FEATURE ARTICLE

The Best Relevant Articles in Pediatric Hospital Medicine

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On a cool fall morning in a San Antonio courtyard, I stared into the bottom of my thick, white porcelain hotel mug wondering if more caffeine would enlighten me, perhaps even help me to establish a path toward a meaningful career. It was 2003, I was <6 months out of residency, and I had somehow found myself alongside 70 other pediatricians at the first official Pediatric Hospital Medicine (PHM) Conference. This town of the Wild West, shaped by trailblazers riding the wave of western expansion, framed the spirit of the participants and their conversations remarkably well. These were some enthusiastic hospital-based cowboys and cowgirls, and they were set on improving the care for hospitalized children. The future of hospital medicine was clearly beginning and so was my career, but the trail was not well marked, and it was fraught with uncertainty. By the end of the conference, I was convinced, however, and I decided to saddle up and ride out toward the horizon with this posse. Mixed with the din of the convention center dishes being put away, I could almost hear the faint echo of birds cawing against a bright orange mesa canyon wall as I looked forward to the future.

Early on, the posse was aware of an outlaw standing in the way. As residents, we all witnessed the wide variability in how attending physicians managed the care of the hospitalized child. Tests that are “certain” to aid in diagnosis are ordered by 1 attending only to be cancelled or ignored by the attending rotating onto the service the next day. “Life-saving treatments,” such as antibiotics or nebulized solutions, are given by 1 attending but are soon deemed unnecessary and cancelled by the next. Patients are admitted and told they will receive 2 weeks of intravenous therapy by 1 attending but might be discharged with oral antibiotics 2 days later by the oncoming attending. In this system, patients and families become confused and their trust in us dwindles, all while the cost of care and the risk of medical errors increase. This posse of embedded hospital workers knew the solution to the “variability problem,” but it would not be fixed overnight. Scientific evidence, or new knowledge, would be needed to ground medical management decisions, and this evidence was lacking for even the most common conditions in the pediatric hospital setting. This quest for new knowledge would be a long journey, and the trail would need to be paved, stone by stone, with studies that addressed fundamental management questions.
Clearly, there was a lot of work to do. We did not know the indications for intravenous antibiotics for common bacterial infections such as urinary tract infections, pneumonia, osteomyelitis, and skin and soft-tissue infections. Applying the most relevant article from a PubMed search at that time—the treatment of urinary tract infections in French swine in a veterinary hospital on the island of Borneo—to the care of the hospitalized child was challenging. What about apparent life-threatening events? My 6-month-old son once spit up and choked on his vomit. Did I neglect to diagnose my currently smiling child with a rare disease lurking somewhere in his pudgy little body? Perhaps I should bring him to the emergency department (ED) so that I could be reassured. But I was not convinced that the health care safari of “routine tests,” blood draws, false alarms, and an overnight admission would contribute to his overall health. I could just imagine the sound of my drowsy face peeling away from the vinyl pullout sofa after being awoken for the third time that night, only to remember once supine the nurses’ admonition that I ignore the alarms. Shouldn’t we be relatively certain of the benefits before exposing patients and families to unnecessary risk and cruel resident-like conditions? What about bronchiolitis? I can almost hear a collective sigh from all the hospitalist readers as I type the word. Would we ever find a treatment that actually improved outcomes? It should not be too hard to improve on the medieval practice of vacuuming snot from an infant’s nose.

Nearly a decade later, I sit here at the PHM conference in Kansas City, once again, looking for answers in the bottom of a ceramic coffee mug. However, this time I am not alone. Michelle Marks and I are discussing the advancements of PHM in the last year because we have been asked to select and summarize the best relevant publications for the pediatric hospitalist. We both have no doubt whatsoever that we joined the right posse. Our careers have been more rewarding than we had ever imagined. The PHM conference has quadrupled in size, and hospital medicine is 1 of the fastest growing fields in medicine. Residents going into hospital medicine today do not need a cowboy hat. In fact, they can probably get away with wearing a silk polka dot ascot to 1 of their fellowship interviews. Hospitalists are riding at an unbelievably quick pace, and they are leaving behind a trail of new knowledge to support medical decisions for generations to come. Pediatric hospitalists are performing groundbreaking studies, winning national research and leadership awards, and leading large research and quality improvement networks. In fact, this journal is proof of how far we have come.

