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28. Penile Diameter During Puberty in Boys: A Longitudinal Study. Reuben D. Rohn, MD. The Department of Pediatrics, EVMS/CHKD.
2012 RESEARCH ABSTRACTS
Hyperglycemia impairs neutrophil recruitment in a male Wistar rat model of *Staphylococcus aureus* peritonitis.

**Vanessa Cavero, Cliff Mauriello, Pamela Hair, and Kenji Cunnion**
*The Department of Pediatrics, EVMS/CHKD*

**Introduction:** Uncontrolled diabetes results in increased risk of skin and invasive infections caused by *Staphylococcus aureus*. Additionally, staphylococcal infections result in more morbidity and mortality in diabetic patients than those without diabetes. We have recently demonstrated that *in vitro* hyperglycemic conditions inhibit complement-mediated immunologic control of *S. aureus*, including decreasing opsonophagocytosis and generation of chemotaxins. The influence of hyperglycemia on complement control of *S. aureus* infection *in vivo* has not previously been studied. We hypothesized that in vivo hyperglycemia would inhibit C5a mediated neutrophil recruitment and C3b mediated opsonophagocytosis during acute *S. aureus* infection.

**Methods:** We performed a time-course study using a rat peritonitis model to test our hypotheses. Wistar rats (250g) were made diabetic using streptozocin. Euglycemic control rats were sham injected with normal saline. Once hyperglycemia was established, rats were injected IP with $10^8$ CFU/mL of *S. aureus*. After euthanasia at 2, 4, 6, 8 and 24 hours post infection peritoneal lavages were performed. Cytocentrifugation of lavage samples were performed on glass microscope slides and stained with either Acridine Orange or Wright’s Stain. Neutrophil enumeration was performed with Wright’s Stain. *S. aureus* phagocytosis events were assayed with Acridine Orange. *S. aureus* burden was assayed by colony counting.

**Results:** Diabetic rats reproducibly had fewer granulocytes and higher *S. aureus* burdens at 24 hours post inoculation. Diabetic rats had a mean of $13 \pm 1$ granulocytes per high power field, while control rats had a mean of $30 \pm 0.8$ granulocytes per high power field ($p=0.0056$). Conversely, diabetic rats had a mean of $9 \pm 5.7$ colonies recovered, while control rats had a mean of $0.3 \pm 0.3$ colonies recovered ($p<0.001$).

**Conclusion:** Hyperglycemia impairs neutrophil recruitment and results in impaired phagocytosis of *S. aureus* in a model of rat peritonitis. We will perform further studies on the lavage fluid to quantitate complement activation and chemotaxin generation to the above observation. We will conduct further *in vivo* experiments to determine if this phenomenon is reversible with insulin rescue.
Inhibition of ABO incompatibility using a novel small peptide.

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Introduction: ABO incompatibility is a potentially severe disease necessitating medical intervention for 80,000 newborn infants annually. Antibodies from the mother directed against major antigens on the baby’s erythrocytes initiate classical complement pathway activation which drives intravascular hemolysis resulting in rising serum bilirubin. In order to prevent permanent brain damage from kernicterus these infants are treated with phototherapy and occasionally exchange transfusion. We have previously shown that Peptide Inhibitor of complement C1 (PIC1) inhibits in vitro classical pathway activation. We hypothesized that (1.) PIC1 would inhibit in vitro model of ABO incompatibility and that (2.) PIC1 would inhibit in vivo classical pathway activation in an animal model.

Methods: To test the ability of PIC1 to inhibit in vitro classical complement pathway mediated ABO incompatible hemolysis, we prepared O serum from a healthy human volunteer and prepared AB erythrocytes from a second healthy human volunteer. We pre-incubated the O serum on ice with increasing amounts of PIC1 or vehicle control for one hour, and then we subsequently incubated the O serum with the AB erythrocytes at 37°C for one hour in a CH₅₀-type assay. Hemolysis was quantitated by spectrophotometry.

To test the ability of CPs to inhibit in vivo classical complement pathway activation, we performed intraperitoneal (IP) injections of 20 mg PIC1 in two male Wistar rats. An additional male Wistar rat was injected IP with an equal volume of vehicle control. Rat serum was collected before injection and one hour after injection. Classical pathway activation was assayed by CH₅₀-type assay.

Results: PIC1 significantly and reproducibly inhibited in vitro ABO incompatible hemolysis in a dose dependent manner (p < 0.0001 by ANOVA, n=3). The post-injection sera collected from the PIC1-treated rats demonstrated a 40-50% reduction in classical complement pathway activation compared with pre-injection serum and the post-injection serum from the vehicle control-treated rat.

Conclusions: These results demonstrate proof-of-concept for PIC1 inhibition of ABO incompatible intravascular hemolysis and efficacy in an animal model. Future studies will focus on generating additional pharmacodynamic data, pharmacokinetic data, and then testing the compound in an animal model of ABO incompatibility.
Delayed Diagnosis and Predictors of Abusive Head Trauma

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**Objectives:** The primary aim of this pilot study is to identify factors that may be predictive of the diagnosis of abusive head trauma (AHT). We wish to further expand upon the literature regarding the incidence of AHT in infants who present with non-specific symptomatology in an attempt to establish a more concrete algorithm to evaluate these subjects and prevent a delay in diagnosis.

**Methods:** We conducted a retrospective chart review of infants less than 12 months of age who presented to our facility and were ultimately assigned a diagnosis of abusive head trauma. Charts were identified by searching the PHIS database for primary and/or secondary diagnostic codes for either abusive head trauma, child physical abuse, shaken infant syndrome, or retinal hemorrhage. Electronic medical records were dissected to identify presenting features of each case, including reported signs by caregiver as well as findings on physical examination. Imaging studies were also reviewed to identify fractures, intracranial hemorrhage or occult trauma. All charts included in our study were reviewed further back to identify cases that had presented with similar symptoms at an earlier date. Data analysis included raw percentages of reported signs and physical exam findings associated with the diagnosis of abusive head trauma. A linear regression model was employed to compare various characteristics and demographics among this group.

**Results:** A total of 21 charts were identified as abusive head trauma over the past 24 months at CHKD. Average age was approximately 20 weeks. Infants were more likely to be Caucasian, have health insurance, single parenthood, and reported history of calling 911. Most common presenting signs included altered mental status, apnea (76%), seizure activity and evidence of bruising on exam (52%). All children were diagnosed on head CT scan; most with subdural hematoma (>95%) and nearly half with skull fracture (43%). All infants had documented retinal hemorrhages; more than 2/3rds bilaterally (71%). Poor outcomes (NS intervention and/or death) were highly correlated with older aged infants, presence of bilateral retinal hemorrhages, and more likely to have a 911 call reported (p=0.07). Poor outcomes were inversely related to length of hospital stay. Three infants had a prior evaluated for signs concerning for AHT; average length between visit and diagnosis equaled 57 days.

