

MACEP Risk Management Course

Module 5: Pediatrics (Pediatric Fever, Testicular Torsion)

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Course Objectives

- Understand the risk management issues of emergency care of the febrile child.
 - Recognize high risk situations in children presenting with fever.
 - Know the high risk situations are occult infection, meningitis, and febrile children under 3 months of age.
 - Be able to discuss the various risk factors that make these high risk situations.
 - Know the pertinent history, physical findings, testing, management, documentation and follow-up needed when evaluating a child with fever.
 - Understand the risk management issues of testicular torsion
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Pediatric Fever

Fever is one of the most common symptoms prompting children's emergency department visits. Most of these children are under 36 months of age. While the identification of all children with sepsis or meningitis is our goal, it is the child under 3 months who presents both the greatest diagnostic challenge and greatest risk.

Most febrile children have self-limited viral disease. However, a small but significant number have bacterial processes. Although most infants and toddlers with bacterial illnesses have clinically identifiable focal sites of infection, the conditions of those with "occult" infections (no identifiable source and relatively benign appearance) can be indistinguishable from those children with simple and uncomplicated viral illnesses. These occult infections include urinary tract infections, pneumonia, and bacteremia.

Pediatric fever is defined as rectal temperature $>38.0^{\circ}\text{C}$ (100.4°F). It should be noted here that maximum height of fever includes rectal temperatures taken at home by responsible caregivers. We can tailor our approach to the febrile child based on the child's age and height of fever.

Older children act more like adults in their presentations and they are frequently able to describe their symptoms. Clinical evaluation of febrile children under three months of age cannot reliably exclude serious bacterial infection and these children should be thoroughly evaluated for source of fever.

Parents bring their children to us because they fear that fever indicates a serious infection. We must always fear that they are correct. Most emergency physicians see a significant number of children with fever. While we know most children do not have a serious etiology for fever, we must always remember our ultimate task is to find the child who does.

History

History from the parent or guardian is crucial for correct assessment. If there is doubt as to the reliability of this history, whether due to educational handicap, mental illness, language or social/parenting factors (including substance abuse) then greater reliance and emphasis must be given to the physical exam and laboratory findings. The following are the core historical data necessary in any assessment of a child/infant with fever:

- Brief perinatal history
- Medical history, especially regarding past infections or illnesses that cause the child to be immunocompromised (HIV, sickle cell disease, malignancy, etc.)
- Exposure to other infectious illness – home, day-care, school, recent travel
- Immunizations (Hib and pneumococcal vaccines)
- General hydration; type and amount of fluids, output; wet diapers, decreased urination
- Eating history – especially infants: quantity, intervals, duration of feeding
- Duration and height of fever and fever control measures
- Use of antibiotics
- Review of symptoms should seek to discover any change in the child's activity level to include playfulness, irritability, or lethargy. Ask about respiratory and GI symptoms. And it never hurts to ask if the child has a new rash.

Physical Examination

The physical examination must be thorough. Don't stop when you discover a red bulging eardrum (this is not the source of the fever). Vital signs should include weight, and only rectal temperatures are reliable. If a parent refuses a rectal temperature, document it. Your physical exam should be thoroughly documented and should generally include overall appearance, state of hydration, HEENT, presence of meningismus (although this is not a sensitive indicator of meningitis in children under 2 years of age), evaluation of the airway (stridor), cardiopulmonary, abdominal and don't forget skin (were the petechiae present before or after you sent the child home?).

From a risk management perspective, perhaps the most important part of the physical exam is an assessment of the child's overall appearance and activity level. How ill does the child look? Is she active, alert and playful, or is she lying listlessly, uninterested in her surroundings? Does the infant have good tone, or is he lying limply in his father's arms? Several formal methods for assessing the severity of a child's illness (i.e., the Yale Observation Score) have been developed. However, they are probably not as useful as the

gestalt of an experienced clinician. In nearly every pediatric fever algorithm, the first branch point is determined by whether the child is toxic. If you exam a child with fever and the child is ill appearing, blood and CSF testing is indicated. The difficulty arises with well appearing febrile children.