The scientific evidence is now rapidly emerging; however, hospitalists do not have the time to sort through the 6 million scientific publications per year (much less the 12 million postings on the SOHM listerv). Nonetheless, we must find a way to incorporate the most current knowledge into our practice and teaching. We should be aware of the opportunities to do practice-changing research as we embark on our own research careers or as we mentor those who are contemplating doing the same. To aid those who seek to improve the care of hospitalized children, we have compiled a list of the best relevant publications in the last year. This list is by no means everything that has been done, and none of it definitely answers the big clinical questions. Rather, this is a survey of publications that we feel lay the groundwork to improve current hospitalist practice. Just like the pediatric oncologist researchers and clinicians who began to continually improve cancer survival rates in the 1950s, the trail to new knowledge and improved care will be made incrementally, stone by stone.

STATE-LEVEL CHILD HEALTH SYSTEM PERFORMANCE AND THE LIKELIHOOD OF READMISSION TO CHILDREN’S HOSPITALS, BY CHRIS FEUDTNER ET AL IN THE JOURNAL OF PEDIATRICS

There is little evidence to justify the common inference that pediatric hospital readmission is a valid marker of inferior hospital care. Patient, hospital, and external factors all may contribute to hospital readmission. This trial was a retrospective cohort study in children 2 to 18 years of age who were discharged from 1 of 39 children’s hospitals located in 24 states during 2005. Patients were followed up for readmission 365 days after discharge from their index hospitalization. The predictor of interest was the 2008 State Variations in Child Health System Performance ranking created by the Commonwealth Fund, which includes 5 assessment dimensions (access, quality, costs, equity, and the potential to lead healthy lives). The study’s findings were surprising. The investigators found that patients in high-ranking health care systems had a significant increase in the odds of readmission. There were many limitations to
this study design that coupled hospital-based administrative data with a state-level performance ranking. For example, readmission could only be ascertained when the patient was readmitted into the same children’s hospital, and the rankings were a measure of state-level performance, not necessarily hospital. Nonetheless, this study raises a flag of caution for those who are considering using readmission as an indicator for a poor outcome. Readmissions can be associated with valuable attributes, and this study highlights the need for a better understanding of how the processes and outcomes of child health care are related across the continuum of care.

SMOKE-FREE LEGISLATION AND HOSPITALIZATIONS FOR CHILDHOOD ASTHMA, BY DANIEL MACKAY ET AL IN NEW ENGLAND JOURNAL OF MEDICINE

It is well known that exposure to environmental tobacco smoke increases the incidence and severity of asthma and that children are particularly susceptible to the deleterious effects of such exposure. In the United States, >200,000 episodes of childhood asthma per year have been attributed to parental smoking. This study was conducted to determine whether the ban on smoking in public places in Scotland changed the risk of hospital admission for childhood asthma. Routine hospital administrative data were used to identify all hospital admissions for asthma (21,415) from January 2000 to October 2009 among children <15 years of age. After implementation of the legislation, there was a mean reduction in the rate of admissions of 18.2% per year relative to the rate on March 26, 2006 (95% confidence interval: 14.7–21.8; \( P < .001 \)). The reduction was apparent among both preschool-aged weeks of age. The antibody response was good. There were no significant differences between groups for safety nor were there any serious adverse events. Moreover, the immunizations did not interfere with responses to the concomitant vaccines administered routinely at 2 and 3 months of age. The study was unable to address efficacy because the seroprotective antibody concentrations in infants are unknown. However, it did find that the influenza vaccine with the current vaccine schedule is safe and immunogenic in 6- to 12-week-old infants and that administration was well accepted by pediatricians and families and enhanced by coadministration with routine vaccines. We look forward to influenza-related hospitalizations for infants becoming a part of history.

