Wow, what a year! As I looked back on the 100’s of articles that were published, there were so many discoveries and advances! I am dedicating this entire issue to looking at some of the articles published in 2009 that have made us change the way we practice...or at least think about it.

The evaluation of the febrile child has gone through many changes in the past decade. One of the biggest reasons? Immunizations. The pneumococcal vaccine was released in 2000. How has that changed the landscape of serious bacterial illnesses in children?

**Prevalence of Occult Bacteremia in Children Aged 3-36 Months Presenting to the Emergency Department with Fever in the Postpneumococcal Conjugate Vaccine Era**
Wilkinson M et al.

Since the introduction of the pneumococcal vaccine, rates of bacteremia and meningitis have decreased by 66% and 64% respectively. This study looked to identify the prevalence of occult bacteremia in the well-appearing, previously healthy, ED patients 3-36 months of age presenting with fever and no obvious source on exam.

This retrospective, cohort study reviewed the ED visits of children 3-36 months of age who were well appearing, had fever without a source, and had a blood culture drawn. What they found was that of the 8,400 patients who met inclusion criteria, there were 21 true positive cultures (0.25% occult bacteremia (OB) rate). Of those, 17 were + for S pneumonia (overall 0.17% OB rate). But, there were 159 cultures that were considered contaminants.

So, what does that mean? Since I like things simple, it boils down to this: the overall OB rate in the well appearing child, aged 3-36 months is very low. But, this study showed that for every true positive culture, there are 7.6 false positives. And I know we have all had to track down (probably false) positive cultures...

Approximately 20% of ED visits (and at least that many office visits) are for fever. One of the potential reasons for that is fever phobia: a popular term for the response of parents to childhood fever, which may result in inappropriate over-management with antipyretics. In one study, 66% of parents thought a fever would continue to rise unless treated, and 40% felt that fever alone could result in death (Rupe A et al. Clin Pediatr 2010;49:172-176).

**Effectiveness of Fever Education in a Pediatric Emergency Department**
Baker MD et al.

One of the main reasons this is an important article to us? Because this was done in our ED...these are our patients and families. An education effort was made to families of children presenting to our department with fever. They took a pretest, and then watched a brief video called Fever in Children: Fears and Facts. Their scores on the posttest? Much improved as compared to the control group! So, those families know the appropriate (as deemed by us ☺) times to return to the ED for evaluation, right?

Well, actually, the intervention made no difference in number of return ED visits, or the appropriateness of those visits. Damn. It's so important to keep trying, though...

The Year in Review continued on page 2
Since being bacteremic seems to have gone out of vogue, what do we do with these febrile children? Are we missing anything?

**Outcomes of Febrile Children Without Localizing Signs After Pneumococcal Conjugate Vaccine**

Waddle E, Jhaveri R  
Arch Dis Child 2009;94:144-147.

Along the same lines as the previous study, this study also wanted to determine the frequency of OB, as well as report the incidence of UTI and antibiotic administration in the same age group before and after the pneumococcal vaccine was released (February 2000).

This retrospective study reviewed the well appearing child, aged 3-36 months who presented to the ED with fever and no source on exam, and had a blood culture performed. They looked at patients in the pre-vaccine era (1997-1999), and patients in the post-vaccine era (2001-2004). This is what they found:

<table>
<thead>
<tr>
<th></th>
<th>Pre-Vaccine</th>
<th>Post-Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood cx performed</td>
<td>1251</td>
<td>2028</td>
</tr>
<tr>
<td>Urine cx performed</td>
<td>81</td>
<td>168</td>
</tr>
<tr>
<td>Fever w/o a source</td>
<td>148</td>
<td>275</td>
</tr>
<tr>
<td>+ blood culture</td>
<td>17 (11.5%)</td>
<td>14 (5.1%)</td>
</tr>
<tr>
<td>+ S pneumo</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Contaminants</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>+ urine culture</td>
<td>10 (6.8%)</td>
<td>21 (7.6%)</td>
</tr>
<tr>
<td>Antibiotics given</td>
<td>60.8%</td>
<td>57.2%</td>
</tr>
</tbody>
</table>

So, the rates of OB decreased from 6.8% to 0.4%, but the rates of UTI essentially stayed the same. The majority of the urine cultures were + for E. coli. Antibiotic administration rates were unchanged. According to their numbers, we would have to empirically treat 1200 patients to prevent 1 serious bacterial illness. Just something to think about.

