Top Articles in Pediatric Hospital Medicine

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INTRODUCTION
This year was an extraordinary year to review the literature for the top articles in hospital medicine. We were given the somewhat daunting task of compiling the articles and presenting the results at the annual Pediatric Hospital Medicine conference in July 2012. As we embarked on this task before us, we first had to decide how to choose the articles. We did what pediatric hospitalists do when they have a question: we asked the American Academy of Pediatrics Section on Hospital Medicine Listserv. As our faithful Listserv participants always do, you provided us with great suggestions for some of the best articles. Our strategy to find additional articles was twofold. We depended on Mark Shen’s vast subscription list (journals, electronic Table of Contents, and other electronic update services). The other half of our strategy was simple but even more involved: reviewing all articles published by Samir Shah over the past 12 months. We chose articles from a variety of journals over a 12-month period (July 2011–July 2012).

Although we were expected to present 10 articles, we actually reviewed 30 articles and highlighted these at the “Top 10 Articles of the Year in Pediatric Hospital Medicine” session at the annual conference. Once again, pediatric hospitalists from far and wide gathered together for lunch and to hear our thoughts on the year’s best articles. We imparted our review of the best literature related to pediatric hospital medicine and threw in some articles from other scientific arenas along with some multimedia to round out the presentation.

Our review is meant to provide you with our interpretation of the literature and offer you the relevant bottom line from the articles. This is not journal club. We will not discuss or debate the validity of using a Bonferroni correction or the Kruskal-Wallis test for continuous variables or any other statistical methods. However, we hope this review inspires you to look at these articles further to arm you with the evidence you need to practice. We have chosen articles from a variety of topics, ranging from diagnosis and treatment to quality improvement to hospital operations.
GUIDELINES FOR PNEUMONIA REDUCE UTILIZATION OF BROAD-SPECTRUM ANTIBIOTICS


As antimicrobial stewardship becomes an increasingly important ecological issue in human–bacteria relations, efforts to safely reduce use of broad-spectrum antibiotics will be needed. Two recently released guidelines recommend amoxicillin or ampicillin as the first-line agent of choice for uncomplicated pneumonia. In this study, investigators from Kosair Children’s Hospital demonstrated a notable reduction in the use of ceftriaxone, with a concomitant increase in the use of ampicillin, for uncomplicated pneumonia after an antimicrobial task force released local guidelines for empirical treatment. A similar effort at an institution with a robust antimicrobial stewardship program demonstrated nearly identical results and this is consistent with a multicenter analysis that revealed consistent effects of clinical practice guidelines on local prescription patterns.

Bottom Line:
Run, don’t walk, to implement guidelines for uncomplicated pneumonia in the context of an antimicrobial stewardship program. Don’t forget to measure outcomes.

URINARY TRACT INFECTIONS AND CHRONIC KIDNEY DISEASE


In August 2011, the American Academy of Pediatrics published the much-anticipated guidelines about diagnosis and management of urinary tract infection (UTI) in febrile infants and children aged 2 to 24 months. These guidelines have some significant changes from the previous iteration published in 1999. Most notable, the previous recommendation to routinely perform a voiding cystourethrogram (VCUG) after the initial UTI was not included in the 2011 guidelines. VCUG is recommended if the renal/bladder ultrasound has findings suggestive of high-grade vesicoureteral reflux or obstruction. This change in the guidelines has been a source of debate this year.

Salo et al conducted a systematic review and retrospective chart review of mostly adult patients with chronic kidney disease (CKD) to evaluate what proportion of patients with CKD had childhood UTIs. From their combined data from the chart review and literature review, a UTI in childhood in patients without structural anomalies was a cause of CKD in <1%. They suggest that the structural abnormalities CKD patients had would have been found on ultrasound.

Bottom Line:
This study supports the notion that UTI is not a major cause of long-term scarring in adults and supports the UTI guideline recommendation that VCUG is unnecessary after a first UTI. Stay tuned for the results of the RIVUR (Randomized Intervention for Children With Vesicoureteral Reflux) study, a prospective trial evaluating the use of prophylactic antibiotics and imaging after first or second UTI.

LUMBAR PUNCTURE UNNECESSARY FOR NONNEONATES WITH UNCOMPLICATED URINARY TRACT INFECTIONS


Clinicians vary in their recommendations for performing a lumbar puncture (LP) in young infants with UTIs, presumably based in part on uncertainty surrounding the exact risk of associated meningitis. Nine years of retrospective data from the Royal Children’s Hospital Melbourne revealed that no infants and children aged >1 month had concomitant meningitis and UTI, with 95% confidence intervals of 0.00 to 0.74 in the 499 infants aged 1 to 11 months. These data may actually overestimate the risk of meningitis in this population because the study only reviewed charts in which urine culture and LP were performed. This refines estimates from previous work by the same authors. Another recent study concluded that LP is of low yield in well-appearing febrile infants with an abnormal result on urinalysis.

