Fever in the Pediatric Office Practice

Jane Murahovschi
J Pediatr (Rio J) 2003; 79 Suppl 1:S55-S64

Lester A. Deniega, M.D.
Abstract

Objective:
1. To determine how to select a child who requires in depth laboratory investigation, defining the most appropriate laboratory screening test
2. To detect the individual who requires immediate therapy, when fever is the main symptom
3. To provide suggestions on how to deal with fever, and with the anxiety it causes
All about fever

Fever - a warning sign

- 20-30% of pediatric appointments
- Accompanied by a strong feeling of anxiety
- Pediatrician’s duty to select those that require further investigation, detect the severe cases demanding immediate intervention and properly manage common episodes
All about fever

• Controlled rise in body temperature above normal values for an individual
• Varies within certain thresholds according to certain factors:
  - Age
  - Circadian rhythm
  - Type of reading
All about fever

- **Body temp** - regulated by thermoregulatory center, balancing heat gain and heat loss

- **Pathogenic sequence**: infectious and noninfectious agents work as exogenous pyrogens which causes phagocytes to produce protein-rich substances (endogenous pyrogens) which in turn stimulate production of prostaglandins that act on thermoregulatory center
All about fever- Friend or Foe?

- Fever is a foe but not as much we believe it to be because,
  - fever increases oxygen uptake and impairs cardiac output
  - Fever may cause seizures esp in genetically susceptible children
  - High fever >41.5°C may cause brain injury (uncommon)
All about fever

• Fever is a friend but not as much as we believe it to be, because:
  - Experimental evidence that high temp are associated with decrease of microbial and viral reproduction and increase in immunologic activity
  - Antipyretics may mask severity of disease
Why Fever Occurs

Endogenous pyrogens:
- IL-1; IL-6; TNF-α & IFN-β and γ

Thermosensitive neurons (Anterior hypothalamus)

FEVER

Thermoregulatory responses
- Increased or decreased sweating
- ECF volume regulation
- Behavioral changes

Redirection of blood to and from cutaneous vascular beds

Endotoxins

Exogenous pyrogens:
- PML
- Monocytes
- Macrophages
- Microbes, microbial toxins
- Other microbe products

ECF volume regulation
Sources of Fever

Physiologic Fever States:
- digestion
- exercise
- ovulation
- pregnancy
- warm environment
- emotion

Pathologic causes:
- Infection
- Inflammation e.g. connective tissue disease
- Neoplasms
- Vaccines
- Dehydration
All about fever

• Fever for over 72 hrs. is probably nonviral
• Fever with shivering is usually of bacterial etiology
• Consider UTI in infants with fever and moderate infectious state without constitutional signs
• CSF is mandatory in febrile children in case of: seizure in infants < 6 mos. old, seizure that occurs 24 hrs. after fever resolutions; fever and meningeal signs and/or mental status disorders; fever in newborns
How to Detect the Infectious State

- Fever is the most characteristic data, but it is not universal
- Loss of appetite (occurs in all cases)
- Changes in behavior: listlessness, irritability (important though subjective)
- Grunting: occurs in more severe cases and is life-threatening
Quantify the severity of the Infectious state

- Mild – fever up to $38.5^\circ$C, good general impression e.g. Viral pharyngitis, viral laryngitis, acute diarrhea. Maintain closely monitored without antibiotics.
- Moderate – temp between $38.5$ to $39.4^\circ$C and listlessness. E.G purulent tonsillitis, otitis, viral meningitis, lobar pneumonia, pyelonephritis. Consider antibiotics.
Quantify the severity of the Infectious state

- Severe – temp reaches 39.5°C or hypothermia (<36°C); grunting, death risk impression. Occurs in pneumonia, bronchopneumonia, purulent meningitis, epiglottitis, pyelonephritis. Hospitalize, investigate and initiate antibiotic therapy
How to Measure the Temperature
Initial Anamnesis regarding the complaint of Fever at Drs. office