SAFETY AND IMMUNOGENICITY OF TRIVALENT INACTIVATED INFLUENZA VACCINE IN INFANTS: A RANDOMIZED DOUBLE-BLIND PLACEBO-CONTROLLED STUDY, BY JANET A. ENGLUND ET AL IN THE PEDIATRIC INFECTIOUS DISEASE JOURNAL

The highest rates of medically attended illnesses during influenza outbreaks are in children <6 months of age with underlying conditions, but no vaccine is licensed for this population. This study was a multicenter, double-blind, randomized placebo-controlled trial to test the safety and immunogenicity of inactivated influenza vaccine compared with placebo in infants at 6 and 12

PREDICTING SEVERE BACTERIAL INFECTIONS IN WELL-APPEARING FEBRILE NEONATES: LABORATORY MARKERS ACCURACY AND DURATION OF FEVER, BY SILVIA BRESSAN ET AL IN THE PEDIATRIC INFECTIOUS DISEASE JOURNAL

Fever in the young infant is a common and challenging problem faced by hospitalists. Because clinical findings are unreliable markers for severe bacterial infections (SBIs) in febrile neonates, laboratory markers play an important role as SBI predictors in this group of patients. The aim of this study was to assess the diagnostic accuracy of white blood cell count, absolute neutrophil count, and C-reactive protein for detecting SBI in well-appearing neonates with early-onset fever without source (FWS) and in relation to fever duration. This was an observational study of 62 previously healthy neonates 7 to 28 days of age who were consecutively hospitalized for FWS for <12 hours to a tertiary hospital.
care pediatric ED over a 4-year period. The infants presented with normal laboratory markers. Fifty-eight of the infants successfully underwent repeated blood examination at 12 hours from fever onset. Five of them had an SBI. The results suggest that in well-appearing neonates with early-onset FWS, laboratory markers are more accurate and reliable predictors of SBI when performed after 12 hours of fever duration. Absolute neutrophil count and especially C-reactive protein results are better markers than the traditionally recommended white blood cell count. This study represents a nice pilot study for the use of laboratory markers as key tests to understand risk of SBI in young infants.

**RANDOMIZED CONTROLLED TRIAL OF CEPHALEXIN VERSUS CLINDAMYCIN FOR UNCOMPLICATED PEDIATRIC SKIN INFECTIONS, BY AARON E. CHEN ET AL IN PEDIATRICS**

Incision and drainage are considered essential for the management of abscesses, but the role of adjuvant antibiotics is unclear. Studies of cephalexin andtrimethoprim/sulfamethoxazole compared with placebo have not shown any differences in outcomes. However, no trial has compared traditional antistaphylococcal antibiotics with methicillin-resistant *Staphylococcus aureus*-active adjuvant antibiotics. In this study, 200 participants 6 months to 18 years of age with an abscess presenting to an ED and ambulatory care center were randomized to receive and blinded to cephalexin 40 mg/kg or clindamycin 20 mg/kg 3 times daily. By 72 hours, 94% in the cephalexin arm and 97% in the clindamycin arm improved, and by 7 days, all were improved. Fever and age <1 year were associated with early treatment failure. There were no serious adverse events, and one subject in each study arm was hospitalized because of worsening. The findings of this study are limited by the small sample size and insufficient ability to detect rare adverse outcomes. Also, it is important to note that local patterns of susceptibilities and drainage or wound care may differ at other hospitals. Nonetheless, cephalexin remains the empirical antibiotic of choice in the outpatient setting in association with drainage, wound care, and appropriate follow-up. Younger age and presence of fever, rather than initial size of lesion, are important predictors for adverse outcomes and hospitalization. We still do not know if hospitalized children with systemic symptoms on admission or discharge require broader coverage.

**IMPORTANCE OF COLONIZATION SITE IN THE CURRENT EPIDEMIC OF STAPHYLOCOCCAL SKIN ABSCESSSES, BY HOWARD FADEN AL IN PEDIATRICS**