**Conclusions:** A strong association exists between certain presenting characteristics as well as demographic data and the diagnosis of abusive head trauma. This is consistent with previous reports. Physician awareness of these predictors is critical in drawing suspicion for abuse and preventing a delay in diagnosis. This pilot study is worthy of further expansion of population size to strengthen these associations in an effort to help solidify an algorithm to evaluate infants with variable presentations.
Oral Dexamethasone versus Oral Prednisone for the Treatment of Acute Asthma and Wheezing in the Pediatric Inpatient Population

Authors: Jennifer L McCarthy, MD, Kyrie Shomaker, MD, David A Austin, MD, Rianna C Evans, MD, Jennifer W Chow, PharmD, and Bryan R Fine, MD, MPH

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Background: Asthma is a chronic inflammatory lung disease that affects millions of children, with costs running in the billions per year. Children with asthma exacerbations or wheezing often receive oral steroids as part of the treatment course. Studies in outpatient and ED settings show that a two-day course of longer-acting oral dexamethasone is likely as effective as a five-day course of oral prednisone. No studies have been done looking at this comparison in the inpatient population. Equivalence in this group would allow patients to be discharged with a shorter course of medication, thus promoting compliance and likely decreasing healthcare costs.

Objective: To investigate whether two doses of daily oral dexamethasone and five doses of daily oral prednisone are equivalent in the treatment of wheezing in the inpatient pediatric population.

Design/Methods: Over 10 months, we prospectively enrolled patients aged 1-18 years old admitted to the hospitalist service for wheezing. Patients were randomized, un-blinded, to receive two daily doses of dexamethasone at 0.6mg/kg/day, or five doses of prednisone at 2mg/kg/day. ED treatment was not considered during randomization, though doses given in the ED were counted toward total treatment days. Enrolled patients were then contacted at least two weeks after discharge to complete a follow-up phone survey.

Results: A total of 76 patients were enrolled, of which 53 were reached for follow-up. There were no inpatient readmissions or deaths in either group within 14 days of discharge. 24 (69%) of the 35 patients randomized to the dexamethasone group were reached for follow-up. Of these 24 patients, 17 (71%) reported symptom resolution by 96 hours post discharge and 2 (8%) returned for unplanned asthma related medical care within 14 days of discharge. 29 (71%) of the 41 patients randomized to the prednisone group were reached for follow-up. Of these 29 patients, 18 (62%) reported symptom resolution by 96 hours post discharge and 3 (10%) returned for unplanned asthma related medical care within 14 days of discharge. Three of the 29 patients in the prednisone group were excluded, 2 secondary to requiring a home steroid taper, and 1 due to non-compliance with the prescribed prednisone course. In addition, 1 patient in the Prednisone group was unable to quantify days until symptom resolution due to a custody change after discharge. Tests for equivalence failed to establish a difference of less than 10% for rates of return for unplanned care within two weeks of discharge and symptom resolution at 96 hours (all p-values > 0.05).

Conclusions: This prospective study provides soft evidence to suggest that a two-day course of dexamethasone is a reasonable treatment modality for inpatient wheezing. The study is admittedly underpowered to demonstrate statistical equivalence for outcome measures. However, a more robust investigation, including blinded enrollment, multi-institutional involvement, addition of dedicated research staff, and patient incentive to complete the study, appears to be a worthwhile next step.
Breast milk after gastroschisis: prescription for success
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Abstract

Objective: Gastroschisis is a congenital abdominal wall defect with increasing prevalence. Infants affected with this condition have a post-operative course complicated by a prolonged ileus and consequent long term use of total parenteral nutrition both leading to protracted hospital stays. With this study, we aimed to investigate whether feeding gastroschisis infants following repair with breast milk or formula feedings led to 1) a decrease in time to full enteral feeds and 2) a shortened length of hospital stay.

Methods: Retrospective medical record review was performed on all infants treated in the Children’s Hospital of The King’s Daughters Neonatal Intensive Care Unit from 2000 – 2010 with an ICD-9 code for gastroschisis repair. Records were examined to determine type of feed (breast milk or formula) and time to full enteral feeds. Length of stay was also obtained and compared. Statistical analysis was performed using Mann-Whitney U tests.

Results: The population of our study included 90 infants born within the time frame mentioned. Three infants died prior to the initiation of enteral feeds and were subsequently excluded from statistical analysis. The infants born with gastroschisis who were fed breast milk after repair had both a decreased time to full enteral feeds and a shortened length of hospital stay. In the breast milk fed group the mean age at full feeds was day of life 29 (Interquartile range (IQR): 18-27) and the mean age at full feeds in the formula fed group was day of life 44 (IQR: 21-50), p-value 0.009. The average length of stay of the breast milk fed group was 33 days (IQR: 20-33) and for the formula fed group it was 54 days (IQR: 25-59), p-value 0.003.

Conclusions: There is a statistically significant difference in the length of stay and age at full feeds between those infants feed breast milk and formula. Feeding these infants breast milk reduces the time it takes them to reach full enteral feeds and thus a reduction in the amount of time they require total parenteral nutrition. Breast milk fed infants also had a decreased length of stay leading to less cost associated with their hospitalizations. This study suggests that breast milk may be the preferred enteral feeding choice for infants who have undergone gastroschisis repair.
UNDERSTANDING SYMPTOMS IN CHILDREN WITH CANCER OVER TIME: EVALUATION OF THE IMPACT ON CAREGIVERS

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There is very little existing clinical research that specifically examines symptoms of children with cancer for the entire course of their illness. Existing research on symptoms is mostly retrospective and from the parent’s point of view. Using validated surveys, investigators at Children’s Hospital of The King’s Daughters (CHKD) plan to prospectively document the symptoms and quality of life of children with cancer throughout their illness from the perspective of the patient and their caregiver.

The impact of symptoms on the child’s overall quality of life and on distress in the child’s caregiver will be explored. Impact will be measured using validated surveys that examine child quality of life, caregiver distress, parental experience of their child’s illness, caregiver general health reports, and caregiver C-reactive protein (CRP), a biological marker of inflammation. CRP will be measured by intermittent blood tests and will provide an objective measure of stress over time in the caregiver.

The study population will be comprised of newly diagnosed and newly relapsed pediatric cancer patients and their primary caregiver at CHKD in Norfolk, Virginia. Patients 7-21 years of age of all cancer types will be eligible. Surveys and caregiver blood samples will be collected at multiple time points over the course of the child’s illness. The study duration is 24 months and is expected to enroll 42 patients and 42 caregivers.

The study aims to demonstrate increased distress and systemic inflammation in the caregiver during times of increased symptoms and suffering in the child. This would suggest that more aggressive interventions in pain and symptom management would not only improve the overall quality of life of children with cancer, but may also reduce the long term impact of stress on the health of their caregivers.
Parental Knowledge of Safety in Radiation Exposure in Pediatric Emergency Department

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Objectives:

We sought to quantify the knowledge base among parents and legal guardians presenting to our pediatric emergency department regarding radiation exposure during medical imaging and potential risks to children resultant from ionizing radiation. We sought to examine if a child’s previous exposure to medical imaging changed caregiver knowledge base and discern caregivers’ preference for future education on this topic.

Methods:

A prospective convenience sample survey was performed of caregivers who presented with their child to our tertiary pediatric emergency department. Parents or legal guardians (18-89) who accompanied a child (0-17) were eligible for inclusion and approached for enrollment. A structured questionnaire was administered by trained interviewers and a chart review was conducted to ascertain their child’s previous imaging.