Bottom Line:
Well-appearing infants >1 month of age with a UTI do not routinely need an LP.

SEPTIC EVALUATION IN INFANTS WITH BRONCHIOLITIS

Bronchiolitis is the most common reason for hospitalization in infants. However, in infants <90 days old, serious bacterial infection is a concern. Often, patients with bronchiolitis present with fever, and clinicians have to make the decision whether to proceed with a serious bacterial infection evaluation, including blood and urine cultures and an LP. A systematic review of the literature found 11 studies that had age-specific rates of serious bacterial infection for children aged <60 to 90 days with bronchiolitis or respiratory syncytial virus infection. No cases of meningitis were found in any of the patients in any of the studies. UTI was the most common cause of serious bacterial infection, with a prevalence of 3.9% in patients with either clinical bronchiolitis or bronchiolitis due to respiratory syncytial virus. When bacteremia was present, it was usually associated with a UTI.

**Bottom Line:**
There is no need for LP or blood cultures in the face of bronchiolitis. Screening for UTIs may still be indicated but remains low yield.

**STANDARDIZED CARE MODEL FOR FEBRILE INFANTS SAFELY SAVES MILLIONS**


Expert guidelines for febrile infants <90 days of age have been in place for nearly 2 decades with recommendations for early discharge in febrile infants with negative culture results. Investigators from the Intermountain Healthcare system now report that an evidence-based care process model for febrile infants saved almost $2 million in the 2 years since its implementation. The primary savings seem to have come from recommendations to consider discharge for patients whose (bacterial) culture results were negative at 24 hours if they tested positive for a viral pathogen or 36 hours if their virus culture results were negative. There were no differences in admission rates or readmissions before and after implementation.

As we continue to search for value in our clinical practices, we will need to assiduously incorporate efficient practices for common and/or high-cost hospitalizations. Although this care process model was systematically implemented across a large integrated health care system with a robust quality improvement infrastructure, there remain significant opportunities for improvement on this group’s work. Viral testing was encouraged for all admitted infants and thus likely overused, whereas compliance with other recommendations was not nearly universal. Furthermore, findings from a recent study suggest consideration of further streamlining antibiotic coverage in this population.10

**Bottom Line:**
Recommendations for earlier discharge in febrile infants with negative culture results could significantly boost the bottom line in institutions with a capitated reimbursement model.

**ACYCLOVIR IN HERPES SIMPLEX VIRUS INFECTIONS**


Herpes simplex virus (HSV) infection is well known to cause devastating disease in infants. Acyclovir therapy decreases mortality in patients with HSV infection. Because there has been ongoing debate about whether to initiate acyclovir therapy in febrile neonates, this study sought to determine if delaying acyclovir therapy was linked to mortality in neonates with HSV infection. Shah et al conducted a multicenter, retrospective cohort study by using the Pediatric Health Information System from 41 hospitals over 6 years. More than 1000 neonates with HSV infection who had received acyclovir were identified and categorized as either early or late acyclovir according to when acyclovir therapy was initiated. Early acyclovir was defined as therapy initiated on day of admission; late therapy was defined as receiving acyclovir on >1 day and ≤7 days of hospitalization.

A multivariate analysis of risk factors for death in neonates with HSV infection revealed greater odds of death for delayed acyclovir therapy (odds ratio: 2.62 [95% confidence interval: 1.34–5.09]). Although the overall mortality of all patients with HSV infection was 7.3%, those patients with delayed acyclovir therapy had a mortality rate of 9.5% compared with 6.8% in those receiving early therapy.

Another study worth mentioning examined neurodevelopment in patients with a history of neonatal herpes. Kimberlin et al11 conducted a double-blind, placebo-controlled study in which neonates with central nervous system or disseminated HSV infection were randomly assigned to receive acyclovir or placebo for 6 months after completing 14 to 21 months of intravenous acyclovir treatment. Neurodevelopmental...
screening scores were significantly higher in the group who received acyclovir.

**Bottom Line:**
Start acyclovir therapy early if you suspect HSV infection. In patients who have central nervous system or disseminated HSV infection, longer is better for neurodevelopment.

**EVIDENCE-BASED MANAGEMENT FOR HOSPITALS: KNOW YOUR MEASURES**

Decisions regarding patient flow or the differential staffing of beds or units in pediatric hospitals are often made based on snapshots of administrative census data. This action may not capture the realities of a dynamically changing hospital census and may result in mismatches between pediatric hospitalist staffing and workload. Investigators from The Children’s Hospital of Philadelphia compared traditional (snapshot) measures of census and occupancy with periodic timestamp-based data from the electronic medical record and found that daily peak occupancy typically occurred between 10 PM and 2 AM. In addition, they found that median length of stay was significantly lower than mean length of stay, which is more commonly used in administrative data.