Of note, immunization status was not known in either of the last two studies. They were done in states with historically above average vaccination rates (Arizona and North Carolina), but that remains a key part of the evaluation. (Strictly) anecdotally, I see a handful of patients who are unimmunized for various reasons and, unfortunately, all bets are off when dealing with them.

So, we're feeling a little better about the 3-36 month age group...I will check less blood cultures and more urines...but what about those scary, don't play by the rules, never can quite tell what their thinking neonates?

**Blood Culture and Bacteremia Predictors in Infants Less Than Three Months of Age With Fever Without Source**

Gomez B et al.  

The rate of serious bacterial illness in children < 3 months of age has been reported as 10-15%. Just as the landscape of pediatric infections have changed in recent years, the intrapartum use of antibiotics for Group B Strep and prenatal ultrasound detection of renal anomalies have altered neonatal infections as well.

So, this study wanted to look at the rate of bacteremia in febrile infants < 3 months of age, describe the bacteria isolated, and try to identify factors that may increase probability of having a positive blood culture.

They included patients < 90 days of age, with temperature ≥ 100.4°F, who were well appearing and did not have a source on exam. For this study, diarrhea and respiratory symptoms were counted as a positive source. Of the 1125 infants evaluated, blood cultures were performed in 91.5%. Those not undergoing blood cultures were more likely to be > 2 months of age. Urine cultures were obtained in 85%. 198 patients (19.4%) had a serious bacterial infection. What were they?

So, it seems that the neonates follow the same pattern as the older children. Good to know. One topic we have recently discussed in our own division is the neonate with a suspicious urine...is it OK to stop there, now that you have a source? Well, they found that of the well appearing infants with negative urine dips, the rate of bacteremia was 1%. But in that same patient with a positive urine dip, the rate of bacteremia rises to 4.4%...exactly opposite of what I would have thought. See, you just can’t trust them...
Then there are the special cases, like the fever that is blamed on teething or, more commonly, immunizations. What is acceptable in those cases?

Serious Bacterial Infection in Recently Immunized Young Febrile Infants
Wolff M, Bachur R.

The prevalence of fever after the 2 month immunizations has been reported to be as high as 28%. And while our previous article makes us feel a little better about evaluating those in the 8-12 week age range, the Red Book® says those can be given as early as 6 weeks (which I know is no surprise to most of you, but I had to look it up...it's been awhile since I've had to think about those things!). This study investigated the prevalence of serious bacterial illness in infants 6-12 weeks of age, with fever \[\geq 100.4^\circ F\] and no source on exam who had received immunizations in the preceding 72 hours.

This retrospective chart review only included patients with documented immunization status, and excluded those with concurrent antibiotic use, recent surgery, chronic illness, or focal bacterial infection other than AOM. Interestingly, they did not exclude the ill appearing patients in their analysis. With similar baseline characteristics such as age (64 v. 65 days), clinical appearance, and height of fever (101.3°F v. 101.5°F), they found that the recently immunized group had a 2.8% rate of serious bacterial illness as compared with 7.1% in the not recently immunized group.

You guessed it...UTI. And although there were equal numbers of males and females, 83% occurred in those who were 48-72 hours since vaccination. So, maybe there is a little leeway in those who have received immunizations in the past 24 hours.

More than 1.5 million head injuries occur annually in the United States, accounting for 300,000 pediatric hospitalizations and up to 90% of injury related deaths (Atabaki SM. Pediatrics in Review 2007;28:215-224). A certain percentage of these children are going to have clinically significant brain injuries, but how do we know which ones they are? And how good are we at deciding?