Results:

Sixty percent of caregivers interviewed (n=340) did not associate any long term effects with medical imaging. Among participants who did express a perceived risk from medical imaging radiation exposure, only 50% could indicate a known negative effect from exposure. We found no significant association between a child having had documented previous imaging studies and overall caregiver knowledge base (Spearman rank rho > 0.52, p < 0.0001). Participants preferred to learn more about this topic from either an Internet based resource (49.7%), informational pamphlet (37.7%), or via treating physician (33%).

Conclusion:

Parents and legal guardians are unaware that exposure to radiation during medical imaging carries an inherent risk for their child. Providers wishing to educate caregivers should utilize reliable internet sources, educational pamphlets and direct communication.
Creating an Effective Immunization Program for the Women and Children of Rural Masindi, Uganda

Authors:
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Introduction:
Palmetto Medical Initiative (PMI) is a non-profit organization founded in 2009 with the goal of creating sustainable quality healthcare in developing nations. PMI has been committed to establishing a sustainable medical presence in Masindi, Uganda through the development of a comprehensive medical center. In December of 2010, the Masindi-Kitara Medical Center opened its doors. As part of the establishment of the outpatient facility, Palmetto Medical Initiative asked our team to assist in establishing an immunization administration program to serve the women and children of Masindi.

The Ugandan National Expanded Programme of Immunization (UNEPI), in conjunction with the Ugandan Ministry of Health, has set forth national guidelines for vaccine administration, including the immunization schedule and the storage and transportation of the vaccines. As part of UNEPI, mobile outreach vaccination clinics also were established to provide immunizations to children in the most rural parts of Uganda. After establishing the Masindi-Kitara Medical Center as a vaccination center for the town of Masindi, we intend to establish it as a central hub for mobile vaccination clinics.

Methods:
We collected vaccination data from the Chief Medical Officer of the Masindi-Kitara Medical Center. Data was collected between September 2011 and April 2012 and included the ages of patients vaccinated, types of vaccinations given, and month during which the vaccines were provided. Once data for 150 vaccinated patients has been collected, a new proposal will be drafted requesting that the Ugandan government allow the Masindi-Kitara Medical Center become a central hub for mobile vaccination clinics.

Results:
For the months of September & October 2011, 6 BCG vaccines, 29 Oral Polio Vaccines (OPV), and 11 DPT-HepB-Hib Vaccines were administered. Thirty-nine of the children vaccinated were under the age of 1 year old and 7 were between 1 and 4 years old. No children received PCV, Rotavirus, or Measles vaccinations. In November & December 2011, 3 BCG vaccines, 19 OPV, 24 DPT-HepB-Hib, and 12 Measles vaccines were given. Fifty-two of the children vaccinated were under the age of 1 year old and 8 were between the ages of 1 and 4 years old. In January & February 2012, 8 BCG vaccines, 31 OPV, 16 DPT-HepB-Hib, and 9 Measles vaccines were given. Fifty-one of these children were under the age of 1 year and 12 were between 1 and 4 years old. For the months of March & April 2012, 8 BCG, 37 OPV, and
17 DPT-HepB-Hib vaccines were given. Of these children, 51 were under the age of 1 year and 11 were between 1 and 4 years old.

**Conclusion:**
Since the establishment of the Masindi-Kitara Medical Center’s vaccination clinic in September 2011, 231 children have been vaccinated in compliance with the Ugandan Ministry of Health’s immunization schedule and administration protocol. With the data that we have collected, a new proposal will be submitted to the government that would seek to establish the Masindi-Kitara Medical Center as a hub for mobile vaccination clinics, thus making immunizations more easily accessible to the underserved areas of Uganda.
Patent Ductus Venosus Presenting as Elevated Direct Hyperbilirubinemia Treated with Dietary Management

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Infants are routinely screened for hyperbilirubinemia with a minority being due to conjugated or direct bilirubin. A patent ductus venosus has been established as a rare cause of direct hyperbilirubinemia, however previously reported cases indicate that these patients may require transvenous coil embolization to correct the problem. We report on a case of a neonate with elevated direct bilirubin, failure to thrive, and a patent ductus venosus found on ultrasound. This was treated with dietary management, watchful waiting, and monitoring of bile acids. The patient avoided invasive procedure and laboratory values subsequently normalized.
Childhood malignancy and treatment abandonment in western Africa

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My project’s financial sponsors were World Child Cancer and the Africa Oxford Cancer Foundation.

Most (70%) of children live in the developing world. Less than 30% of patients diagnosed with cancer in developing countries survive. By contrast, cure rates in developed countries are around 85%.

Abandonment of therapy is a significant contributor to treatment failure in resource-limited countries such as Ghana. This project is a retrospective review of 683 medical records of children aged 0-15 years with a new oncological diagnosis seen at the single pediatric oncology referral center in Ghana (from January 2004 through December 2010). Lymphoma was the most common diagnosis (43.1%) while leukemia constituted a mere 20.4% of all diagnosed cancers. Burkitt’s Lymphoma composed 24.4% of all cancer diagnosis. Demographic data collected included age in years, gender, tribe, number of siblings, and duration (months) between symptom onset and diagnosis. Medical data collected included presenting complaint, final diagnosis, treatment initiation (surgery, chemotherapy, radiation, palliative care, or no treatment) and whether treatment was completed. Patient outcome (alive, dead, unknown) was determined by a review of paper charts, social work logs, and death certificates. Abandonment of treatment was determined as a major cause of therapeutic failure in Ghana, affecting 345 (54%) of cases. Abandonment rates varied from 38% to 100% according to diagnosis. Demographic data and diagnosis were assessed for prognostic indicators of abandonment. Effective strategies to impact pediatric cancer survival in the developing world should include a reduction of treatment abandonment.
Two Unusual Cases of Meningitis in a Pediatric Emergency Department

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**Background:** With the routine use of perinatal prophylaxis and immunization, bacterial meningitis during infancy and childhood is becoming increasingly rare. However, physicians still need to consider bacterial meningitis in the differential diagnosis for febrile, ill-appearing children in the Emergency Department.

**Objective:** To remind emergency department physicians to consider unusual presentations of meningitis in febrile children with compromised host defenses.

**Cases:** Two unusual cases of meningitis are presented in this study. The first case is an infant with rapidly developing meningitis after sustaining a skull fracture and intracranial hemorrhage. The second case is an immunized child with *Haemophilus influenza* type b meningitis after foreign travel. The infant in the first case developed meningitis after injury to his blood-brain barrier and the child in the second case was infected with an unexpected organism based on her medical history and immunization status.

**Conclusions:** Meningitis is frequently in the differential diagnosis for febrile, ill-appearing infants and children in a pediatric emergency room. Physicians should continue to expand their differentials for meningitis in children with vulnerable blood-brain barriers, recent travel, and potential vaccine failure.

