Pediatric Fever Update

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Goals

- Fever control
- Birth to 3 Months vs 3 months to 36 months
- Immunized vs not
- Viral vs bacterial etiologies
  - Diagnosis and management
- Judicious antibiotic use & watchful waiting
- Well-appearing vs ill-appearing
- Bacteremia
- FUOs
Objectives

- Etiology
- Evaluation
- Management
  - What do I tell parents?
  - When do I worry?
  - What do I do about it?
  - What evidence supports my work-up?
Fever definition

- 38°C (100.4°F)
- Rectal is still gold standard
- Caregiver report:
  - Of 244 infants with reported digital rectal fever, 92% had fever on presentation or during 48hr obs
  - Of 26 infants with reported tactile fever, none had fever during 48hr obs

Fever Control

- Efficacy of standard doses of ibuprofen alone, alternating, and combined with acetaminophen for the treatment of febrile children
- Combined or alternating 3 hours provided better antipyresis than ibuprofen alone at 4 hrs and 6 hrs

Clin Ther. 2010 Dec;32(14)2433-40
Fever Control

- Combined and alternating paracetamol and ibuprofen therapy for febrile children
- Alternating or combined antipyretic results is fewer children remaining or becoming febrile at 4 hrs
- Only 1 small study that compared alternating with combined therapy showed no significant difference

Cochrane Database Syst Rev. 2013 Oct 30;10
Fever control

- What to tell parents?
  - <6 months of age
    - Acetaminophen only
  - >6 months of age
    - Alternate drugs every 3 hours
Why alternate?

- Fever
- Happy Child
- Happy Parent
- Miserable Child
- Miserable Parent
- Fever Control
  - Q 3h vs q4-6h
Bundling newborns and temp

- May be able to increase to temp febrile
- Bundling=5 blankets + hat (12 infants)
  - Control 1 blanket (8 infants)
- 2 of 12 infants reached 38 C R in 2.5hrs
- >38.5 C (101 F) should never be attributed to bundling regardless of route

Birth to 3 months

- 0-28 days: Blood, Urine, CSF, +/- CXR, empiric antibiotics and admit
  - Ampicillin (covers listeria up to 6 weeks of age) + Cefotaxime or Gentamicin
- Ill-appearing 29-90 days: same work-up
  - Cefotaxime or ceftriaxone + vancomycin
  - No ampicillin after 6 weeks
HSV

- Skin, eye, mouth
  - Usually in 1st 2 weeks but may occur up to 6 weeks
  - High risk of progression to CNS or disseminated

- CNS
  - Localized or hematogenous spread
  - Usually by weeks 2-3 but may occur up to 6 weeks

- Acyclovir coverage
  - Routine use vs ill-appearing
  - Seizures; vesicles; elevated LFTs; CSF pleocytosis
Birth to 3 months

- Well appearing 29-60 days
  - Blood, Urine, +/- CSF, +/- CXR
  - Urine is most important
    - UA + cath Ucx (no dips and no bags)
    - Admit if UA is suggestive
  - WBC 5,000-15,000 with < 1,500 bands/microL suggests lower risk for SBI
  - LP if starting empiric antibiotics
    - Admit for IV vs IM ceftriaxone if CSF obtained
  - Admit for obs with no LP and no antibiotics
Birth to 3 months

- Discharge criteria
  - 0-28 days: well appearing + 48 hrs of neg cultures
  - >28 days: 24-48 hrs
    - Well appearing + 24 hrs of neg cultures and positive viral testing (except RSV & flu)
    - Well appearing + 36 hrs of neg cultures
  - Critical pathogens grow within 24 hrs in 95% of cultures
    - S. pneumoniae, Salmonella, other Enterobacteriaceae, N. meningitidis, groups A & B strep
Concomitant viral infections

- Partial sepsis w/u in well appearing febrile infants >28 days
- URI symptoms does not rule out a SBI
- 844 febrile infants <60 days (Pediatrics. 2009;124(1):30)
  - 123 were flu +
  - 3 had a SBI; all were UTI’s
- Infants <90 days with RSV or clinical bronchiolitis
  - UTI was most common SBI (in 3.3%)
  - None with meningitis
- Febrile 0-28 days with influenza or RSV still warrants a full sepsis w/u.