1. Age – determine the age group
2. Intensity of the fever – reaches $39.5^\circ C$ and whether hypothermia occurred (below $36^\circ C$)
3. Association of fever with shivering – distinguish between simple chills or muscle jerks
Initial Anamnensis regarding the complaint of Fever at Drs. office

4. Appetite- clear reduction
5. Changes in behavior – marked irritability, excessive drowsiness, apathy, inconsolable crying, whining, hallucinations, grunting
Initial Anamnesis regarding the complaint of Fever at Drs. office

6. Other constitutional symptoms: coryza, nasal discharge, sneezing, cough (airways) wheezing and breathing difficulty (bronchi), vomiting and diarrhea (GI), headache (mild, nonspecific or pronounced (CNS))
Initial Anamnesis regarding the complaint of Fever at Drs. office

7. Length of the fever episode: try to find out the precise moment of fever onset. Beware of expressions like: ”he has been feverish all the time” or “he has had fever for over one month,”
When Immediate Investigation is Indicated

1. Age of risk:
   - newborn - obligatory investigation
   - first 2 mos - recommended investigation
   - third month of life - closely monitored (if general impression is satisfactory).
   - After 3 mos - OPD observation with easily available and programmed access
When Immediate Investigation is Indicated

2. Fever higher than 39.4°C – esp. if accompanied by shivering: suggest bacterial infection/bacteremia. In unwell children also if temp below 36°C
When Immediate Investigation is Indicated

3. Pronounced infectious/toxemic state: poor general impression, listlessness, lack of appetite, irritability alternated with drowsiness, lethargy, apathy, suffering appearance, inconsolable crying or whining, grunting (warning sign) and child’s enthusiasm
When Immediate Investigation is Indicated

4. Length of fever greater than three days (over 72 hours) counted as accurately as possible from the presumed onset of fever

- Viral infections cause fever up to 3 days duration
- After 3 days consider UTI esp <2 y with no other sx
When Immediate Investigation is Indicated

- Infants with high fever with pronounced irritability, consider roseola
- Congested tympani in a febrile child does not characterise AOM
How to investigate a child with fever as only complaint

• Retrospective analysis of Infants <3 mos at ER services of Children’s Hospital (Boston)

• Best data to detect bacterial disease:
  - Age < 14 days
  - Rectal temp >39°C
  - Leukocytosis >20,000 and leukopenia <4,100
  - Positive urine test (≥5 WBC/hpf)
# Assessment of Risk of Febrile Infants

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Boston(^a)</th>
<th>Rochester(^b)</th>
<th>Philadelphia(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>28-89 days</td>
<td>&lt;60 days</td>
<td>29-60 days</td>
</tr>
<tr>
<td>Fever</td>
<td>&gt;38(^0)C</td>
<td>&gt;38(^0)C</td>
<td>&gt; 38.2(^0)C</td>
</tr>
<tr>
<td>Appearance</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
</tbody>
</table>


\(^b\) Baskin MN, O’Rourke Ej, Fleischer GR: Outpatients treatment of febrile infants 8 to 89 days of age with intramuscular administration of ceftriaxone, J Pediatr 1992