Key words: meningitis, vaccine failure, intracranial hemorrhage
"Percent frequency of dyslipidemia and signs of insulin resistance in the pediatric overweight and obese population in a community based weight and health management clinic"

David Andrew Lorenzo, MD, Dominique Williams, MD (Mentor), John Harrington, MD (Mentor), Amy M. Perkins, MS

This project looks at the percent frequency of dyslipidemia and evidence of insulin resistance in a population of overweight and obese pediatric patients. The population examined are patients enrolled in the Healthy You for Life Program, who each have BMI >85 percentile for their ages, and whom the majority have lab work performed upon admittance to the program. This project looks at the percent frequency of these lab abnormalities, as well as correlates them with risk factors including hypertension, demographics, family history, physical exam findings, and evidence of liver or kidney disease.
Survey of Pediatrician and Parental Attitudes and Knowledge of the Female Genitalia

Verena Wyvill, Susan Lamb, Suzanne Starling, Diana Niam, Amy Perkins

Objective: To identify the misconceptions that both pediatricians and parents have regarding what happens to preadolescent and adolescent female genitalia during both consensual and nonconsensual coitus and to evaluate parental and pediatrician attitudes regarding sex education in the pediatric office.

Methods: Surveys designed by the investigators were distributed anonymously to parents recruited from a hospital based general pediatric clinic, an inpatient pediatric service, at a private general pediatrics office. Statewide pediatricians were polled electronically via a newsletter distributed survey. Survey questions included knowledge of the female genitalia in the context of both sexual abuse and consensual sex and questions regarding attitudes toward sex education.

Results: 267 parental surveys were collected. 30.8% of parents were uncomfortable or somewhat uncomfortable educating their children about sex. 85.5% of parents felt that they would be comfortable if their pediatricians provided sex education to them directly. However, only 54% felt comfortable with sex education being provided to their children. 93.5% of parents reported that their children had never received sex education from their pediatrician. The average parental knowledge score was 1 on a scale of 1 to 7. Parental knowledge was not shown to vary significantly by level of parental education, race or age of oldest child but did show a direct correlation with income.

Ninety-one (91) pediatrician surveys were collected. 73.6% of pediatricians reported that they provide sex education to their patients. 30.77% reported that they provide sex education to parents, and 44% reported that they only provide education to parents if asked. 25.3% never provided education to parents. 62.6% felt comfortable providing sex education their patients; however, 41.1% felt comfortable providing sex education their patients’ parents. Only 17.6% felt comfortable performing a genital exam in a possible case of sexual abuse. The average pediatrician knowledge score was 4 on a scale of 1 to 7. Pediatrician knowledge did not vary significantly from comfort with the genital exam but did correlate directly by gender and inversely with time out of residency.

Conclusions: Pediatricians are the gatekeepers of knowledge for child sexual health. Parents are comfortable with pediatricians providing them with knowledge to help them educate their children. However, there is still discomfort for pediatricians to speak openly to patient’s parents about sex. In addition, although they are knowledgeable, most pediatricians feel only somewhat comfortable or uncomfortable performing a genital exam when there has been a disclosure of sexual abuse. In order for parents to feel more knowledgeable in teaching their children about sex and about sexual abuse, more open discussions should occur in the pediatric office, and pediatricians should have more confidence in their own knowledge.
Subepithelial Fibrosis Correlates with Basal Cell Hyperplasia in Children with Eosinophilic Esophagitis

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**Background and Aims:** Eosinophilic Esophagitis (EoE) is a disease characterized by esophageal eosinophilic predominant inflammation. Subepithelial fibrosis has been demonstrated, as has basal cell hyperplasia, both even in young children.¹²³ Assessment of fibrosis can be difficult in children because endoscopic biopsies are not always deep enough to adequately evaluate fibrosis. The aim of this study was to perform a retrospective review of patients with EoE and determine 1) the percentage of study subjects that did in fact have fibrosis and 2) determine relationships between subepithelial fibrosis and other histologic or clinical findings.

**Subjects and Methods:** A retrospective review of 79 subjects with EoE (≥ 20 eos/hpf) was performed at a single tertiary pediatric facility at an academic medical center from 2000-2006. Clinical notes, laboratory data, and histopathologic specimens were retrospectively reviewed in identified subjects. The presence of esophageal subepithelial fibrosis before and after initiation of treatment (swallowed inhaled corticosteroids and/or selective elimination diet) and the relationships between eosinophil count per high powered field (eos/hpf), subepithelial fibrosis (FS), and basal cell hyperplasia (BC) were analyzed. Relationship to atopic disease and symptom score was also examined. H&E and trichrome-stained proximal and distal esophageal biopsies at diagnosis (“Pre”) and two subsequent post-treatment biopsies (“Post 1” and “Post 2”) were evaluated by pathologists for eos/hpf, BC, and FS (method by Chehade et al 2007¹). Descriptive statistics for fibrosis, asthma, allergies, corticosteroids, and demographics were calculated using SAS 9.2 (SAS Institute, Cary, NC). The relationship between FS and BC was quantified using Spearman rank correlation at all three time points.

**Results:** Subepithelial fibrosis was present in the majority of study subjects. Exact logistic regression models showed that basal cell hyperplasia is a significant predictor of subepithelial fibrosis (p ≤ 0.001). In the models without basal cell hyperplasia, a multiple logistic regression model showed that tree nut allergy and asthma together significantly predict subepithelial fibrosis in the Pre time period.

Conclusions: Subepithelial fibrosis is a common feature of children with EoE. We propose that basal cell hyperplasia can be used as a surrogate marker for fibrosis in patients where there is not adequate biopsy specimen to assess the degree of fibrosis. Further research needs to be done to clarify to correlation of concomitant allergies and asthma with subepithelial fibrosis.
Alteration of Phenobarbital Serum Concentrations in Neonates Undergoing Therapeutic Hypothermia for Hypoxic-Ischemic Encephalopathy

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Background: Perinatal asphyxia can lead to hypoxic ischemic encephalopathy (HIE), resulting in long-term neurodevelopmental sequelae and death. Use of therapeutic hypothermia in term neonates with moderate or severe HIE reduces long-term neurodevelopmental disability and mortality at 18 months of age when initiated within six hours of birth and continued for 48-72 hours.

Alterations in drug metabolism may occur in patients treated with hypothermia due to decreased rate of metabolism, decreased substrate binding affinity and changes in binding pocket conformation. These changes may lead to an increase in drug concentrations.

Patients suffering from HIE are at risk for seizures and may require treatment with phenobarbital. The purpose of this study was to determine if therapeutic hypothermia for hypoxic ischemic encephalopathy, when used according to our institution’s hypothermia treatment protocol, affects phenobarbital serum concentrations in neonates.

Methods: A case-control, retrospective review was conducted of patients admitted to the Neonatal Intensive Care Unit (NICU) at our institution between January 2000 and December 2011. Patients who received phenobarbital while undergoing treatment with therapeutic hypothermia were identified and matched on the basis of gestational age and gender with normothermic patients who also received phenobarbital. Data collection included demographics as well as phenobarbital dosing and serum concentrations.

Results: The final analysis included twenty-two patients, eleven in the hypothermia group and eleven in the control group. Phenobarbital serum concentrations were drawn an average of 15.5 hours after the initial maintenance dose in the hypothermia group, resulting in an average serum concentration of 32 mcg/mL. In the normothermic group, phenobarbital serum concentrations were drawn an average of 11.5 hours after the initial maintenance dose, resulting in an average serum concentration of 32.8 mcg/mL.