Clinical Judgment Versus a Decision Rule for Identifying Children at Risk of Traumatic Brain Injury on Computed Tomography After Blunt Head Trauma
Palchak MJ et al.

This was a prospective, observational study of children 18 year of age and younger with non-trivial head injury, who underwent CT scan. Of the almost 1200 patients that met criteria for inclusion, 89 (7.6%) had CT findings. How did clinical judgment compare with decision rule?

Well, for all of you out there with a research-oriented mind and a love for all things statistical, here are the results:

<table>
<thead>
<tr>
<th></th>
<th>Decision Rule</th>
<th>Clinical Judgment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>98.9%</td>
<td>94.4%</td>
</tr>
<tr>
<td>Specificity</td>
<td>26.7%</td>
<td>30.5%</td>
</tr>
</tbody>
</table>

For those of you like me, who like the more straight forward approach:

* **Decision Rule:** Missed 1 patient
* **Clinical Judgment:** Missed 5 patients

Of the 5 patients missed by the clinical judgment, 3 were hospitalized for at least 24 hours, and none required neurosurgical intervention. The 1 missed by the decision rule (also missed by clinical judgment) was sent home from the ED. And, they estimated a 25% reduction in CT scans using the decision rule.
So, now that we know we should at least think about using a decision rule, which one do we use? Well, lucky for us that the Pediatric Emergency Care Applied Research Network (PECARN) has developed and validated one for us...

**Identification of Children at Very Low Risk of Clinically-Important Brain Injuries After Head Trauma: A Prospective Cohort Study**

Kupperman N et al.


This study undertook the task of not only developing, but also validating a decision rule for identifying the patient at very low risk of important brain injury, i.e. those who don’t need a scan. They enrolled patients 18 year of age or younger with non-trivial blunt head injury, presenting within 24 hours of injury with a Glasgow Coma Score of at least 14. What they found was that in the more than 42,000 patients evaluated in this 25 hospital network, 35% underwent CT scan and 0.9% had clinically important brain injury (defined as resulting in death, requiring neurosurgical intervention, requiring a hospital admission for head injury related causes for $\geq 2$ nights, or requiring intubation as part of the treatment/stabilization of the head injury. The decision rules are as follows:

**Children < 2 Years of Age:**
- Normal mental status
- No scalp hematoma
- No LOC or LOC for $< 5$ seconds
- Non-severe injury mechanism*
- No palpable skull fracture
- Acting normally per parents

(Sensitivity: 100%; NPV: 100%)

**Children $\geq 2$ Years of Age:**
- Normal mental status
- No LOC
- No vomiting
- Non-severe injury mechanism*
- No signs of basilar skull fracture
- No severe headache

(Sensitivity: 96.8%; NPV: 99.95%)

*Severe injury mechanism defined as: MVC with patient ejected, death of another passenger, or rollover; pedestrian or cyclist struck by motorized vehicle without helmet; struck by high impact object; falls of $> 3$ feet for $< 2$ years, $> 5$ feet for $\geq 2$ years.

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**Advanced Pediatric Life Support Class**

**March 1-2, 2010**

**Bradley Lecture Center**

Space still available!

For more information, contact:
Sarah Sterner: ssterner@peds.uab.edu
205-939-9587

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**APLS: The Pediatric Emergency Medicine Course**

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*The Year in Review* continued on page 5
I don’t know about you, but it seems to me that gastrointestinal issues hit hard, sparing no one. Anything new to help on that front? We’re probably all aware of the 2008 literature supporting the use of oral ondansetron in vomiting due to AGE, showing that they received IV fluids less and were admitted less often. But, if you’re like me, you might have been concerned with the possibility of missing something, making me less likely to use it in some patients. This study looked at just that.

**Ondansetron Use in the Pediatric Emergency Department and Effects on Hospitalization and Return Rates: Are We Masking Alternative Diagnoses?**

Sturm JJ et al.

