I remember when I was growing up in Kansas City, summertime was the best. It stayed light outside until after 9pm, and the only job I had was to play as much as possible. The heat wasn’t a problem...it was the best part! Just like so many other things, issues like the risk of heat related illnesses didn’t seem to be on the top of people’s lists of things to worry about (and even if we did, my mother would probably use mercurochrome to fix it—whatever happened to that stuff anyway?). These days, however, it attracts more attention. Maybe it’s due to increased media coverage of the mortality that has occurred not in the elderly, but in our youth. Maybe it’s hotter now than before. Maybe we need to get mercurochrome back on the market. Whatever the reason, I thought it would be a good thing to brush up on and share as we enter the long, hot summer.

As with most things, children are not just little adults, and so they have different physiological responses to heat stressors, and run a higher risk of significant injury/illness. Some of these differences include greater surface area-to-mass ratio, higher metabolic rates, and less sweat produced per gland. Since most of the heat we absorb during outdoor activities is from radiation, the higher relative surface area in a child makes it so a smaller dose of radiation is needed to cause effects. Also, children < 5 years of age do not increase their cardiac output in the face of heat stress. They will increase their heart rate, but decrease their stroke volume. They also exhibit a greater ability to increase blood flow to the skin, and while that may seem to be an advantage, with overall less blood volume, it can lead to symptoms of shock sooner. It’s also important to remember that depending on the age and developmental abilities of the child, he or she may not be able to exhibit the behavioral responses one would expect (i.e. moving to the shade, avoiding strenuous exercise).

There are three main types of heat illness: heat cramps, heat exhaustion, and heat stroke (summarized in Table 1). Heat cramps are typically the mildest form of heat illness, and consist of painful muscle cramps and spasms that usually occur after the exercise is over, during rest. It is thought that this is due to acute electrolyte depletion. Core body temperature tends to remain normal in this stage.

Heat exhaustion is next in the continuum of heat illnesses and usually occurs during periods of extreme exercise/sweating without adequate replacement of fluid and electrolytes. The symptoms may be vague, but the presence of systemic symptoms differentiate heat exhaustion from heat cramps. These can include dizziness, nausea/vomiting, headache, weakness, fatigue, and irritability. Body temperature may be normal, but hyperthermia may occur (< 40.0°C/104°F). There are two types of heat exhaustion: water depletion and salt depletion. Salt depletion, or hyponatremic heat exhaustion occurs more slowly and occurs when fluid replacement is predominantly free water (inadequate sodium intake).

Heat stroke is the most severe of the heat illnesses, and is considered a medical emergency. To differentiate between heat exhaustion and heat stroke, you must have a core body temperature of > 40.6°C (105.1°F) and have the presence of CNS dysfunction. It is a multisystem disease, with CNS and cardiovascular symptoms usually being the most easily recognized. The CNS symptoms may include headache, hallucinations, irritability, ataxia, seizures, delirium, and coma, while cardiovascular signs include tachycardia and signs of distributive shock (warm extremities with bounding pulses).
Do All Infants With Apparent Life-Threatening Events Need to Be Admitted?

Picture this scenario: it is early July in the emergency department, and one of the brand new interns is checking out a patient to you who they report has had an ALTE. Of course, the next question out of your mouth is “What is an ALTE?” Because it is the first week of residency, and they have just begun their quest for all knowledge that is pediatric (and have not yet become jaded), they have actually read about this and recite to you “An ALTE is an acute episode characterized by a combination of apnea, color change, and/or alteration in muscle tone.” They may even go on to list the possible causes of ALTE: sepsis, arrhythmia, seizure, toxins, abuse…but can they answer the million dollar question…does the child need to be admitted?

Sometimes the answer to this question is more clear, with clues either by history or exam, but that is not always the case. Can any of these children be sent home? That is what this study investigated. They performed a prospective observational study on children <12 months of age presenting to an urban pediatric ED with ALTEs. Exclusion criteria included prematurity (EGA <30 weeks), uncorrected cardiac disease, known seizure disorder, significant developmental delay, or chronic lung disease. They focused on 2 primary issues: predictive criteria (what patient characteristics could be used to predict serious outcomes) and outcome criteria (subsequent events requiring resuscitation/life-threatening conditions or subsequent ALTEs revealing an identifiable pathologic condition).