Testing

There are six common tests used to evaluate the child with fever: urinalysis, urine culture, complete blood count, blood culture, chest x-ray, and lumbar puncture. The question is how to use them (see Green MS, Evaluation styles for well-appearing febrile children: Are you a "risk-minimizer" or a test-minimizer"?, *Annals of Emergency Medicine* 1999; 33:2; 211-213). In 2003, ACEP published a clinical policy that thoroughly discusses the various tests for febrile pediatric patients and presents the weight of evidence for each recommendation. Below is a summary of these recommendations.

Urinalysis

Urinary tract infections are the most common occult infection in children. About 5% of febrile children under one year will have a urinary tract infection and the rate is higher with higher temperatures. Urinary infections are more common in females under age two, males under 6 months, and uncircumcised males <1 year old. While older children with a urinary tract infection are likely to have urinary symptoms, most young children with urinary infections present with non-specific symptoms. Younger children also have a higher incidence of renal damage from infections than older children. Therefore, always think of urinary tract infections in children, especially girls under age 2 with unexplained fever >39°C (102.2°F).

A reasonable and efficient approach in the emergency department would be to obtain a urine sample (for children not toilet trained, this should be done by bladder catheterization), treat positive urinalyses (may use dipstick), and have the urine culture checked when the child sees the pediatrician for follow-up. Be aware that a dipstick alone may miss a proportion of patients with UTIs and a microscopy exam can increase the sensitivity and specificity. Most children with a negative urinalysis may be sent home with follow-up. However, when urinalysis is negative, order a culture on a child under age 2 you consider high-risk for urinary tract infection.

Chest Radiographs

To x-ray or not, that is the question. There are several reports of occult pneumonias in pediatric patients. However, there are also studies that show the majority of lower respiratory tract infections are viral and there is poor interobserver reliability to determine if there is even a pneumonia on a chest radiograph. The literature divides pediatric patients into 2 groups: under 3 months, and 3 months to 3 years.

In a large meta-analysis of patients younger than 3 months old, no subject had a positive chest x-ray without at least one respiratory finding on exam (tachypnea, abnormal chest sound on

exam or history of cough). Of patients with at least one respiratory finding, 33% had a positive chest x-ray. Therefore, a chest x-ray is only recommended for babies less than 3 months old with pulmonary findings on exam or history of cough.

In children over 3 months old, several strategies have been developed. Multiple clinical factors, including tachypnea, rales, crackles, ronchi and decreased breath sound all have been associated with pneumonia. In one study, occult pneumonia as defined as no identifiable symptom on exam was found in 26% of febrile children <5 years old with a WBC of $>20,000/\text{mm}^3$. Several studies since this initial one have corroborated this finding, however all are small studies with various methodological challenges. Most experts state that there is insufficient evidence to determine when a chest x-ray is required in a febrile, well appearing child and you should consider one for a patient with a WBC $>20,000/\text{mm}^3$.

Complete Blood Count

If even thinking about it gives you a headache you are not alone. There seems to be no consensus on whether you should order one, when you should order one and what you should do with it. When occult bacteremia (defined as bacteremia occurring in a well appearing child with no obvious focus of infection and no clinical evidence of sepsis) was found to be an harbinger of serious bacterial infection, investigators began searching for markers to identify those children at risk. There is no clear consensus as to which marker performs the best for finding occult bacteremia. To add to the confusion, new vaccines continue to be developed leading to changes in incidence of disease and therefore to recommended practice. In 2000, A multi valent pneumococcal vaccine was developed and the vaccine has been shown to dramatically reduce pneumococcal infections. Mark Joffe wrote an eloquent summary of the history and current concepts of bacteremia in children (Occult Pneumococcal Bacteremia A Review. Pediatric Emergency Care 2010;26). Several studies have found the rate of occult bacteremia in the post pneumococcal vaccine era to be less than 0.5% for the immunized child and some authors state blood work is not indicated for the vaccinated patient.