Masking alternative diagnoses is something we often worry about when we give certain medications—pain medications, certain antibiotics, and anti-emetics. The next few lines will be a *shameless editorial* regarding promethazine, so if you would rather not hear my opinion, please skip to the next paragraph. I think drugs like promethazine have their place, but rarely is it in the young pediatric population. And this does not come from “ivory tower academic” attitude...this comes from the several times I have had to perform (probably) unnecessary tests (such as CT scans and lumbar punctures) on children who have received it. On top of that, it doesn’t seem to work well in this population of patients. So, instead of having a child who is no longer vomiting and tolerating oral fluids, you have a sleepy, vomiting child with altered mental status and at 3 o’clock in the morning, it’s tough to sort that out.

For those reasons, I was very excited to see the promising results with ondansetron. But, this is a relatively new use for this drug, and we wonder if things like appendicitis and intussusception are getting missed because the patient improves while in the ED or office, but then worsens when they go home. This study looked retrospectively at patients 3 months to 18 years of age over a three year period who presented to an ED vomiting, with or without diarrhea, and looked at the rates of hospitalization, return visits, and alternative diagnoses given. They found that of the over 34,000 patients that met inclusion criteria, 58% received ondansetron. Of the return visits that required admission, 70% of those had received ondansetron. It could be argued that those receiving the medication tended to be the ones who were more ill, therefore selecting out a biased population. But what about the alternative diagnoses?

The subsequent alternative diagnoses and number of cases in each group are shown below:

<table>
<thead>
<tr>
<th>Final Diagnosis</th>
<th>+ Ondansetron</th>
<th>- Ondansetron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendicitis</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Intussusception</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Bacteremia</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Pyelonephritis</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>SBO</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Intracranial tumor</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10.6%</strong></td>
<td><strong>11.1%</strong></td>
</tr>
</tbody>
</table>

SBO = small bowel obstruction

With appendicitis being the most common alternative diagnosis, there was not a significant difference in the group who received or did not receive ondansetron. When they looked to see if there were any factors that were more highly predictive of the patient having something other than AGE, they found:

- **Presence of fever?**
  - Not predictive...
- **Presence of diarrhea?**
  - Not predictive...
- **Duration of vomiting?**
  - Not predictive, but...
- **Presence of abdominal pain?**
  - More likely to be present in children with alternative diagnoses.

So, use ondansetron when appropriate, but be suspicious of those with significant or persistent abdominal pain...they may have something else brewing.
5K and 1 mile fun run  
Saturday, May 8, 2010  
www.springscramble.org

Race Benefit Statement:
The fourth annual 5 K Spring Scramble will benefit The Children’s Hospital of Alabama’s Weight Management Clinic. Money raised will be used to support this much needed resource for the growing population of obese children. This race is also held to educate and inspire healthy lifestyle choices for all of our community’s youth. Sponsoring this race are the UAB Pediatric Residents who support child advocacy and community outreach programs. We gratefully acknowledge the support of Children’s Hospital of Alabama and Homewood City Schools!

REGISTRATION INFORMATION:

ONLINE: at www.active.com

OFFLINE: return forms to the CHECK Center at Children’s Hospital, Chief Resident’s Office, Homewood High School Front Office

BY MAIL: return form to Chief Residents Office, 604 Ambulatory Care Center, 1600 7th Ave South, Birmingham, AL 35233

Online and Pre Registration Deadline: May 6, 2010  
Race Day Registration Available onsite starting at 7am

REGISTRATION FEE*: $15 for all UAB/Children’s Hospital Employees, $20 Community Runners

*Registration Fee includes race day T-shirt (while supplies last and guaranteed to all registrants prior to May 1st) and a goodie bag.