Of the 59 patients enrolled, 55 were admitted but only 8 (14%) were admitted could have been discharged safely from the ED. The characteristics most commonly encountered with the high-risk infants included multiple episodes of ALTE and age ≤ 1 month. Applying these criteria of multiple episodes and age ≤ 1 month identified 100% of the high-risk patients. If the same criteria were applied to they entire study group, 26 (44%) of patients that were admitted could have been discharged safely from the ED.

Even though the clinical picture is a major part in the decision to admit one of these patients for me, equally if not more important is the reliability of the caretaker, presence of language barriers, availability of transportation and other potentially non-objective measures. So, this study provides us with some useful data, but it needs to be used in context with your individual patients…and that is what I will probably tell the new interns. All the best books and studies won’t necessarily teach you how to take care of children. It is an art that takes improves with practice and experience…but don’t stop reading!

Clinical Predictors of Occult Pneumonia in the Febrile Child

The fever work-up…is never gets old, does it? We’ve discussed evaluating for occult pneumonia in the past, primarily in the pre-pneumococcal vaccine era. An increased WBC count was associated with higher prevalence of pneumonia, even in the absence of respiratory symptoms. However, with the decrease in pneumococcal bacteria since the introduction of the vaccine, not as many CBCs are getting checked…so now what? Chest x-rays for everyone!

This group performed a retrospective cross-sectional study of patients ≤ 10 years of age who presented with the complaint of fever (T ≥38°C) and got a CXR for suspected pneumonia. Exclusion criteria included CXR in the past 24 hours, radiographic pneumonia in the past month, suspicion for FB aspiration, chronic lung disease (excluding asthma), sickle cell disease, severe cardiac or neurological disorders, and immunodeficiency.

Patients were divided into 2 groups: those with no signs of pneumonia (no respiratory distress, no tachypnea, no hypoxia, no lower respiratory tract findings on exam) and those with signs of pneumonia (those that failed to meet all of the above criteria). Pneumonia was considered present if the attending radiologists read the x-ray as positive (equivocal x-rays were not considered positive).

53% of those without clinical signs of pneumonia had positive x-rays. The positive predictors in that group were longer duration of cough, longer duration of fever (both of which were more significant if present for > 5 days), and WBC > 20,000 (for those who had one drawn). Of interest, for those with increased WBC count, the rate of occult pneumonia was 14.2% as compared with estimates of 26% in the pre-pneumococcal vaccine era.

For those with clinical signs of pneumonia, 12.6% had positive x-rays. In this group, the presence of rales or decreased breath sounds was a positive predictor of radiographic pneumonia, while presence of wheezing more highly predicted a negative x-ray. This will be another good teaching point for the new interns...don't you love July!
Endocarditis prophylaxis...something we all know about, but probably have to look up when it actually presents itself. So, when the revised guidelines came out this year, I thought it would be a good review for me, and maybe for you as well.

The American Heart Association has been publishing prophylaxis recommendations since 1955, with the last revision in 1997. Much thought has gone into these most recent changes, and were collaborated on and written by representatives from the AHA, AAP, American Dental Association, and the Infectious Diseases Society of America.

