

Fever in Children



Julia Martino, M. D.

Pediatrics

Palo Alto Medical Clinic

Palo Alto, California

Introduction



- Fever is most common presenting complaint in pediatrics: 10-20% visits
- Majority of children presenting with fever < 3 years old
- Both minor and life-threatening infectious diseases common in this age group
 - respiratory infections
 - occult bacteremia
 - meningitis

Introduction (continued)



- Distinguishing viral illness from occult bacteremia can be difficult
- Children with occult bacteremia treated as outpatients without antibiotics can develop bacterial meningitis or other focal bacterial infections
- Management of young febrile children must minimize unfavorable outcomes

Fever



■ Definition:

- rectal temperature $\geq 38.0^{\circ}\text{C}$ (100.4°F)

■ Pathophysiology: 3 causes

- Raising of hypothalamic set point in CNS
 - Infection, collagen vascular disease, malignancies
 - lowered by antipyretic medication and removing heat
- Heat production exceeding heat loss
 - salicylate overdose, hyperthyroidism, environmental heat
- Defective heat loss
 - ectodermal dysplasia, heat stroke, poisoning with certain drugs

Fever: Treatment



- Antipyretics: lower the central set point
 - inhibit cyclo-oxygenase enzyme, prevent synthesis of prostaglandin
 - do not interfere with immune response to infection
- Doses:
 - Acetaminophen: 15 mg/kg every 4 hours
 - Ibuprofen: 10 mg/kg every 6-8 hours

Fever: Treatment: adjunctive measures



- adequate hydration
 - fever can cause excessive heat loss
 - better heat dissipation with adequate intravascular volume
 - careful not to overhydrate and cause hyponatremia
- comfortable surroundings: temperature 72° F (22° C)
- Not bundled in extra clothing or blankets
- sponging with tepid water
 - temperature around 80° F (27° C)
 - ice baths or alcohol should be avoided: lead to shivering which may increase body temperature and is uncomfortable

Differential diagnosis of acute fever



■ Upper Respiratory Tract Disease

- Viral respiratory tract disease
- Otitis media
- sinusitis

■ Lower Respiratory Tract Disease

- Bronchiolitis
- Pneumonia

■ Gastrointestinal Disorders

- Bacterial gastroenteritis
- Viral gastroenteritis

Differential diagnosis of acute fever (con't)



- Musculoskeletal Infections
 - Cellulitis
 - Septic arthritis
 - Osteomyelitis
- Urinary Tract Infections
- Bacteremia
- Meningitis

Physical exam



- General appearance: for experienced clinician, the most important aspect of exam
- Vital signs
 - temperature
 - $> 40^{\circ}\text{C}$ (104°F) marker for increased risk of bacteremia
 - respiratory rate
 - tachypnea out of proportion to fever suggests pneumonia
 - blood pressure
 - pulse rate
 - oxygen saturation if available

Physical exam (continued)



- State of hydration
- Peripheral perfusion
- Detailed mental status exam needed to diagnose CNS infection
- Head to toe exam
 - physical abnormalities
 - tenderness to palpation
- Toxic appearing: definition

Physical exam (continued)



- Toxic appearing
 - clinical picture consistent with sepsis
 - lethargic: decreased level of consciousness, poor eye contact, failure to recognize parents or interact with environment
 - poor perfusion
 - hypoventilation or hyperventilation
 - cyanosis

Fever without a source: definition



Acute febrile illness in which the etiology of the fever is not apparent after a careful history and physical exam

Serious bacterial infection: definition



Serious bacterial infections include meningitis, sepsis, bone and joint infections, urinary tract infections, pneumonia, and enteritis

Practical guidelines in management of infants/children 0-36 mo



- Expert panel of pediatricians, infectious disease specialists and emergency medicine physicians formed to develop guidelines to assist in managing infants and children with fever without a source
- Guidelines are evidence-based: comprehensive literature review and statistical analysis performed
- Guidelines published in Pediatrics in 1993 and used across the United States since then

Infant < 28 days old



- immune system immature at this age
- risk of acquiring infection during delivery
 - onset of symptoms can be delayed days to weeks
- risk of overwhelming sepsis
- clinical evaluation inadequate to determine which infants at risk for serious bacterial infection

Evaluation of infant < 28 days old with fever



- Physical exam
- Laboratory screen:
 - CBC and blood culture
 - catheterized urinalysis and urine culture
 - lumbar puncture for CSF analysis and culture
- Screening chest XRAY unnecessary if no signs of pneumonia
- If diarrhea, stool for WBC
 - culture if bloody or if >5 WBC/highpower field

Management of infant < 28 days old with fever



- Following evaluation, all febrile neonates should be hospitalized pending culture results
- Parenteral antibiotics should be given while awaiting culture results
- In low risk infants, hospitalization and observation without antibiotics may be considered while awaiting culture results
- Antibiotics may be discontinued if culture results negative at 48 to 72 hours

Low risk criteria for febrile infants



■ Clinical criteria

- Previously healthy
- Nontoxic clinical appearance
- no focal bacterial infection

■ Laboratory screen

- WBC of 5000 to 15,000/mm³
- bands less than 1500/mm³
- normal urinalysis
- CSF analysis negative
- if diarrhea present, stool < 5 WBC/highpower field