The number of staphylococcal skin and soft-tissue infections has increased dramatically, and an unusual distribution of abscesses has been noted, with relative increases in abscesses located on the buttock, groin, and thigh. The investigators hypothesized that colonization of the rectum in these infections would be more common than the nose. The aim of the study was to compare rectal and nasal *S aureus* colonization rates for children with *S aureus* skin and soft-tissue abscesses and for normal control subjects. This case-controlled study included 60 children with *S aureus* skin and soft-tissue abscesses that required surgical drainage; 90 control subjects were enrolled. Cultures of the nares and rectum were taken in both groups. *S aureus* was detected significantly more often in the rectum of children with abscesses (47%) compared with those in the control group (1%; \(P > .0001\)). The rates of nasal *S aureus* colonization were equivalent for children with abscesses and control subjects. Although this study was discontinued early because of the dramatic initial results showing rectal colonization as the most significant risk factor for methicillin-resistant *S aureus* abscesses of the buttocks and lower extremities, there are several limitations. The results are from 1 medical center and the data were collected in 2006 to 2008 and therefore may not represent local or current epidemiology. However, there is still ample evidence to support redirecting our efforts to control eradication of rectal colonization rather than nasal.

**SHORT- VERSUS LONG-TERM ANTIMICROBIAL TREATMENT FOR ACUTE HEMATOGENOUS OSTEOMYELITIS OF CHILDHOOD: PROSPECTIVE, RANDOMIZED TRIAL ON 131 CULTURE-POSITIVE CASES, BY HEIKKI PELTOLA ET AL IN THE PEDIATRIC INFECTIOUS DISEASE JOURNAL**

Considerable uncertainty exists for the optimal duration of antimicrobial agents for acute hematogenous osteomyelitis (AHOM) in children. Antimicrobial agents are often administered for 1 to 2 months after decompressive
surgery and short courses of intravenous antibiotic agents. However, there is little comparative evidence to support these practices. This was a prospective study of 131 culture-positive patients with AHOM who were randomized into short- and long-treatment groups. The patients were randomly assigned to receive oral clindamycin or a first-generation cephalosporin for either 20 or 30 days after 2 to 4 days of intravenous antibacterial agents. Surgery was kept at a minimum. *S. aureus* caused 89% of cases, and all strains were methicillin susceptible. The median duration of treatment was 20 days for 67 children and 30 days for 64 children. Most children underwent only the diagnostic percutaneous aspiration or drilling, and 24% did not have surgery. Except for 1 mild sequela in both treatment groups, all patients recovered entirely. This study states that most cases of childhood AHOM can be treated for 20 days with oral antibiotics after a short period of intravenous therapy by using large doses of a well-absorbed antimicrobial, such as clindamycin or a first-generation cephalosporin, and provided the clinical response is good and C-reactive protein normalizes within 7 to 10 days. Extensive surgery is rarely needed. One limitation to this study is that the data were collected over many years (1983–2005). Therefore, the protocol may have been compromised or the epidemiology of infection may have evolved over time. Nonetheless, this study supports the use of shorter course of oral antibiotics for AHOM.

**YIELD OF LUMBAR PUNCTURE AMONG CHILDREN WHO PRESENT WITH THEIR FIRST COMPLEX FEBRILE SEIZURE, BY AMIR KIMIA ET AL IN PEDIATRICS**

This largely descriptive study sought to assess the rate of acute bacterial meningitis (ABM) among children with a first complex febrile seizure (CFS). The investigators performed a chart review on 6- to 60-month-old children who presented to the ED within 12 hours of a CFS. Patients with comorbid conditions or history of nonfebrile seizure were excluded. Only 3 (0.9%) patients had ABM (confidence interval: 0.2–2.8). Pleocytosis was uncommon (2.7%) in patients receiving a lumbar puncture (64%); 2 grew *S. pneumoniae* in the cerebrospinal fluid cultures and 1 grew it in the blood (the lumbar puncture was unsuccessful). For all 3 cases of ABM, there was suspicion of meningitis, and none of the patients without a lumbar puncture, presumably based on low suspicion of meningitis, had ABM at follow-up. It is also important to note that 2.4% of the cultures were contaminated or false-positives. This study’s findings are limited because it is a retrospective descriptive report of care at a single site. Important rare outcomes may have been underreported because 11% of patients were lost to follow-up, and the study may have been underpowered. It was also before the *S. pneumoniae* vaccine became available, and the high vaccine rate of participants may not reflect a national sample. Nonetheless, the risk of ABM among patients who present solely with a first CFS appears to be low, and in the absence of other signs or symptoms (if not sedated) of meningitis, even lower. This study should remind us that clinical acumen, rather than low-yield testing, is the best guide for medical decision-making when it comes to conditions with rare adverse outcomes.