How you approach this issue depends on many things, including your resources, how closely the pediatrician can follow the child, and your interpretation of the data. There are several ways to approach the issue of obtaining CBCs in the child with no obvious focus of infection and a fever greater than 39.5°C (some authors consider 40°C the cutoff). It is perfectly reasonable to send the child home without a CBC or antibiotics but with early re-evaluation in 24 hours or sooner if symptoms worsen. Because of the very low risk of occult bacteremia, this option should certainly be used if the child has had the HIB and pneumococcal vaccines. If you have decided to treat the child with antibiotics, you don't need a CBC. If you opt to give antibiotics for elevated counts, give them in the emergency department, send a blood culture, and arrange for early follow-up.

There is one certain axiom regarding the CBC: Do not order it if you are not going to use it.

Lumbar Puncture

No one wants to miss a pediatric meningitis, but it is both impractical and unnecessary to do a

lumbar puncture on every child with a high fever. A lumbar puncture is indicated in a febrile child with meningismus, any child who is listless, flaccid, and appears to be toxic, infants under 28 days as part of sepsis workup, and should be considered on any child who has a source of infection and appears toxic.

If you suspect meningitis, do a lumbar puncture. If you strongly suspect meningitis, start the appropriate antibiotic immediately while you set up to do the LP. If you think the child needs the LP, do it yourself. Don't wait for the child's pediatrician or a hospitalist to arrive. If you have a situation where you are unable to tap the child, start antibiotics while you wait for someone else to make an attempt.

The febrile child who you suspect has meningitis and who has focal neurologic findings, warrants a head CT. These children should be given antibiotics before the CT and lumbar puncture are done.

Treatment

When you have a child with a serious bacterial infection, begin appropriate antibiotics as soon as possible. If you are sending a child home, consider giving the first dose of antibiotics in the emergency department, especially if there is any question as to timeliness of prescription filling, compliance, language, educational, financial or cultural factors.

Documentation is your best defense. Document a complete history to include past history, an appropriate review of systems, activity level and oral intake. Include a thorough examination including negative findings when appropriate (for instance, no meningismus, no stridor, no rash). Carefully document the child's general appearance, activity, and interactions. Document any lab work and how you interpret it. Document any conversation with the pediatrician regarding treatment and follow-up. Note how the child was when you discharged him/her home.

Discharge Instructions

Appropriate discharge instructions are crucial to the delivery of quality emergency care to infants and children with febrile illnesses. Give good instructions for the use of antipyretics. Upon discharge, parents/guardians should be given instructions regarding continuing care. These instructions should include use of antibiotics (when prescribed), antipyretic use, appropriate fluid intake, follow-up care and under what circumstances they should see their own physician or return to the emergency department. Since we may see a child early in his/her illness when a serious infection is not apparent, infants and children should be followed closely by their own physician until the course of their illness becomes clear. Be certain that the child's parents/guardians are clear where, when and with whom this is to occur.

Special Population: Children Younger Than 3 Months

Children under 3 months are a unique group. In the past, all of these children with fever had a complete sepsis work-up and were admitted to hospital. This has begun to change. Since there is no good data supporting outpatient treatment of low risk newborns (up to 28 days), as a general rule, a newborn with a fever (38° C) should be admitted to hospital with a sepsis work-up. Non-toxic appearing children 28-90 days who meet “low risk” criteria may be followed as outpatients after an appropriate evaluation (see Baraff, LJ, Management of fever without source in infants and children, Annals of Emergency Medicine, December 2000;36:602-614). Management of this group of children generally requires discussion and agreement between the emergency physician and the child’s pediatrician. The appropriateness of out patient treatment is often dictated by individual circumstances and frequently these children are treated in hospital.

Testicular Torsion

Introduction

Testicular torsion is a true surgical emergency that is time sensitive, requiring rapid diagnosis and treatment. Torsion has a bimodal age distribution, typically presenting in the neonatal and adolescent age, but it can occur at any age. Delayed diagnosis and treatment leads to eventual hemorrhagic necrosis of the testis. If de-torsion occurs within 6 hours of onset of symptoms, the salvage rate is 90-100%. The salvage rate drops to 20-50% after 12 hours. Orchidectomy (note this is a correct term but “orchietomy” seems to be more generally used), which results in decreased sperm count and reduced fertility, is indicated for a necrotic testis.