Evaluation of infants 28 - 90 days old with fever



- Physical exam
- Laboratory screen:
 - CBC and blood culture
 - catheterized urinalysis and urine culture
 - lumbar puncture for CSF analysis and culture
 - Screening chest XRAY unnecessary if no signs of pneumonia
- If diarrhea, stool for WBC
 - culture if bloody or if . 5 WBC/highpower field

Management of infants 28 - 90 days old with fever

- Hospitalize and protect with parenteral antibiotics while awaiting 48 to 72 hour culture results
- In this age group can consider outpatient management in low risk infants
 - Clinical criteria
 - previously healthy
 - nontoxic clinical appearance
 - no focal bacterial infection (except otitis media)
 - Laboratory screen
 - WBC of 5000 to 15,000/mm³
 - bands less than 1500/mm³
 - normal urinalysis
 - CSF analysis negative
 - if diarrhea present, stool < 5 WBC/highpower field

Management of infants 28-90 days old with fever (continued)



- Parents must be reliable
- Must have good access to medical care
 - less than 30 minute travel time to emergency department
 - telephone available
- Cover with parenteral Ceftriaxone 50 mg/kg daily
- Recheck in 18 - 24 hours
 - at recheck give repeat dose Ceftriaxone until culture negative at 48 to 72 hours
- If cultures become positive, infant must be hospitalized

Management of infants 28-90 days old with fever (continued)



- If infant low risk, especially if close to 90 days old, can consider not performing lumbar puncture
- Can observe (inpatient or outpatient) and await blood and urine culture results without starting antibiotics
- If start antibiotics must perform lumbar puncture to avoid partially treating meningitis

Child 3- 36 months old with fever



- Incidence of fever without a source
 - most visits for fever less than 39°C (102.2°F)
- Risk of bacteremia
 - risk greatest if fever greater than 39°C (4.3%)
 - bacteria isolated most often:
 - *S pneumoniae* (85%)
 - *H influenzae* type b (10%)
 - *Neisseria meningitidis* (3%)

Child 3- 36 months old with fever (continued)



- Outcome of bacteremia if sent home without antibiotics:
 - risk of persistent fever: 56%
 - risk of persistent bacteremia: 21%
 - risk of meningitis: 9%

Child 3- 36 months old (continued)



■ Blood culture:

- should be considered if fever $>39^{\circ}\text{C}$ without a source
- WBC result can help determine if blood culture necessary
- not necessary if presumptive diagnosis of a viral syndrome supported by benign clinical appearance

Child 3- 36 months old (continued)



■ Lumbar puncture

- indicated in any child suspected of sepsis or meningitis based on history, observation or physical exam
- no other test can exclude meningitis
- approximately 1% of children with a normal CSF WBC, chemistries and gram stain will have a positive CSF culture

Child 3- 36 months old (continued)



- Urinalysis and urine culture
 - Urinary tract infection occurs in
 - 7% male infants \leq 1 year old with fever without source
 - 8% female infants \leq 1 year old with fever without source
 - 20% young children with UTI have normal urinalysis
 - only a urine culture can establish or exclude diagnosis of UTI
 - catheter or suprapubic aspiration to obtain specimen

Child 3- 36 months old (continued)



■ Chest Radiographs

- usually negative in children if no signs of lower respiratory tract infection
 - tachypnea
 - cough
 - rales
 - rhonchi

Child 3- 36 months old (continued)



■ Stool cultures

- valuable only if have diarrhea
- common causes of bacterial diarrhea:
 - Salmonella
 - Campylobacter
 - Shigella
 - Yersinia
 - enteroinvasive or toxigenic strains of E coli
- if signs of invasive bacterial diarrhea (bloody or mucoid diarrhea or 5+ WBC/hpf): empiric antibiotic therapy

Child 3- 36 months old with fever without source: empiric antibiotic therapy

- Options:
 - all children with temperature $\geq 39^{\circ}\text{C}$: blood culture and antibiotics
 - temperature $\geq 39^{\circ}\text{C}$ and WBC count $\geq 15,000$: blood culture and antibiotics
- Parenteral antibiotics reduce risk of subsequent bacterial meningitis significantly more than oral antibiotics: 0.3% vs 8.2%
 - Ceftriaxone 50 mg/kg
- Risk of partially treating meningitis if start empiric antibiotics without lumbar puncture

Child 3- 36 months old with fever without source: empiric antibiotic therapy



- If blood or urine culture positive, must recall child for re-evaluation
 - if blood culture positive for *S pneumoniae* and afebrile and well-appearing: can repeat Ceftriaxone and treat as outpatient with 10 d oral penicillin
 - if blood culture positive for *H influenzae* or *N meningitidis*, repeat blood culture, perform lumbar puncture and admit for parenteral antibiotics
 - if only urine culture positive, consider outpatient antibiotics if afebrile and well-appearing

Conclusion



- Appropriately managing fever without a source in infants and children essential to minimizing risks of serious bacterial infection
- Guidelines presented do not eliminate all risk
- Physicians may individualize therapy based on clinical circumstances

References:



Berlin CM. Fever in children: A practical approach to management. Contemporary Pediatrics 1-8.

Baraff LJ, Bass JW, Fleisher 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.

Nizet V, Vinci RJ, Lovejoy FH. Fever in children. Pediatrics in Review 1994; 15:127-135.