Practical considerations of fever alleviation and febrile seizures

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NORMAL BODY TEMPERATURE

Person-to-person variations of normal
- mean normal temperature: 37°C (98.6°F)
- upper limit of normal in children: 37.9°C (100.2°F)

Normal body temperature varies with:
1) Age – higher in children due to higher metabolic rate and larger body surface
2) time of the day – peaks late afternoon
3) level of activity
4) phase of the menstrual cycle
5) etc.
TEMPERATURE MEASUREMENT

The most common sites:
1) rectum
2) mouth
3) axilla
4) tympanic membrane

Each of these sites has its own range of normal values!
TEMPERATURE MEASUREMENT

**Rectal thermometry**
- core body temperature
- the best site for young children who **cannot cooperate**
- **contraindicated in patients with neutropenia!**

**Oral thermometry**
- preferred in children **who cooperate**
- 0.6°C (1.0°F) **lower than rectal temperature** (because of mouth breathing, important in patients with tachypnea, recent ingestion of hot or cold liquids)
Axillary thermometry
- 0.6°C (1.0°F) lower than rectal temperature
- in neutropenic patients who are unable to use an oral thermometer

Infrared tympanic membrane (TM) thermometry
- amount of heat produced by the tympanic membrane
- close to core temperature
ELEVATED BODY TEMPERATURE

**Fever** - *increased body temperature* with *elevated hypothalamic set-point*

**Hyperthermia** - *increased body temperature* due to inadequate compensation by normal heat-loss mechanisms with *normal hypothalamic set-point*

*It is important to differentiate between these conditions because they have different clinical implications and management strategies!*
DEFINITION OF FEVER

Convention!

- In children 0 to 36 months
  rectal temperature ≥38.0°C (100.4°F)

- In older children (> 3y) and adults
  oral temperature ≥37.8°C (100.4°F) = rectal temperature > 38.3°C (101°F)
DEFINITIONS

- **Hyperpyrexia** - elevation of temperature to unusually high levels, 105.8°F (41°C) or higher

- **Fever Without a Focus** - fever with no clear cause determined by history and/or physical exam

- **Fever of Unknown Origin** (FUO) - prolonged fever lasting over 7 – 10 days without identified cause
WHAT ETIOLOGIES CAUSE FEVER?

1) Infectious
2) Inflammatory
3) Oncologic
4) Other: CNS dysfunction, drug fever
PHYSICAL EXAMINATION

- Measure and record temperature, HR, RR and CRT
- Look for the origin of the infection
- 2 y > check urine sediment
- CRT > 3 s - high-risk (*amber* sign)
- 3 mo > with 38°C < - high-risk
- 3–6 mo with 39°C < - intermediate-risk
- duration of fever does not predict the likelihood of serious illness
WHICH PATIENTS ARE HIGH-RISK FOR SEPSIS?

1) Neonates
2) Transplant recipients
   Bone marrow
   Solid organ
3) Oncology patients
   Undergoing therapy, mucositis, central line
4) Asplenic patients, including sickle cell
WHEN TO REFER?

- **Age**: < 3 mo or < 6 mo with 39°C
- **High risk patients** due to chronic illnesses (oncology patients, immunodeficiencies, somatomental retardation, diabetes, congenital adrenal hyperplasia)
- **If on physical examination**:
  - **Skin**: pale, cyanotic, petechiae
  - **Activity**: irritable, lethargic, weak cry, somnolent
  - **Breathing**: dyspnoe, tachypnoe, grunting
  - **Circulation**: CRT > 2s, weak pulse, significant tachycardia, signs of dehydration
  - **Other**: meningeal signs, swollen joints, focal neurologic signs
PATTERNS OF FEVER

- A&B - continuo: fever all day long with +/- 0.5°C variation - bacterial infections
- C - remitting: fever all day long with more than 0.5°C fluctuation - endocarditis
- D - intermittant: after some hours fever decreases then it comes back - malaria, sepsis
- E – undulant: fever fluctuates widely at regular intervals - brucellosis
- F - periodic: periodic fever syndromes - autoinflammatory diseases
HARMS & BENEFITS OF FEVER

Potential benefits:
- Inhibition of the growth & replication of microorganisms
- Aiding the body’s acute phase reaction
- Enhancing the immunologic function of WBCs

Potential harms:
- may be uncomfortable for patients
- increased metabolic rate, O2 consumption, CO2 production
- Increased demands on the cardiovascular and pulmonary system → in shock or in case of pulmonary or cardiac abnormality, it can be detrimental
- no evidence that fever ≥40°C (104°F) is associated with increased risk of adverse outcome (e.g. brain damage)

no evidence in humans
MANAGEMENT OF FEVER

Determine the cause

Monitor for signs/symptoms that require an intervention or suggest a more serious illness

- Altered mental status
- Changes in activity level
- Skin rash
- Signs of dehydration
- Specific pain (ear, abdomen, neck, etc.)
- Swollen joints
MANAGEMENT OF FEVER

Indications for treatment:

- discomfort
- shock, high-risk for sepsis – for decreasing CO2 production and metabolic rate
- other condition with increased metabolic rate (e.g., burn, postoperative state) – for decreasing CO2 production and metabolic rate
- underlying neurological or cardiopulmonary disease
- alteration in fluid and electrolyte balance – reducing insensible water loss
- hyperpyrexia?
MANAGEMENT OF FEVER

1) Antipyretic agents

2) External-mechanical cooling
ANTIPYRETIC AGENTS

Restore the thermoregulatory set-point to normal

→ ineffective in heat stroke and may exacerbate concomitant liver injury or coagulopathy

The most commonly used antipyretic agents in children

- **Acetaminophen** (paracetamol) 10-15 mg/kg 4x/day (max. 1g/dose)
- **Ibuprofen** 10 mg/kg 3-4x/day (max 600 mg/dose)

**Aspirin** should not be used - Reye syndrome
EXTERNAL COOLING

*Routinely DON’T suggest temperature reduction in previously well children*

→ *uncomfortable*

Possible indications:

a) hyperthermia

b) abnormal temperature control and poor response to antipyretic agents
FEBRILE SEIZURES

There is no evidence that reducing fever reduces the morbidity or mortality from a febrile illness or decreases the recurrence of febrile seizures.

Key facts:
- 4% of healthy children
- Typical age: 6 mo-5 y (peak 12-18 mo)
- Recurrence risk 35% over lifetime
- Vast majority: harmless
- 95-98% do not develop epilepsy
FEBRILE SEIZURES

- History: epilepsy in family?
- Examination: neurological as well!
- EEG: in case of complicated or recurrent seizures
- Imaging: not indicated after the first episode if the neurological exam is negative
FEBRILE SEIZURES

SIMPLE
Generalized, tonic-clonic
Less than 15 min
Do not recur in 24 h

HARMLESS

COMPLICATED (20%)
Focal
>15 min
may recur within 24 h
FEBRILE SEIZURES

- Safety
- Assistance
- Treatment only if > 10 min:
  - diazepam 5/10mg supp. (15kg < 10mg)
  - intranasal midazolam
- DD: meningitis, shaking chills
- Seizure prevention?
THANK YOU FOR YOUR ATTENTION!

I used to have Saturday night fever...
Now I just have SATURDAY NIGHT HOT FLASHES!