These findings should make us question the accuracy of administrative data when they are used to make decisions regarding hospitalist staffing or workflow. More accurate sources of census data are needed. The same authors recently published a similar study demonstrating that scheduled surgical admissions may contribute to higher occupancy and bottlenecks in patient flow on weekdays.12

**Bottom Line:**
Hospitalists should push for accurate and more critical analysis of measures used to drive workflow and staffing decisions in their institutions.

**MEDICATION UTILIZATION IN HOSPITALIZED PEDIATRIC PATIENTS**

The safety and efficacy of many medications used for pediatric patients have not been evaluated as adequately as in adult patients. Medication errors continue to be an area of focus for hospitals, and many hospital engagement networks, including the Ohio Children’s Hospitals Solutions for Patient Safety network, have been charged with reducing adverse drug events. This study examined the prevalence and patterns of medications administered to hospitalized pediatric patients in both children’s hospitals and community hospitals. Not surprisingly, intravenous fluids, antipyretics, and anti-infectives top the list of most commonly prescribed medications to inpatients. As patients stayed in the hospital longer, they were exposed to more medications and therapeutic agents. Although this trend is consistent across both children’s hospitals and community hospitals, patients in children’s hospitals are exposed to more medications than those in community hospitals. However, patients in children’s hospitals include many patients with uncommon diseases and may account for some of those patients receiving more medications.

Interestingly, the authors also did an additional analysis evaluating medications used in asthma, appendectomy, and seizures. Variation of medication utilization was seen in these 3 conditions in both children’s hospitals and community hospitals. As mentioned previously, antimicrobial stewardship programs have had success changing prescribing patterns and can help decrease utilization of targeted medications. Programs such as this might be helpful to reduce variation.3,13

**Bottom Line:**
The longer patients are in the hospital, the more medications they receive. Strategies need to be developed to decrease adverse drug events.

**PROTON PUMP INHIBITORS INEFFECTIVE FOR INFANTS WITH GASTROESOPHAGEAL REFLUX DISEASE**

The use of proton pump inhibitors (PPIs) for pediatric gastroesophageal reflux disease (GERD) has increased over recent decades despite limited evidence of efficacy and demonstrations of potential harm. This study found no benefit of esomeprazole in infants with GERD. The study has many strengths, including: guidance from the US Food and Drug Administration; 33 international centers; randomized,
double-blind, placebo-controlled, parallel-group design; and treatment withdrawal. Although funding and manuscript writing support were provided by industry, this bias did not seem to affect the outcomes of the study. Ultimately, these findings support analysis from a recent systematic review as well as the US Food and Drug Administration experience. In the context of newer reports of adverse effects of acid suppression, from neonates to adults, the routine use of PPIs for GERD in infants should seriously be questioned.

Bottom Line:
PPIs do not have a routine role in the management of GERD in infants.

ASTHMA ACTION PLANS: SHOULD WE TOSST ‘EM?

As everyone is aware, The Joint Commission’s only pediatric-specific measures are the 3 measures in the Children’s Asthma Care (CAC) measure set. These apply to patients aged 2 to 17 years admitted for an asthma exacerbation. CAC-1 is whether the patient received relievers; CAC-2 is whether the patient received systemic steroids on admission. Universally, hospitals perform well in these 2 measures. CAC-3 is whether the patient and family received a home management plan of care (HMPC) for the child’s asthma; this is also known as the asthma action plan. This study evaluated trends in compliance with CAC measures and assessed if compliance with the CAC measures is related to improvement in outcomes. Data for this study were obtained from the National Association of Children’s Hospitals and Related Institutions Pediatric Quality Measurement System for the CAC measures and the Pediatric Health Information System for readmissions and emergency department visits for patients admitted from January 1, 2008, to September 30, 2010. A total of 45,499 asthma admissions were evaluated. Over the study period, minimum compliance with CAC-1 and CAC-2 was 97.1% and 89.5%, respectively. Although CAC-3 compliance improved significantly over the study period, no significant change was seen in either readmission rate or emergency department visits.

The authors make the argument that The Joint Commission should reevaluate whether the CAC measure set should be an accountability measure because the relationship between compliance with the HMPC did not improve the outcomes. However, the debate continues about asthma action plans. Fassl et al conducted a similar study at a single institution. They increased their CAC-3 compliance from 0% to 87% over the 5-year study period and showed a decrease in 6-month readmissions from 17% to 12%. During their study period, a few other interventions were used such as accurately classifying the asthma severity. A few of our very own pediatric hospitalists published a letter in response to the article by Fassl et al and make the point that an increase in CAC-3 compliance may not have been the sole reason for the decrease in readmissions.

Bottom Line:
Focus on what is important in caring for patients with asthma instead of filling out forms. We should encourage The Joint Commission to reconsider using the HMPC as an accountability measure and find a measure that clearly ties the measure to an outcome. For a little humor about asthma action plans, visit this YouTube link: http://youtu.be/q_EyoP-gf6I.

REFERENCES


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The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://hosppeds.aappublications.org/content/3/1/1