Teething and fever

- 8 month longitudinal study looked at 47 infants
- Maximal daily tympanic and axillary temp were 36.8 C & 36.7 C, respectively

  Pediatrics. 2011;128(3):471

- Another review, Temp >38.5 C unlikely from teething

  Arch Dis Child 2007;92(3):266
UTI

- Fever without a source
  - UA/Ucx
- Females 3-24 months
  - 7.3% in 0-24 months
- Uncircumcised males < 12 months
- Circumcised males < 6 months
  - Probability of UTI at 3-24 months when febrile without a source
    - 10-25% in uncircumcised
    - 2-4% in circumcised
  - Probability of UTI if circumcised & > 1 year is < 1%
UTI: Clinical Practice Guidelines 2011

- Ages 2-24 months
- 50,000 colonies per mL (used to be 100,000)
- Antimicrobial therapy (cephalexin) for 7-14 days
- US of bladder & kidneys
- No longer use prophylactic antibiotics to prevent a febrile UTI without VUR or with grades I-IV
- VCUG only if abnormal US or recurrent febrile UTIs

Pediatrics 2011 Sept;128(3):595-610
Antibiotic use for URIs

- Encourage judicious antibiotic use
- 1 in 5 pediatric ambulatory visits results in an antibiotic prescription
- Can be difficult to distinguish between viral vs bacterial URIs
  - AOM
  - Sinusitis
  - GAS pharyngitis

Pediatrics. 2013 Dec;132(6):1146-54
AOM

- Middle ear effusion plus signs of inflammation
  - Moderate to severe bulging
  - Otorrhea not due to otitis externa
  - Mild bulging plus pain or erythema

- Benefits
  - NNT as few as 4 to achieve improved symptoms

Pediatrics. 2013 Dec;132(6):1146-54
AOM

- No significant benefit to preventing mastoiditis
  - Usually present on initial encounter
  - NNT to prevent 1 mastoiditis is 5,000
- Consider watchful waiting
  - Patients > 2 years
  - Unilateral disease without severe symptoms
  - 50% recover on their own

Pediatrics. 2013 Dec;132(6):1146-54
GAS pharyngitis

- Confirm by rapid testing or culture
- Colonization rates 15-20% in asymptomatic children
- Only test if 2 of the following present and > 3 years old:
  - Fever
  - Tonsillar exudate, petechiae or swelling
  - Swollen/tender anterior cervical nodes
  - Absence of cough

Pediatrics. 2013 Dec;132(6):1146-54
GAS pharyngitis

- Benefits of treating:
  - Shorten duration by 1 day
  - Prevent rheumatic fever (3% incidence if untreated)
  - Prevent transmission
  - Limited evidence that tx prevents PTA
    - NNT > 4,000

Pediatrics. 2013 Dec;132(6):1146-54
Bronchitis vs Sinusitis

- Viral vs bacterial?
- Course of uncomplicated viral URI
  - 5-10 days total
  - Fever in the 1st 2 days
  - Respiratory symptoms peak days 3-6
  - Respiratory symptoms on day 10 should be less severe
- Ethmoid & Maxillary: present at birth; aerated by 4 months
- Sphenoid: develop around 2-5 years; aerated by 5-8 years
- Frontal: develop around 6-8 years, aerated by mid-adolescence
Acute bronchitis

- Viral illness
- Dx more than 2 million pediatric visits annually
- Antibiotics are prescribe 70% of the time

Pediatrics. 2013 Dec;132(6):1146-54
Bacterial Sinusitis: Clinical Practice Guidelines 2013

- Age 1-18 years
- Persistent URI symptoms more than 10 days without improvement
- Worsening course or new symptoms (fever, increased daytime cough, purulent nasal discharge after initial improvement)
- May wait 3 days
  - Fever & purulent nasal discharge should persist 3 additional days

Pediatrics. 2013 Dec;132(6):1146-54
Bacterial Sinusitis

- No imaging
  - Unless orbital or CNS involvement is suspected
  - CT with IV contrast
- Amoxicillin plus or minus clavulanate or wait 3 more days (should be improving)
- 14 days at 90mg/kg/day (should be resolved)
- Reassess 72 hours after start for improvement

Pediatric CAP

- Usually some abnormality on PE
  - Increased work of breathing without symmetric wheezing
    - Tachypnea, retractions, nasal flaring
  - Crackles
  - Asymmetry on auscultation
Pediatric CAP & WBC