Conclusion: Hypothermia treatment did not affect phenobarbital serum concentration in NICU patients admitted to CHKD. This result differs from a prior pharmacokinetic study that found an effect of hypothermia on phenobarbital serum concentrations. A prospective study with a larger patient population will be useful to study this subject further in the future.
Retrospective assessment of the treatment of pediatric community acquired pneumonia prior to 2011 IDSA guidelines

Samuel Ng PharmD, Jennifer W. Chow PharmD, Sarah Boggs MD, Kyrie Shomaker MD

**Introduction/Purpose:** In the fall of 2011 the Infectious Disease Society of America (IDSA) in conjunction with the Pediatric Infectious Diseases Society released the first guidelines for the treatment of pediatric community acquired pneumonia (CAP) in children who are fully immunized and between the ages of three months and 21 years. Prior to the release of these guidelines, our institution used empiric cefotaxime as the antibiotic of choice. The new guidelines recommend ampicillin as an empiric antibiotic. The purpose of this study is to establish that empiric ampicillin is non-inferior to cefotaxime for the treatment of pediatric CAP.

**Methods:** Prior to guideline implementation, all patients admitted for CAP between the ages of three months to 21 years and fully immunized who received cefotaxime empirically from September 1, 2010 until February 7, 2012 will be included. Patients were excluded from the study if they were admitted to the hematology/oncology service, the neonatal intensive care unit, diagnosed with cystic fibrosis or admitted from a long term care facility. Treatment failure was based on the following criteria: 1) need for antibiotic change during admission 2) need for pleural drainage 3) need for pediatric intensive care unit admission 4) revisit to the emergency department within 48 hours of discharge 5) readmission to the hospital as an inpatient. After guideline implementation, all patients who meet inclusion criteria and are admitted to the hospitalists service at our institution will be empirically treated with ampicillin will be included. Following discharge from the hospital a research team member will follow up by telephone call to the parent, guardian or patient to evaluate treatment failure and adherence to outpatient prescriptions.

**Results:** There were 7,912 admissions throughout the hospital. Of those admissions, 183(2.3%) children were admitted regarding bacterial community acquired pneumonia with an average age of 6 years (range: 3 months – 21 years). The average length of stay was 3 days (range: 1-34 days). One hundred and twenty three (67.21%) patients empirically received cefotaxime, 14(7.65%) patients empirically received ampicillin, and 46(25.14%) received another antibiotic as their empiric antibiotic of choice. Of the 123 patients that received empiric cefotaxime, 17(13.82%) patients met the failure criteria. None of the 14 patients who received empiric ampicillin met the failure criteria. The results of the prospective arm are pending as data is currently being collected.

**Conclusion:** Retrospective data collected provides a baseline cefotaxime failure rate. The ampicillin failure rate being collected will determine that empiric ampicillin is non-inferior for the treatment of pediatric CAP.
Continuous Esomeprazole Infusion Case Series Review Abstract

Jennifer Chow PharmD, Samuel Ng PharmD and Michael Chicella PharmD

This case series review is to establish preliminary safety and efficacy data for the use of continuous esomeprazole infusions in pediatric patients for the treatment of gastrointestinal (GI) ulcers which are actively bleeding in the pediatric population. Continuous infusions of various proton pump inhibitors (PPI) have been well documented and commonly used to acutely treat critically ill adults who suffer from actively bleeding GI ulcers. Most adult literature has applied a bolus dose plus a low dose continuous infusion and the most commonly used PPI in studies is omeprazole. The typical adult loading dose used was 80mg of IV omeprazole followed by an 8mg/hr continuous infusion of omeprazole for a period of 72 hours. And through numerous trials in adults compared to oral therapy and other drug classes such as H$_2$ receptor antagonists, continuous PPI infusions have become the new standard of critically ill patients who suffer from active GI ulcer bleeds. However, there is little to no data in to establish the efficacy of continuous infusions of PPIs in the pediatric population. From the established adult data, we extrapolated the data for pediatric patients. Patients with GI ulcers would receive an intravenous (IV) bolus dose of 2mg/kg/dose with a maximum dosage of 40mg of esomeprazole (which is the only IV formulation PPI available at our institution). The bolus dose would then be followed by a 0.1mg/kg/hr infusion. In our retrospective case series review, we found six cases where a continuous infusion of esomeprazole was used at our institution. We determined the efficacy by monitoring gastric pH levels and monitored for safety by reviewing initial hemoglobin and hematocrit levels, platelet counts, prothrombin time and international normalized ratios. We conclude that continuous esomeprazole infusions are safe and effective at the established dosing, however further larger scale randomized controlled trials are required to determine true statistical significance.
Successful Implementation of a Multicenter Pediatric Hematology/Oncology Central Line Associated Blood Stream Infection Collaborative.

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Background: Despite years of successful trials in pediatric cancer, quality improvement (QI) programs are needed to improve outcomes in other areas of pediatric hematology/oncology (PHO) care.

Objectives: 1) To identify an initial area for improvement with measurable targets, 2) To develop improvement change packages (bundles), 3) To create a multicenter, transparent, multispecialty collaborative group to implement these change packages, 4) To measure reliability of change implementation (processes) and improvements in infection rate (outcomes).

Design/Method: Reducing inpatient PHO unit central line (CL) associated blood stream infection rates (CLABSI) was the initial QI target. An evidence-based CL maintenance (care) bundle was developed based on extant guidelines. Data collection tools were created for self-reported compliance with bundle elements and to report CLABSI events (defined by CDC NHSN criteria). Institutions reported CLABSI events, inpatient CL days and compliance data monthly via an online system. Institutional and collaborative–wide CLABSI rates and compliance data (organized into daily goals, line entry and dressing/tubing change processes) were shared monthly. Monthly webinars for data review and sharing individual institutions’ QI successes and challenges and twice-yearly in person learning workshops were held for in-depth collaborative steering and QI education.

Results: Centers submitted up to 46 months of pre-collaborative CLABSI rate data. Prospective data collection and bundle implementation began in Nov. 2009; 33 units (29 hospitals) started the project with 30 (26 hospitals) continuing participation. The required report submission rate for these centers was 95% and increased over time. Average center attendance at the workshops was 95%. Accrued data exists for 630 CLABSI events and >280,000 line days. Comparing the 1st 6 months to last 6, reported compliance rates increased for daily goals (60% to 91%), line entry (92% to 99%) and dressing/tubing change processes (41% to 83%). 9 more units (8 hospitals) joined in April 2011.

Conclusion: Multicenter, transparent collaborative quality improvement activity can be successfully implemented in PHO programs.
Assessing the needs for transition to adult care

**Primary Investigator:** Mandi Brock, MD and Takara Jobe, MD

**Associate/Sub-Investigators:** Heidi Flatin, MD, Assistant Clinical Professor, General Academic Pediatrics

**OBJECTIVE:** The goal is to determine the needs of children in the process of transition to adult care at Children’s Hospital of The King’s Daughters (CHKD) outpatient General Academic Pediatric Practice in Norfolk, VA. A secondary objective is to establish a list of available primary and subspecialty providers. These objectives will help in the ultimate goal of establishing a transition clinic for the General Academic Pediatrics Clinic at CHKD.