The reasons the guidelines were originally written were for the following reasons:
- Infectious endocarditis (IE) is an uncommon but life-threatening disease, with prevention being preferable over treatment of established infection
- Certain underlying cardiac conditions predispose someone to IE
- Bacteremia with organisms known to cause IE occurs commonly with invasive dental, GI, or GU tract procedures
- Antimicrobial prophylaxis was proven effective for prevention of IE in animals
- Antimicrobial prophylaxis was thought to be effective in humans for prevention of IE associated with dental, GI, or GU procedures

Although the first 4 reasons are still considered very valid, many have disputed the 5th principle stated above. On top of that, IE prophylaxis has become very complicated, making it difficult for families and healthcare providers to be compliant. So, the following reasons have been given for these revisions:
- IE is much more likely to result from frequent exposure to random bacteremias associated with daily activities rather than a procedure
- Prophylaxis may prevent an exceedingly small number of cases of IE, if any, in those undergoing dental, GI, or GU procedure
- The risk of antimicrobial-associated adverse events exceeds the benefits, if any, from prophylactic antibiotic therapy
- Maintenance of optimal oral health and hygiene may reduce the incidence of bacteremia from daily activities and is more important than prophylactic antibiotics for a dental procedure to reduce the risk of IE

Of note, antibiotic prophylaxis solely to prevent IE is not recommended for GU or GI tract procedures. It is also reaffirmed that prophylaxis is not needed for ear and body piercing, tattooing, vaginal delivery, and hysterectomy.

Based on the new recommendations, far fewer patients will be recommended for IE prophylaxis. The authors of these guidelines realize that this may cause some concern among patients and physicians who were previously instructed to do so. They hope that these recommendations will identify those who will benefit from prophylaxis and which procedures are high-risk. It is also their hope that future research will be done on this topic specifically. I hope you find the following information helpful!

### Cardiac Conditions for Which Prophylaxis for Dental Procedures is Recommended

- Prosthetic cardiac valve
- Previous IE
- Congenital Heart Disease (CHD)
  - Unrepaired cyanotic CHD, including palliative shunts and conduits
  - Completely repaired congenital heart defect with prosthetic material or device in the first 6 months following the procedure
  - Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or device
- Cardiac transplant recipients who develop cardiac valvulopathy

### Dental Procedures for Which IE Prophylaxis is Recommended

- All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa
- The following DO NOT need prophylaxis:
  - Routine anesthetic injection through noninfected tissue
  - Taking dental radiographs
  - Placement of removable prosthodontic or orthodontic appliances
  - Adjustment of orthodontic appliances
  - Placement of orthodontic brackets
  - Shedding of deciduous teeth
  - Bleeding from trauma to the lips or oral mucosa
Although the absolute temperature is definitely a risk factor in the development of heat related illnesses, humidity may play an even more important role. There have been case reports of heat stroke in young athletes who were practicing in 80°F weather, but with high humidity. To better account for those factors, specialists have used what is called a wet bulb globe temperature. This apparatus is comprised of 3 thermometers, one to measure humidity, one to monitor radiation, and the third to measure air temperature. These values are used to calculate the heat stress index. Interestingly, 70% of the stress is attributed to humidity, 20% to radiation, and only 10% to air temperature.

Children have already been identified as a high risk group for being affected by climatic heat, not only because they don’t feel the need to drink as much during exercise, but they also have a relatively higher increase in core body temperature for the degree of dehydration they are experiencing. There are also other conditions associated with higher risks of heat intolerance. They include:

- Excessive fluid loss
- Abnormal hypothalamic thermoregulatory function
- Suboptimal ability to sweat
- Excessive sweating
- Diminished thirst
- Inadequate drinking
- Obesity

Heat related morbidity and mortality is preventable. Some measures that can be taken by families are summarized in Table 2. The AAP Committee on Sports Medicine and Fitness have also issued a statement with specific guidelines:

- **The intensity of activities lasting > 15 minutes should be reduced when climatic levels reach critical values**
  - Increase rest periods
  - Substitute players frequently
- **A the beginning of a vigorous exercise program or when moving/traveling to a warmer climate, the intensity and duration of exercise should be limited initially and then gradually increased to achieve acclimatization**
  - A child would require 8-10 exposures (30-45 minutes each) daily or every other day
- **Before prolonged activity, the child should be well-hydrated**
  - During activity, frequent drinking should be encouraged (150cc of cold tap water or electrolyte-containing solution every 20 minutes for a child weighing 40kg and 250cc for those weighing 60kg)
- **Clothing should be light-colored and lightweight, and limited to a single layer of absorbent material to aid in sweat evaporation**
  - Sweat soaked garments should be replaced by dry ones