- 28% of febrile (>38 C) children 3-36 months with WBC > 25,000/mm3 had pneumonia on CXR
  
  Arch Dis Child. 2010;95(3):209

- 20-30% of kids <5 years old with temp >39 C without clinical evidence who had WBC >20,000/mm3 had pneumonia on CXR

Pediatric CAP & CXRs

- Not necessary if high clinical suspicion and well enough to be managed outpatient
- Recommended if
  - Hypoxemia,
  - Respiratory distress
  - Failed initial therapy
- Recommended in the admitted patient

Clin Infect Dis. 2011;53(7):e25-e76
Pediatric CAP & CXRs

- When do I repeat the CXR?
  - Recurrence
  - Pneumothorax,
  - Effusion
  - FB aspiration

Clin Infect Dis. 2011;53(7):e25-e76
Pediatric CAP

- When to hospitalize?
  - Respiratory distress and/or O2 saturations <90%
  - Infants < 3-6 months
  - Suspected or documented CA-MRSA
  - Concern for careful observation
  - Compliance

Clin Infect Dis. 2011;53(7):e25-e76
Pediatric CAP

- Blood cultures
  - Not recommended in fully immunized child managed in the outpatient setting
  - Should be obtained in a child who fails to improve or worsens after initiation of antibiotics
  - Recommended for the admitted patient

Clin Infect Dis. 2011;53(7):e25-e76
Pediatric CAP

- Amoxicillin/Ampicillin is 1st line
  - Ceftriaxone or cefotaxime if not fully immunized
  - Vanco or clinda only if MRSA
- Consider covering atypical organisms (mycoplasma) in school-age and adolescent children with macrolides
- Clinical improvement in 48-72 hrs

Clin Infect Dis. 2011;53(7):e25-e76
Occult bacteremia

- Ill patient, febrile, with a focal infection
  - e.g. meningitis, septic arthritis, cellulitis)
  - Treat the focus!
- Ill appearing, febrile, no focus
  - Work-up
  - Treat empirically!
Occult bacteremia

- What about the febrile well appearing child?
Occult bacteremia

- Before routine immunization with Hib and either PCV 7 or PCV13
  - 5% occult bacteremia in the well appearing child
    - 80% were S. pneumoniae & 20% Hib
    - Small amount of N. meningitidis
- After routine immunization
  - <0.5% occult bacteremia
  - Close f/u is favorable and cost effective over laboratory testing in the 3-36 month age group

Occult bacteremia

Predictors
- Age 3-36 months
- Fever >39 C (102.2 F)
- WBC > 15,000/microL
- Neither response to antipyretics nor clinical appearance were predictive

Contaminants

- Contaminants are more common than pathogens
- Gram stain showing
  - Gram positive rods
  - Coagulase negative Gram positive cocci in clusters
    - S. epidermidis
  - Slow growth
    - Most pathogens grow in 24 hours
- Reassess with close follow-up
Worrisome gram stains

- Gram positive cocci in chains
  - S. pneumoniae
- Gram negative rods
  - E. coli
  - Salmonella
  - Klebsiella
  - Pseudomonas
- Gram negative diplococci
  - N. meningitidis
FWS vs FUO

- FWS (Fever Without a Source)
  - <5-7 days without adequate explanation after careful H&P
- FUO (Fever of Unknown Origin)
  - 5-7 days to 3 weeks
  - Careful H&P PLUS
  - Initial outpatient or hospital evaluation with labs/imaging
  - Broad differential
    - Infectious, rheumatologic, oncologic
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<th>Fever Pattern</th>
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<tbody>
<tr>
<td>• Intermittent with high spike</td>
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<tr>
<td>• Remittent</td>
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<tr>
<td>• Sustained</td>
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<td>• Relapsing</td>
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<td>• Recurrent</td>
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<th>Associated complaints</th>
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<tbody>
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<td>• Sinuses</td>
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<td>• GI</td>
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<td>• Limb and bone pain</td>
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<td>• Skin</td>
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<th>Exposures</th>
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<td>• Surgery</td>
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FUO Initial work-up

- CBC with Diff
- Blood culture
- Viral Panel
- ESR and CRP
- Urinalysis and culture
- CXR
- PPD
- Electrolytes plus LFTs
- HIV
Summary

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  - Diagnosis and management
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Questions?

- Thank you!