***Students, register and race for free if you recruit an adult to run!***

COURSE INFORMATION:
This will be a fun, fast, flat 5 K (3.1 miles) Run or Walk. Race starts at Homewood High School (1901 Lakeshore Drive S, Birmingham, AL 35209)  
Race will be a single-loop, mainly on paved greenway trail parallel to Lakeshore Drive. Timing & Results by Birmingham Track Club.

****RACE TIME 8 AM****  
Fun Run 8:30

Awards and Door Prizes starting AT 9:15am

PRE-RACE PACKET PICK UP:  
Friday May 7th, 8am-7 PM at The Children’s Hospital of Alabama, First Floor Lobby, 1600 7th Ave S

CONTACT:  
Justin Davis jdavis@peds.uab.edu 205-212-0999
Anaphylaxis is scary, even in the emergency department where I have resources at my fingertips. But what can be even scarier at times is deciding who can go home, and who needs to be admitted for concerns for potential biphasic reactions.

Clinical Predictors for Biphasic Reactions in Children Presenting with Anaphylaxis
Mehr S et al.
Clinical & Experimental Allergy 2009;39:1390-1396

I try to sound (somewhat) intelligent when I am speaking to families who are dealing with an anaphylaxis episode...food triggers tend to be more prolonged, the symptoms will wax and wane over the next few days...but what I’m really wondering is which patient is going to have that significant biphasic reaction. This study set out to determine predictive factors for just that.

They retrospectively evaluated children presenting to an ED with anaphylaxis over a 5 year period. They found that the majority of cases were uni-phasic (87%), but of the biphasic reactors, almost half were at least as severe as the initial reaction. Those with biphasic reactions were more likely to have received >1 dose of epinephrine, and/or a fluid bolus during their initial resuscitation. Of the children who had biphasic reactions, the ones with similar or worsened symptoms tended to be younger (2 v. 13 years), and had a shorter time to second phase (1.5 v. 16 hours). They found no difference in the groups in terms of prior history of anaphylaxis, history of atopic disease, time to initial reaction, type of trigger or route of exposure.

Helpful? I think it supports our gut feelings...the ones who require >1 dose of epinephrine or IV fluid bolus deserve to be watched in house overnight. The rest? The numbers are small, but they’re out there. Providing the families with good education and anticipatory guidance may be our best defense.

You didn’t really think I would make it through this whole issue without SOMETHING on bronchiolitis, did you?? The search continues...but this time it may have uncovered something…

Epinephrine and Dexamethasone in Children with Bronchiolitis
Plint AC et al.

We’ve been down this road before, right? Epinephrine doesn’t work. Steroids don’t work. But this group wanted to put them together and try again.

This large Canadian research group prospectively evaluated infants (6 weeks to 12 months of age) presenting to a pediatric ED, and randomized them into one of four groups:

- Epinephrine + Dexamethasone
- Epinephrine + Placebo
- Placebo + Dexamethasone
- Placebo + Placebo

What they found was that with similar baseline characteristics, the group who received epinephrine and dexamethasone were less likely to require admission within 7 days. It also seemed that these children (who showed the highest benefit in the first 3 days after study enrollment) were discharged from medical care sooner and returned more quickly to baseline respiratory status. These results were not modified by presence or absence of atopy, RSV status, or length of illness.

It should be noted, though, that when adjusted for multiple comparisons, the differences in the groups did not meet statistical significance. But would any type of improvement mean clinical significance for this most frustrating of pediatric illnesses? If you’re thinking about trying it (and I have not been convinced to as of yet), here is the magic” formula:

- Nebulized epinephrine:
  - 3cc of 1:1000 preparation
  - 2 treatments given 30 minutes apart
- Oral dexamethasone:
  - 1 mg/kg (max 10mg) given after 1st aerosol
  - 5 daily doses of 0.6 mpk (max 10mg) at home

If you try it, let me know how it works!
Mark Your Calendars

Come celebrate tax day with us at the
7th Annual Rud Polhill Memorial Grand Rounds!

Thursday, April 15, 2010
Noon
Bradley Lecture Center
Hope to see you there!