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<tr>
<td>• Leukocytes</td>
<td>&lt;20,000</td>
<td>&gt;5,000 and &lt;15,000</td>
<td>&lt;15,000</td>
</tr>
<tr>
<td>• Bands (rods)</td>
<td>&lt;1,500</td>
<td>&lt;1,500</td>
<td>&lt;0.2</td>
</tr>
<tr>
<td>• Bands/Segs</td>
<td>&lt;10/field</td>
<td>&lt;10/field</td>
<td>&lt;10/field</td>
</tr>
<tr>
<td>• Leukocytes (urine)</td>
<td></td>
<td>&lt;5 leukocytes per field</td>
<td>No blood &amp; WBCs</td>
</tr>
<tr>
<td>• Bacterioscopy (urine)</td>
<td>w/o infiltrates &lt;10 WBCs/mm(^3)</td>
<td>&lt;5 leukocytes per field</td>
<td>w/o infiltrates &lt;8 WBCs/mm(^3) ( - )bacterioscopy</td>
</tr>
<tr>
<td>• Stool/smear</td>
<td></td>
<td></td>
<td>negative</td>
</tr>
<tr>
<td>• Thoracic x-ray</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Liquor</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Hospital + antibiotic</td>
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</tr>
<tr>
<td></td>
<td>Empiric antibiotic</td>
<td></td>
<td>Home/return</td>
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</tr>
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<td></td>
<td>Home/return</td>
<td></td>
<td>Home/return</td>
</tr>
<tr>
<td>HIGH RISK</td>
<td>Hospital + antibiotic</td>
<td>Hospital + antibiotic</td>
<td>Hospital + antibiotic</td>
</tr>
<tr>
<td>LOW RISK</td>
<td>Empiric antibiotic</td>
<td></td>
<td>Home/return</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>94%</td>
<td>92%</td>
<td>98%</td>
</tr>
<tr>
<td>Specificity</td>
<td>94%</td>
<td>50%</td>
<td>42%</td>
</tr>
<tr>
<td>Positive Predictive value</td>
<td>12%</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>Negative</td>
<td>9%</td>
<td>98.9%</td>
<td>99.7%</td>
</tr>
</tbody>
</table>
Caution – Before infant is placed in the Low-Risk Group

- Consider Home Environment
  - reliable caregiver
  - Availability of transport
  - Means of communication
Basic Tests
1. Hemogram: Check for leukocytosis >15,000 and/or leukopenia <5,000; neutrophilia (>10,000 neutrophils), with a left shift (bands >1,500), morphological neutrophil alterations (toxic granulations and vacuoles)
2. ESR: >30 mm
3. Quantitative CRP: concentrations < 5 mg/dl rule out severe bacterial infection
Basic Tests

4. Urine test: Leukocyte count and bacterioscopy
5. CSF analysis
6. Blood culture
Practical counseling to Parents

Decalogue of the Febrile Child

1. If necessary, explain that it is probably a viral disease, usually benign, whose fever is limited to 3 days
2. Dress the child with light clothing, keep environment ventilated
3. Offer the child fluids regularly
4. Warn that loss of appetite is inevitable and that the child should eat what he/she tolerates better
Practical counseling to Parents

5. Explain - moderate fever stimulates the defense mechanisms against infection thus it is not necessary to normalize the temperature completely

6. Explain - aim of antipyretics is to relieve discomfort caused by the fever and should be used only during pronounced listlessness, with no preset time, but respecting the minimum interval of each medication
## Antipyretics

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage (m/k/time)</th>
<th>Gap</th>
<th>Forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA</td>
<td>10-15</td>
<td>4-6 hrs</td>
<td>Tablets</td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>15-20</td>
<td>4-6 hrs</td>
<td>Drops, syrups, tablets, supp.</td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>10</td>
<td>6 – 8 hrs.</td>
<td>suspension</td>
</tr>
</tbody>
</table>

Note:
- AAS is not recommended for suspicious cases of dengue
- Suppository might be useful for children that vomit or reject medications
- Intravenous antipyretics not recommended for OPD cases
- Concomitant and sequential use of anti-inflammatory medications with acetaminophen can have increased effect and cause hypothermia
Practical counseling to Parents

7. Prescribe the most accessible antipyretic and consider preferences, availability, acceptance, tolerance and habitual efficiency of common antipyretics

8. Explain limited benefits of warm baths and warm compresses that may be used after antipyretic administration. Warn against the use of cold water and alcohol. Don’t immerse child in a bathtub
Practical counseling to Parents

9. Inform (orally and in writing) about the warning signs:

- fever greater than 39.4°C with shivering,
- pronounced listlessness or unwellness (drowsiness, irritability, inconsolable crying or whining, grunting) which do not resolve after the effect of antipyretics;
- development of different symptoms;
- fever for over three days in a row
THANK YOU!!!