**BACKGROUND:** Many studies have shown that the communication between adult and pediatric health care providers has traditionally been poor. Reviews have demonstrated that in addition to the standard barriers for transition to adult care, black, hispanic, and low income youth are at greater risk for gaps in healthcare entering adulthood, which is reflective of the General Academic Pediatric Practice patient population. At present, there is no organized system to transition the General Academic Pediatric Practice patients with chronic medical illnesses to adult care. It is important to have a program that eases this barrier.

**METHODS:** Each parent/caregiver of children 12-18 years old was provided a written questionnaire upon arrival to the CHKD General Academic Pediatric Practice. The survey focused on the needs and barriers for transition to adult care. A second electronic survey was sent to local adult providers via survey monkey electronic questionnaire. This survey included questions on the physician’s barriers to transition.

**Results:** Children from the General Academic Pediatric Practice generally have not clearly sought out care from adult providers. 50% of internists/specialists did not feel comfortable at all accepting young adults with complex medical problems. Concerns elicited from the electronic survey included: patient maturity level, lack of training in pediatrics, difficulty to obtain old records, lack of family involvement, and insurance coverage. The most common age at which they were comfortable accepting was 18 years old.

**Conclusions:** Transition from pediatric to adult care continues to be a challenge. Many families from our General Academic Pediatric Practice have not begun to think about this transition. Adult internists/specialists identified their highest concerns included patient maturity level and lack of training in congenital/pediatric diseases.
Brain temperature in newborns undergoing hypothermia for hypoxic-ischemic encephalopathy: relationship to EEG, MRI, and neurodevelopmental outcome.

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Background: Rectal temperature (RT) is used to determine the temperature set-points of hypothermia (HT) treatment of infants with hypoxic-ischemic encephalopathy (HIE). We have previously reported a technique of non-invasive measurement of brain temperature to a depth of 1.5 centimeters using radiometric thermometry (RadT) in animal studies, in normal newborns and in infants with HIE undergoing HT. RadT passively senses electromagnetic energy emitted in direct proportion to tissue temperature. During therapeutic HT, brain temperature often varies from RT, converging upon rewarming. The variations in brain temperature of infants undergoing HT for HIE could impact neurodevelopmental outcome.

Objective: To determine if brain temperature in infants with HIE during HT is related to the severity of abnormalities on EEG, MRI and neurologic outcomes.

Design/Methods: Twenty-six infants with significant HIE were treated with 72 hours of systemic HT (RT 33°C), followed by rewarming of 0.2°C per hour. Continuous measurements of RadT and RT were recorded. The average difference between RadT and RT (RadT/RTΔ) during the 72 hour cooling period was calculated for each patient and compared to EEG results at mean ages of 3 days and 12 days, MRI at a mean age of 11 days, cognitive adaptive test-clinical linguistic auditory milestone scale and neurologic examinations every 6 months for two years. Four infants expired prior to MRI; all showed WM abnormalities on ultrasound. Thirteen infants have been followed for 24 months, 9 for less than 12 months.

Results: RadT/RTΔ was significantly associated with WM injury, neurodevelopmental outcome and death, but not with EEG abnormalities.
Conclusions: In infants with HIE treated with HT, warmer brain temperatures as measured by RadT were associated with greater risk of white matter injury, neurodevelopmental delay and death. Further study will be needed to determine if a warmer brain temperature is an inherent feature of greater brain injury (i.e. greater inflammation) or is it amenable to modification with lower target temperatures of hypothermia treatment.
Relationship between Weight and Sleep Architecture in Children

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RATIONALE
Overweight has been associated with sleep problems in children. It is important to identify if weight gain change the sleep architecture.

OBJECTIVE
Evaluate overweight as a risk factor for sleep architecture disturbances.

METHODS
This is a retrospective review of 224 Polysomnograms performed between January and December 2006 in a population between 2 and 20 years of age. The patients were classified in three groups: normal weight, overweight (BMI 85-95th percentile), and obese (BMI > 95th percentile), underweight subjects were excluded. BMI percentile for age was used to classified subjects. Total Sleep Time, Sleep Efficiency, Sleep Latency, REM, Stage 1, Stage 2, Stage 3, Daytime sleepiness, Arousal index, Age, Gender, Ethnicity, Height, Weight, BMI and Apnea-Hypopnea Index (AHI) were evaluated.

RESULTS
123 of patient were male and 101 female, 120 were Caucasians and 92 African American; 100 patients had normal weight, 26 patients were overweight and 98 patients were obese. No significant relationship was found between Weight and Apnea-Hypopnea index (p 0.266), Sleep Efficiency (p 0.319), Stage 1 (p 0.582), REM Latency (p 0.540) and Total Sleep time (p 0.664). In Stage 2 (p 0.000), Sleep Latency (p 0.046), Stage 3 (p 0.020), REM (p 0.07) and Daytime sleepiness (p 0.01) showed statistics differences. The Normal weight group showed normal Sleep stage durations and normal Sleep Latency. Overweight group showed increased Stage 3, increased REM and a tendency to decreased Sleep latency. The Obese group showed severe OSAS, decreased Sleep latency, decreased REM, decreased Stage 3, increased Daytime sleepiness. Comparing groups, Obese group showed significant differences in REM sleep compared with patients with normal weight (p 0.011) and overweight (p 0.028).

CONCLUSION
Maintaining a normal weight helps to conserve a normal sleep architecture. Overweight produce an increment of stage 3 and decreased sleep latency, which are the earliest changes noticed in the sleep architecture. Obesity produce a significant disturbance in the sleep architecture: decreased sleep latency, decreased REM (p 0.013), decreased stage 3, increased daytime sleepiness (p 0.01) and severe OSAS. This data shows that obesity produces significant changes in the sleep architecture, therefore the importance of weight control.
Adaptive Servo Ventilation in Sleep Breathing Related Disorder in an Infant with Multiple Co-Morbidities

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Introduction

Tonsillectomy with adenoidectomy, and/or non invasive positive pressure support, is used to treat sleep disordered breathing (SDB) in children, if the above therapies fail, a tracheostomy is indicated, especially in severe cases. Here we present a child with multiple co-morbidities that did not respond to continuous positive airway pressure (CPAP) and bi-level positive airway pressure (BiPAP). To prevent performing a tracheostomy, we tried BiPAP with adaptive servo ventilation (BiPAP ASV).