### Table 1: Symptoms of Different Heat Related Illnesses

<table>
<thead>
<tr>
<th>Heat Cramps</th>
<th>Heat Exhaustion</th>
<th>Heat Stroke</th>
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<tr>
<td>- Flushed, hot skin&lt;br&gt;- Painful cramps, especially in legs and abdomen&lt;br&gt;- Normal to mildly elevated body temperature (&lt;102°F)</td>
<td>- Pale, moist skin&lt;br&gt;- Muscle cramps&lt;br&gt;- Body temperature usually &gt;102°F&lt;br&gt;- Systemic symptoms:  - Nausea/vomiting&lt;br&gt; - Diarrhea&lt;br&gt; - Headache&lt;br&gt; - Fatigue&lt;br&gt; - Weakness&lt;br&gt; - Anxiety</td>
<td>- Warm, dry skin&lt;br&gt;- Body temperature usually &gt;104°F&lt;br&gt;- Tachycardia&lt;br&gt;- CNS Symptoms:  - Headache&lt;br&gt; - Confusion&lt;br&gt; - Agitation&lt;br&gt; - Irritability&lt;br&gt; - Lethargy/stupor&lt;br&gt; - Seizures&lt;br&gt; - Coma</td>
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Once heat-related illness is recognized, prompt treatment is crucial. First and foremost, the affected person should be moved out of the sun/heat and into a cool, shady area. Oral rehydration should be initiated. Clothing should be removed to aid in heat loss. If available, the person should be misted with water and fanned to assist in convective heat dissipation. Ice packs may be placed in areas where major vessels travel (neck, axillae, groin), although the utility of this practice has not been established. Immersion in cold water is an option in the person who is severely affected by heat-related illness. Lying with the feet elevated may also aid in resuscitative efforts. Seizures should be aggressively managed to avoid further increase in body temperature. The goal of treatment is not normothermia, but to reduce the temperature to a degree where physiologic mechanisms function more effectively. Once the body temperature has fallen below 39°C (102.2°F), active cooling measures should be stopped. As we enter this summer, we are probably anticipating plenty of fun and activity. In the ED, I am anticipating a wide spectrum of heat related illness, ranging from mild sunburns and heat rashes to heat stroke. Please don’t minimize the importance of safeguarding against heat illnesses, not only with our patients, but also with ourselves and our families. Let’s be safe and have a great summer!

Table 2: Guidelines for Preventing Heat Related Illness

- Drink plenty of non-caffeinated and non-alcoholic beverages during vigorous activity
- Dress your child in light-colored, lightweight, tightly woven, loose fitting clothing
- Schedule vigorous activity and sports for cooler times of the day
- Take rest periods in shady or cool areas
- Use hats, sunglasses, and umbrellas to block the sun
- Increase time spent outdoors gradually to help get used to the heat
- Teach children to take frequent drink breaks and “wet down” or mist themselves with a spray bottle to avoid becoming overheated
- Do not leave children unattended in a hot automobile
- Teach children to warm-up and cool-down before and after exercising
- If a child has an underlying medical problem or is taking any medications, monitor for possible side effects or interactions

References:

Mark Your Calendars!!

Like music? Like hanging out with good friends (in a smoke-free environment)? Then join us for FAB!

FAB is a Beatles tribute band based in Nashville, Tennessee, and they are performing a concert to benefit the telemedicine program for the Children’s Hospital emergency department!

When: Saturday, September 29, 2007
Where: Workplay Theatre
Time: 7:00 p.m. - 11:00 p.m.
Tickets: $50.00 per person

For more information regarding tickets or sponsorship opportunities, please contact:
Andrea Martin
205-939-9017
andrea.martin@chsys.org

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Summer Safety Tips

Well, it's that time of year again...summer, and with it comes thoughts of vacations, swimming, and endless fun. But, it also brings its own unique safety concerns for our families that can lead to an increase in injuries. What are some of the bigger ones? I have tried to compile a top ten list that, while is in no way comprehensive, I hope will remind us all of some of the major themes we should pass on to our patients and families this summer.