Presentation

The classic presentation of testicular torsion is acute onset of scrotal pain that is sharp and constant. On exam, a single testis is usually in a vertical position with significant tenderness and swelling. The pain can be very intense and be associated with emesis and radiating abdominal pain. The major pitfall in torsion is the atypical presentation. Testicular pain and tenderness may be absent in up to 30% of cases. Scrotal swelling or erythema of the scrotum with abdominal pain may be the only findings. The pain may be intermittent and dull, especially with intermittent torsion. Children may report only abdominal or inguinal pain with associated emesis. In a screaming male infant, the testis may not be examined, making a correct diagnosis very unlikely.

Exam

Physical exam is vital to perform and document in these cases. Testicular exam should include an evaluation of the axis and lie of the test. Axis describes horizontal or vertical position of the longest axis of the testis. Lie describes the position of the testis itself within the scrotum: high or low. Always compare the affected to the unaffected side. Cremasteric reflex should be assessed. Tenderness, elevation and transverse lie with absent cremasteric reflex are the classic exam findings. Lack of these findings does not rule out torsion.

Testing

Urinalysis should be obtained, but the presence of nitrites and leucocyte esterase does not rule out a torsion. Color duplex scrotal ultrasound has been reported to be 86% sensitive and 100% specific in detecting torsion. These rates are operator dependent and may be lower for any given study. Additionally, intermittent torsion can have peripheral blood flow through the testis and can be interpreted as normal.

Summary Points

Pediatric Fever

History: The child can't tell you what's wrong; a thorough history from the parent or guardian is crucial.

- Activity level?
- Fever – how high and how long?
- Feeding?
- Oral intake? Wet diapers?
- Antipyretics given?
- Antibiotics given?
- HIV/AIDS, malignancy, sickle cell disease all lower the threshold for aggressive evaluation and treatment.
- Good review of systems.

Evaluation:

- Be suspicious.
- Be thorough.
- Believe only rectal temperatures.
- Take your time. Observe the child carefully.
- Do a thorough examination.
- Meningeal signs in young children are not reliable.
- Look carefully for the source of fever.
- Know when studies are indicated.
- If you order a white count, use it.
- Remember that urinary infections and pneumonia can be occult.
- Get a urinalysis or chest x-ray when appropriate.
- Do a lumbar puncture on any child who appears toxic.
- Do lumbar puncture on any child with a source of infection who appears toxic.
- Don't wait for someone else to do the lumbar puncture.

Treatment:

- Begin parenteral antibiotics immediately if meningitis or other serious bacterial infection is discovered.
- Begin antibiotics before LP if meningitis is strongly suspected.

- Start antibiotics if there will be any delay in lumbar puncture, i.e., waiting for CT.
- If sending home: discharge diagnosis must be supported by findings.
- Give thorough discharge instructions.

Documentation:

- Be sure to document a complete history, ROS, activity level, oral intake, and exam.
- Always describe the general appearance of the child.
- Chart lab work.
- Document conversations with the child's pediatrician.

Testicular Torsion

- Keep testicular torsion on the differential for any child who presents with abdominal pain, especially associated with emesis and any scrotal findings including swelling or erythema.
- Exam the testis in any crying male neonate.
- Consider referral to urology even when the ultrasound shows preserved blood flow, especially if the pain is reported as intermittent and dull.
- Any very suspicious case of torsion that presents with a high riding, horizontal testis that is very tender requires prompt surgical exploration with the goal of under 6 hrs from time of the onset of symptoms.