Report of Case

11 months old Caucasian male born with congenital hydrocephalus (required a ventriculo-peritoneal shunt), hemidiaphragm, and Chiari malformation. He was re-hospitalized for multiples episodes of oxygen desaturations and apneas, a VP shunt revision was not contributory. A polysomnogram (PSG) showed severe obstructive and central sleep apneas. CPAP/BiPAP spontaneous (S) was tried without success, a posterior fossa decompression was recommended, after the procedure two more attempts to use CPAP/BiPAP spontaneous timed (ST) were unsuccessful, at this point a tracheostomy with ventilator support was recommended, the parents refused the procedure. A fifth PSG with (BiPAP ST/BiPAP ASV titration was performed; BiPAP ST was started with pressure of IPAP 16 cm of water and EPAP 11 cm, respiratory rate of 14. Events were seen only during REM. BiPAP ASV was used and it corrected the apneas, hypopneas and hypoxemia during REM and nREM, at the optimal pressures of IPAP 8 cm of water, EPAP 8 cm, pressure support of 25 cm and a respiratory rate of 14. A Mini-me nasal mask was used and the BiPAP ASV was well tolerated, currently this child is 2 years old and he is tolerating well the BiPAP ASV without SDB.

Discussion

BiPAP ASV titration allows the use of higher pressures when the patient needs it, usually during REM sleep, and it uses lower pressures during nREM. BiPAP ASV allows better tolerance and decreases the amount of central apneas, contrary to the use of continuous high pressures with CPAP and BiPAP S. BiPAP ASV showed to be useful in an infant with severe obstructive and central apneas. Notorious improvement in activity and verbal interaction after the BiPAP ASV treatment was noted. BiPAP ASV is a viable option in patients with complicated severe complex apnea.
Early-Onset Congenital Central Hypoventilation Syndrome Due to a Heterozygous 20 and 26-Polyalanine Repeat Expansion Mutation in the PHOX2B Gene

C.S. Sendon², J.F. Chocano¹,², Eastern Virginia Medical School and Children’s Hospital of The King’s Daughters, Norfolk, Virginia.

Introduction

Congenital Central Hypoventilation Syndrome (CCHS) is an extremely rare genetic disorder, the disease-causing gene is the paired like homeobox gene PHOX2B. Approximately 90% of individuals are heterozygous for a polyalanine repeat expansion mutation (PARM). About 1 in 200,000 live born children have the condition. It is characterized by respiratory arrest during sleep; it is associated with neuroblastoma, Hirschsprung disease, dysphagia and other anomalies. Children with CCHS develop life-threatening episodes of apnea and cyanosis.

Case Presentation

4 years old African American male born by cesarean section, full term, normal weight with good muscle tone and vigorous cry, at 1 hour of life, he presented hypoxemia and retractions. He was intubated and given antibiotics, days later he was extubated, but did not tolerated it, presenting poor respiratory effort, hypoxemia and hypercarbia, nasal CPAP failed, and he was re-intubated, there was no evidence of cardiorespiratory or neuromuscular abnormalities. CCHS was suspected and genetic testing confirmed the gene PHOX2B. He required a tracheostomy and ventilatory support when asleep. He developed gastroesophageal reflux and oral aversion, requiring a G-tube. At 2 years old, he presented febrile seizures, developmental delay and left eye ptosis without intracranial abnormalities. At 3 years old, a polysomnography performed with an uncapped tracheostomy showed moderate hypopneas with an index of 6 and a REM index of 30, moderate impairment of gas exchange. It was recommended to continue with the tracheostomy and ventilatory support. Due to severe constipation a full thickness rectal biopsy performed showed absence of ganglion cells compatible with Hirschsprung’s disease; he required a colostomy that was re-anastomosed later. Currently, he has learning difficulties but he does well socially.

Discussion

The clinical outcome of children with CCHS has markedly changed since the description of this disorder. In the past, most patients presented with neurocognitive deficits, stunted growth, cor pulmonale, and/or seizure disorders; however, early diagnosis and adequate ventilatory support improves growth and development and should be associated with longevity. Patients generally require tracheostomies and lifetime mechanical ventilation in order to survive, multidisciplinary medical attention is necessary in order to correct all the systemic manifestations associated to this syndrome.
Spirometry and Sleep Quality in Children and Young Adults with Cystic Fibrosis

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**RATIONALE**

Sleep is a major physiological drive that plays an important role in everyone’s quality of life. It is important to investigate the sleep quality in children with chronic respiratory disorders. Cystic fibrosis (CF) patients, present reduced breathing function, may experience nocturnal hypoxemia, and sleep problems. Few studies that were performed in children with CF showed sleep disruption, more common in adolescents with severe CF. Pittsburgh Sleep Quality Index (PSQI) questionnaire given to adult stable CF patients and to normal adult controls showed scores of 6.45 +/- 3.31, and 2.67 +/- 1.70 respectively. No studies on sleep quality in CF patients have been done in children and young adults.

**METHODS**

This is a prospective study, 42 Subjects with diagnosis of cystic fibrosis between 10 to 25 years of age from the Cystic fibrosis clinic were evaluated. Patients unable to perform spirometry, those with acute sickness, sleep disorders, or mood disorders were excluded. We obtained consent from the subjects or from the parents if the subject was younger than 18 years of age. Spirometry was performed in each subject, and then the PSQI was given. Poor sleep quality is defined as a score greater than 5. Data will be analyzed using SPSS.

**RESULTS**

21% (9) of the subjects presented poor sleep quality, the PSQI score was 3.62 +/- 2.83, the FEV1, FEV1/FVC and FEF 25-75% were 83.52 +/- 22.84, 90.12 +/- 11.65 and 72.07 +/- 38.84 respectively. Assessed relationship between sleep quality and spirometry showed no statistical significance: PSQI score with FEV1 (p = 0.60), with FEV1/FVC (p = 0.88), with FEF 25%-75% (p = 0.52).

**CONCLUSIONS**

CF patients in this study have worse sleep quality than the normal adult controls obtained from the literature. There was no relationship between sleep quality and spirometry values. Most CF patients in this study are stable and have mild disease.
Epidemiology and Impact of Depressive Symptoms in Adolescent and Young Adult Kidney Transplant Recipients

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Abstract

It has been well-established that depression is widespread in the general adolescent population, with an overall prevalence of 4 to 8 percent\(^1\), and is associated with a host of functional impairments including disturbances in school functioning\(^2\), increases in risk-taking behaviors\(^3\), and suicide\(^4\). Far less is known about depression in children, adolescents, and young adults with chronic illness. Some specific populations have been suggesting that these groups suffer not only increased rates of depression when compared with healthy children but also poorer medical outcomes and quality of life compared with their peers with the same chronic illness.

We searched multiple databases and could find very few data regarding the prevalence of depressive symptoms or their impact on quality of life or medical outcomes in pediatric patients with end-stage renal disease (ESRD) who have received renal transplant or are receiving dialysis. Compared to other operations, a transplant operation itself produces extraordinary physiological stress, but afterwards, patients are committed to a lifetime of a complex regimen of immunosuppressive therapy that may generate distressing side effects.\(^5\) It is possible that depressive symptoms in this context may generate additional medical risks. Among adults with renal transplants, depressive symptoms are very common, with a prevalence measured between 22% and 32%\(^6,7\). Depression is further associated with noncompliance with immunosuppressive medications\(^8\) and is an independent risk factor for graft failure, return to dialysis, and death.\(^9\) Similarly, depression has been shown to be a risk factor for mortality in adult hemodialysis patients\(^10,11\) and negatively impacts quality of life, too, in both hemodialysis patients\(^12,13\) and those who have received transplants.\(^14\) Thus, we believe that investigation of this topic is both relevant and timely, and will help to bridge a gap in medical knowledge in a relatively large, unique, and medically-needy pediatric population.