10. Picnic Safety

What a great way to spend the afternoon! But, it will be a long evening if you don't protect against insects! Avoid using scented lotions/soaps, and stay away from bright colors/floral prints. DEET-containing products are among the most effective mosquito repellents, with the recommended maximum concentration being 30%. The higher the concentration, the longer the repellent effect. DEET should not be applied more than once daily, so combination sunscreen/insect repellents should be avoided. DEET should not be used under clothing, over open skin, on the hands and face of young children, and is not recommended for infants less than 2 months of age.

When barbecuing, always check your equipment (especially with the first use of the season), and ensure there are no cracks or leaks in tubing if using a gas grill. Never use charcoal grills inside as it poses the risk of carbon monoxide toxicity.

9. Fireworks Safety

July 4th is a great reason to have family get-togethers, neighborhood parties, or take a trip to the beach. While the AAP recommends prohibiting public sale of all fireworks that is probably not going to happen this year. Parents should strongly consider attending public fireworks displays rather than using them at home. For those who are going to use fireworks at home, they should be reminded to only use them outdoors and that only people 12 years of age and older should handle them. Sparklers can reach extreme temperatures, causing significant burns. Eye protection should be worn by those in the vicinity. People should be familiar with their local laws and regulations and, as always, fireworks and alcohol don't mix.

8. Lawn Mower Safety

This has been brought to my attention by our orthopedists who handle these cases on an alarmingly regular basis. Children < 16yrs should not be allowed to use ride-on mowers and those < 12yrs should not use walk-behind models. Sturdy shoes should be worn while operating any type of lawn mower, and the user should NEVER be barefooted. On a slope, walk-behind models should be used across, while ride-on mowers should be used up and down the slope. Children should not be allowed to ride as passengers. Other ways to reduce injuries is to pick up small toys from the yard before mowing begins.

7. Water Safety

If you own a swimming pool, minimize potential tragedies by using several barriers that need to be crossed to access the water (i.e. fences, door and pool alarms, gates that self-latch closed and open away from the water). Inflatable swim aids should not be viewed as life preservers, and never leave children alone in or near the water...even just for a minute.

There's nothing like a relaxing day on the water, and it can stay that way if just a few safety measures are met. All people on a boat should have properly fitting life jackets on at all times, even adults (if even just to set a good example!). Inflatable toys should not be used as life preservers. When swimming in open water settings, utilize the 'buddy system', never letting children swim alone. Avoid areas of fast moving water, and be aware of the depth of the water, particularly when people are diving into the water. And, again, alcohol should be used responsibly.

6. Sun Safety

For infants < 6 months of age, lightweight clothing with long pants and sleeves should be worn, as well as wide brimmed hats. Small amounts of sunscreen (at least SPF 15) can be used on small areas. For older children, sunscreen should be applied at least 30 minutes prior to going outside, and should be SPF 15 or greater. Peak intensity hours (10a-2p) should be avoided if possible. Sunscreen should be reapplied every 2 hours, or after swimming/sweating, and remember that water and sand reflect the rays and may result in a burn more quickly.

5. Safety Gear

Helmets save lives...I can't say it enough. They have been shown to significantly reduce the risk of head injury. Any child using a bicycle, skates, scooter, any motorized vehicle, or horse should be wearing a helmet. Bicycles should be bought to fit the child, not "one to grow into". Developmentally, children may not be ready for two-wheeled bikes until they are 5-6 years of age. Skateboard parks are becoming more popular in neighborhoods, and are more likely to have safer facilities than those constructed at home. Children under the age of 16 should not be allowed to navigate off road vehicles, and double riding results in injuries frequently. Flags and reflectors should be used to make vehicles more visible, and nighttime riding discouraged.
4. Sports Safety

When playing baseball, consider using softer than standard balls, batting helmets with face guards, and bases with a safety release mechanism. For soccer families, remind them that movable soccer goals can fall over and severely injure or kill a child. Make sure the goals are well anchored and do not allow climbing on the net. If the goal is not in use, remove the net for further safety.