**USE OF SKELETAL SURVEYS TO EVALUATE FOR PHYSICAL ABUSE: ANALYSIS OF 703 CONSECUTIVE SKELETAL SURVEYS, BY SHANNA O. DUFFY ET AL IN PEDIATRICS**

In 2006, 140000 children in the United States were victims of physical abuse, and fractures are a common manifestation. Although abusive fractures rarely are fatal, early recognition of child abuse is important. A significant proportion of children who die as a result of abuse were evaluated previously by medical professionals for injuries and/or symptoms that were very likely attributable to abuse but were not recognized as being abusive. This trial was a large retrospective descriptive study that sought to assess the use of the skeletal survey (SS) to evaluate for physical abuse, to identify characteristics of children most likely to have unsuspected fractures, and to determine how often SS results directly influenced the decision to make a diagnosis of abuse. Of the 703 SSs reviewed, 10.8% yielded positive results. Children <6 months of age, children with an apparent life-threatening event or seizure, and children with suspected abusive head trauma had the highest rates of positive SS results. Of children with positive SS results, 79% had 1 healing fracture. The SS results influenced directly the decision to make a diagnosis of abuse for 50% of children with positive SS results. These data, combined with the high morbidity rates for missed abuse and
the large proportion of children with healing fractures detected through SS, would suggest that broader use of SS, particularly for high-risk populations, may be warranted. There are significant limitations of the study. It was retrospective, and therefore the physician’s diagnostic reasoning and bias are unknown. Nevertheless, this study supports a focused use of SSs for very young patients admitted for apparent life-threatening events and seizure.

KANGAROO CARE TO IMPROVE COMMUNICATION FOR NEUROSURGICAL PATIENTS ON FAMILY CENTERED ROUNDS, BY JAQUES STRAP, OLLIE TABOOGER, JEAN POOLE, ET AL IN THE JOURNAL OF FAMILY-CENTERED ROUNDS

We hope this article in the first edition of this new journal will surprise you as much as it did us.11 We selected it because of the novel study design and the potential implications for hospitalists’ career satisfaction. As many great physicians know, good communication is the cornerstone to quality patient care. However, the rapid growth of surgical hospital medicine has provided emerging evidence that communication between hospitalists and neurosurgeons can be ineffective, from both the perspective of the patient and the hospitalist. Multidisciplinary family-centered rounds (FCRs) have the potential to improve communication barriers between medical staff but, to be successful, all parties must be engaged in the process. Kangaroo care (KC), or skin-to-skin contact between a mother and her newborn, has been shown to improve bonding between a mother and her infant in the NICU. Taking the maternal approach a bit further, investigators sought to assess whether KC between neurosurgeons and pediatric hospitalists during FCRs could improve family and medical staff satisfaction and decrease medical errors. Their unique study design was a nonblinded, randomized controlled trial with 6 neurosurgeon/hospitalist pairs conducted during FCRs in a tertiary academic medical center. Because of safety concerns for hospitalists as human subjects, true KC with neurosurgeons was not possible so the astute investigators used “modified KC.” Although not as tender as the investigators would have liked, modified KC was defined as skin–skin contact between neurosurgeon and hospitalist during FCRs and must have included at least handholding, hugging, or a warm embrace for up to 1 minute. Multiple sincere fist bumps were included in a subanalysis, but pats on the back and nods were not. The investigators were unable to find many willing participants, but the results were remarkable nonetheless. Family satisfaction surveys improved by 10% (P < .001) and the proportion of consultations containing “not the shunt” decreased by 80% (P < .001). Although hospitalist job satisfaction minimally improved (08%; P< .51), hospitalist hand hygiene improved 100% (P< .000000000000001). The small sample size and the complexity of human nature limit the findings of this study, and the authors caution that hugging a neurosurgeon could have unintended consequences. Nonetheless, we were intrigued by the notion that a simple intervention based on our maternal instincts, such as embracing a neurosurgeon tenderly, could save a life.

REFERENCES

11. Obviously, this one is fictitious. We still encourage you to hug a neurosurgeon but please be aware of unintended consequences.