Module 5: Pediatrics References

1. Karcz, A, et al, Massachusetts Emergency Medicine Closed Malpractice Claims: 1988-1990, *Ann Emerg Med* 1993; 22:553.
2. Karcz A, et al, Malpractice claims against emergency physicians in Massachusetts 1975-1993, *Am J Emerg Med* 1996;14(4):341-345.
3. Medical Professional Mutual Insurance Company ("ProMutual"); Closed Case Analysis, *Emergency Medicine* 2005-2009
4. Green MS, Rothrock SG; Evaluation styles for well-appearing febrile children: Are you a "risk-minimizer" or a test minimizer"?, *Ann Emerg Med* 1999;33:2; 211-213.
5. Baraff LJ; Management of fever without source in infants and children, *Ann Emerg Med* December 2000;36:602-614
6. Kuppermann N; Occult bacteremia in young febrile children, *Pediatric Clinics of North America*. 1999;46: 1073-1109.
7. Kramer MS, Shapiro ED; Management of the young febrile child: a commentary on recent practice guidelines. *Pediatrics*. 1997;100:128-134.
8. Baraff LJ, Bass JW, Fleisher GR, et al.; Commentary on practice guidelines, *Pediatrics*. 1997;100:134-136.
9. Baraff LJ, Bass JW, Fleischer GR, et al; Practice guideline for the management of infants and children 0 to 36 months of age with fever without source. *Pediatrics* 1993;92:1-12.
10. Kuppermann N, Fleisher GR, Jaffe DM: Predictors of occult pneumococcal bacteremia in young febrile children. *Ann Emerg Med* 1998;31:679-687.
11. Lee GM, Fleisher GR, Harper MB, Management of febrile children in the age of the conjugate pneumococcal vaccine: a cost- effectiveness analysis, *Pediatrics*;108:4 October 2001, 835-844
12. Alpern ER, Alessandrini EA, Bell LM, Shaw KN, and McGowan KL, Occult bacteremia from a pediatric emergency department: current prevalence, time to detection, and outcome, *Pediatrics* 106:3 September 2000, 505-511
13. Still ML et al, Incidence of occult bacteremia among highly febrile young children in the era of pneumococcal conjugate vaccine, *Arch Ped Adol Med* 2004;158:671
14. Zukin DD, Hoffman JR, Cleveland RH, Correlation of pulmonary signs and symptoms with chest radiographs in the pediatric age group, *Ann Emerg Med*, 1986;15:792-796.
15. Kupperman N, Fleischer GR, Jaffe DM; Predictors of occult pneumococcal bacteremia in young febrile children. *Ann Emerg Med* 1998;31:679-686
16. American Academy of Pediatrics. Practice parameter: the diagnosis, treatment and evaluation of the initial urinary tract infection in febrile infants and young children. Committee on Quality

- Improvement, Subcommittee on Urinary Tract Infections, Pediatrics. 1999; 103:843-852.
17. ACEP Clinical Policies Committee and the Clinical Policies Subcommittee on Pediatric Fever. Clinical policy for children younger than three years presenting to the emergency department with fever. *Ann Emerg Med* 2003;42:530-545.
 18. Baraff LJ, Editorial: Clinical Policy for Children Younger Than Three Years Presenting to the Emergency Department with Fever, *Ann Emerg Med*, 2003;42:546-549.
 19. Wilkinson M, Bulloch B, Smith M. Prevalence of occult bacteremia in children aged 3 to 36 months presenting to the emergency department with fever in the postpneumococcal conjugate vaccine era. *Acad Emerg Med*. 2009; 16:220–225.
 20. Carstairs KL, Tanen DA, Johnson AS, Kailes SB,, Riffenburgh RH. Pneumococcal bacteremia in febrile infants presenting to the emergency department before and after the introduction of the heptavalent pneumococcal vaccine. *Ann Emerg Med*. 2007; 49:772–7.
 21. Herz AM, Greenhow TL, Alcantara J, et al. Changing epidemiology of outpatient bacteremia in 3- to 36-month-old children after the introduction of the heptavalent-conjugated pneumococcal vaccine. *Pediatr Infect Dis J*. 2006; 25:293–300.
 22. American College of Emergency Physicians Clinical Policies Committee; American College of Emergency Physicians Clinical Policies Subcommittee on Pediatric Fever. Clinical Policy for Children Younger Than Three Years Presenting to the Emergency Department With Fever. *Ann Emerg Med*. 2003;42:530-545
 23. Bachur R, Perry H, Harper MB. Occult pneumonias: empiric chest radiographs in febrile children with leukocytosis. *Ann Emerg Med*. 1999;33:166-173.
 24. Somani, Bhaskar et al. Testicular Torsion *BMJ* 2010;341:c3213