I realize that trampolines are not really a sport, but they deserve mentioning. When parents ask me about trampolines, I have a one word answer: don't. But for those who feel strongly about having them, limit only one person at a time on the trampoline, and do not allow flips/somersaults. The trampoline should be separated from other playground equipment, and have a shock-absorbing pad that covers the springs.

3. Playground Safety

Playgrounds should be housed on safety mats or loose materials (wood chips, sand, etc), and should be at least 9 inches deep, and have a border of at least 6 feet around the equipment. Anything with strings/straps (including bicycle helmets!) should not be allowed on playgrounds, as children have been strangled by these when they get caught in the playground parts. Metal slides should be monitored for temperature to prevent burns.

2. Heat Illness

You had to know that this would make it into the top 10...and I think we've covered it pretty well! In short, more water!!

1. Personal Safety

Here are a few tips to remind the kids themselves:

- Check in frequently with parents or guardians
- Take a friend with you when you go play
- Don’t go into public restrooms by yourself
- Never accept gifts or treats without your parent’s permission
- If you are at home, keep the doors locked, and don’t open the door for strangers
- Don’t wear clothing or carry items with your name displayed on the outside
- Trust your feelings and don’t be afraid to say no or get away from a situation that is making you uncomfortable

References:

Misdiaognoses are the most common type of serious medical error. Jerome Groopman, a hematologist and the chair of medicine at Harvard, sheds light on how these errors occur. Groopman outlines many cognitive errors that physicians can make: premature closure, framing effects, availability errors, and affective bias. Premature closure occurs when a physician makes a snap judgment or finds a piece of evidence supporting a preliminary diagnosis. Framing effects, which occur when data is fit to a preliminary diagnosis, are especially problematic for emergency physicians or specialists who see patients referred with a label. Affective bias can be seen when pediatricians either do not want to put a patient through an uncomfortable test or discount information given by parents who are seen as unreliable. The mental effect of all of these heuristics is to turn off alternative diagnoses.

The chapter on ‘Gatekeepers’ should resound with pediatricians. Here primary care physicians lament the difficulty of keeping their guard up to identify the rare patient displaying signs of a serious illness. Economic pressures have lead to shorter patient visits and minimal time to reflect on competing diagnoses. Groopman interviews several primary care physicians who placed caps on patient volumes in order to foster thoughtful care.

The underlying theme behind most cognitive errors appears to be poor communication and a lack of self-awareness. Poor communication is observed in the setting of inadequate histories and failure to take seriously the concerns that are expressed. Awareness of physicians of their own mental states is essential to detect the unacknowledged biases and outside influences which affect our thinking. Groopman’s book is primarily written for a lay audience to help in guiding their physicians to think better. The questions he suggests patients ask their doctors: “What else could it be?”; “Is there something that doesn’t fit?”; “Is it possible that more than one thing is going on?” are also tools that physicians can utilize when thinking about a problem. Simply asking these questions and communicating our feelings of uncertainty may be the best safeguard against medical errors.

Summer Book Review

By: Mark Baker, MD

How Doctor’s Think

Jerome Groopman, MD
Houghton Mifflin 2007

The Polhill Report
Volume 3 • Issue 2 • Summer 2007
Page 7
We are delighted to announce the newest addition to our division, Dr. Jennifer McCain. Originally hailing from Valdosta, Georgia, Jennifer attended University of Georgia for her undergraduate degree, and then completed medical school at The Medical College of Georgia. We were fortunate to match her in our pediatric intern class in 2002, and again to have her as a PEM fellow for the last three years. Anyone who knows Jennifer knows her laid-back and fun-loving spirit, and the wonderful connection she makes with children of all ages. She is an avid tennis player and college football fan (how ‘bout them Dawgs?)! Please join us in welcoming Jennifer to our family!!