anti-vaccine activists use emotive language, powerful images and anecdotes to promote their agenda. Although, perhaps not as powerful as the personal anecdote in changing minds, historical vaccine narratives may have a role to play in promoting vaccine uptake. In 1860, George Boole, foundation Professor of Mathematics at University College Cork, Cork, Ireland and discoverer of Boolean algebra, decided to have one of his daughters, little Alice aged 2 ½, vaccinated against smallpox, which was then flourishing in the city. The vaccination with cowpox was uneventful. The fact is that personal stories of successful, safe vaccinations are almost always left untold, leaving anti-vaccine activists unlimited scope to infect the population with their dangerous propaganda. While smallpox has been eradicated from the world, mankind is not immune from a resurgence of the virus, in the context of bio-terrorism. Mass population based smallpox vaccination may yet be required.