This is a prospective study using three survey which include: the Children’s Depression Inventory (CDI), the short form-36, and a questionnaire created by the investigators to assess demographic variables. This study included male and female subjects aged 12 to 24 years who are established patients of the pediatric nephrology clinic at the Children’s Hospital of the King’s Daughters being treated for the following conditions: end-stage renal disease being treated with hemo/peritoneal dialysis, renal transplant, and other chronic diseases not associated with current impairment of renal function (i.e. hypertension or glomerulonephritis).

We anticipated that our data will show that depressive symptoms are quite common in this population, and that there will be a strong correlation between depressive symptoms and health-related quality of life. Patients felt to be a danger to themselves or others will not be allowed to leave the clinic, and will be sent to the emergency department for consideration of inpatient hospitalization. This complies with the current standard of care employed by outpatient clinics at CHKD.

We will score the two surveys –
the Children’s Depression Inventory and the SF-36. Demographic information calculated using percentages. The incidence of significant depressive symptoms and incidence by diagnosis will be reported in terms of percentages as well. Depressive symptoms will be compared between diagnoses via Pearson Chi-Square test and relative risk of depression for subjects that have undergone renal transplant will be calculated. There are currently over 30 patients enrolled in the study with results pending along with ongoing enrollment with a goal n=10.
Implementation of an Intranasal Fentanyl Pathway for Management of Long Bone Fractures in the Emergency Department

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Children come to the emergency department each year having suffered orthopedic trauma and require a rapid form of analgesia. Intravenous (IV) morphine is fast and effective, but an IV line can be time consuming, painful for the patient, and distressing for the caregivers. Intranasal (IN) fentanyl offers rapid analgesia without requiring an IV and is as effective as IV morphine, with effective analgesia in as little at 10 minutes. We hypothesize that a pathway designed to help facilitate the use of intranasal fentanyl for long bone fractures will expedite the delivery of pain medication, decrease the total length of ED stay and be equally effective in pain control, compared to IV morphine. A clinical pathway for utilization of intranasal fentanyl to manage pain in long bone fractures was instituted in our emergency department in July 2011. We performed a retrospective chart review of patients, ages 3-21 years, who presented to the emergency department between January 2007 and November 2011 with a clinically suspected long bone fracture. The subject population was identified using ICD-9 diagnosis codes for long bone fractures and morphine or fentanyl. A total of 79 patients who met our inclusion criteria were identified, 71 who received IV morphine and 8 who received IN fentanyl per pathway protocol. The average length of time to receive pain medication in the IV morphine group was 62 minutes, compared to 44 minutes in the IN fentanyl group. The total length of stay for patients who received IV morphine was 268 minutes, compared to 265 minutes in the IN fentanyl group. There was no statistically significant difference in pain control between the two groups. Our results show a trend towards a decreased time to receive pain medication and equal pain control in the group who were placed on the IN fentanyl pathway when compared with those who received IV morphine as first line pain management. We do not have a large enough sample size post IN fentanyl pathway institution to show a statistically significant difference between the two groups, thus the study is being continued prospectively in order to enroll more patients placed on the IN fentanyl pathway.

This study is a retrospective comparison of intestinal perforation due to necrotizing enterocolitis (NEC) or spontaneous intestinal perforation (SIP) in very low birth weight (VLBW) infants. These are two distinct entities that are sometimes difficult for practitioners to distinguish. The goal of this project was to help further identify differences between NEC and SIP. We used de-identified data from the NICU at CHKD from 2008-2011 using the Vermont Oxford Network. We found that infants who had intestinal perforation due to NEC tended to be older at time of perforation, had older gestational ages, had higher birth weights, had different pathogens from positive blood cultures/ peritoneal cultures, and tended to be sicker (more fatalities and complications). More studies need to be done on this data. In the future, this information may help guide different management strategies based on the cause of perforation.
INTRODUCTION  Sexual maturity rating (SMR) or Tanner staging in boys is twofold: Assessment of pubic hair (PH) development and assessment of genital development. Genital SMR is dependent upon a composite of three criteria: Scrotal, testicular and penile development. Because of the tripartite nature of the rating, ambiguity between SMR of genital stages exist. Attempts have been made to objectify boys genital SMR, such as the use of the orchidometer (1). Only one published study has attempted to objectify penile development by measuring penile girth (2). That particular study confined itself to comparing penile diameter (PD) or girth to chronologic age only.

OBJECTIVE  To compare PD to PH stage and secondarily to testicular volume (TV).

METHODS  61 boys (44 Caucasian, 14 African American, and 3 of other ethnicities) between the ages of 6 to 21 years were studied longitudinally. During routine physical examination, their stretched PD was measured in the flaccid state using a plastic template cut-out (fig. 1). Boys with hypopituitarism, hypogonadism, or severe delay in puberty were excluded from the study. PH and TV were assessed at the same time by the author on a quarterly to semi-annual basis.

Descriptive statistics were calculated for TV and PD and were stratified by PH. Pearson correlation coefficients were used to quantify the relationship between the puberty factors, and one-sample “t” tests were used to assess whether the correlation coefficients were different from zero. A covariance pattern model was developed to determine whether PH, TV and race predicted PD. This mixed model utilized residual maximum likelihood estimation and an auto-regression covariance structure for the repeat visits followed by post-hoc tests using the Scheffe method of adjustment for multiple comparisons to test for differences in PD by PH.

RESULTS  Penile Diameter By PH Stage and Compared to Testicular Volume

<table>
<thead>
<tr>
<th>Pubic Hair Stage</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penile Diameter (mm) ± SD</td>
<td>16.6 ± 2.5</td>
<td>18.6 ± 3.0 †</td>
<td>21.02 ± 3.2 *</td>
<td>25.7 ± 2.7 ‡</td>
<td>27.8 ± 2.8</td>
</tr>
<tr>
<td>Testicle Smaller (ml) ± SD</td>
<td>2.6 ± 1.8</td>
<td>4.6 ± 2.4</td>
<td>7.7 ± 3.7</td>
<td>12.1 ± 4.1</td>
<td>16.4 ± 6.0</td>
</tr>
<tr>
<td>Testicle Larger (ml) ± SD §</td>
<td>2.9 ± 2.1</td>
<td>5.4 ± 3.1</td>
<td>8.7 ± 4.1</td>
<td>13.8 ± 4.7</td>
<td>17.7 ± 6.1</td>
</tr>
</tbody>
</table>

† p <0.0001 PH II vs. PH III, IV, V.
* p < 0.001 PH III vs. PH I, II, IV, V;
‡ p <0.001 PH IV vs. PH I, II, III.
§ correlation coefficient = 0.81 vs. PD, p <0.0001
Race was not a significant predictor of PD, p = 0.99.
Conclusions

1. PD growth increases significantly after PH II and through PH IV.
2. There is no significant PD growth between PH I and PH II.
3. There is no significant PD growth between PH IV and PH V.
4. PD correlates well with TV.
5. PD is another tool that may be use in assessing boys SMR.