Practical considerations of fever alleviation and febrile seizures

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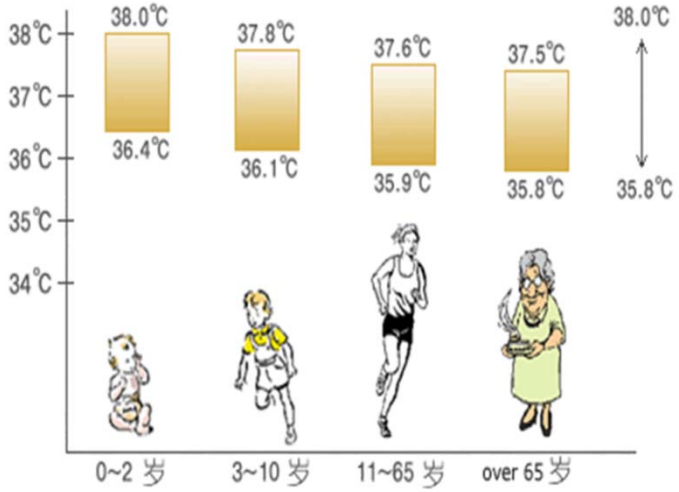
NORMAL BODY TEMPERATURE

Person-to-person variatons of normal

- mean normal temperature: 37ºC (98.6ºF)
- upper limit of normal in children: 37.9ºC (100.2ºF)



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!

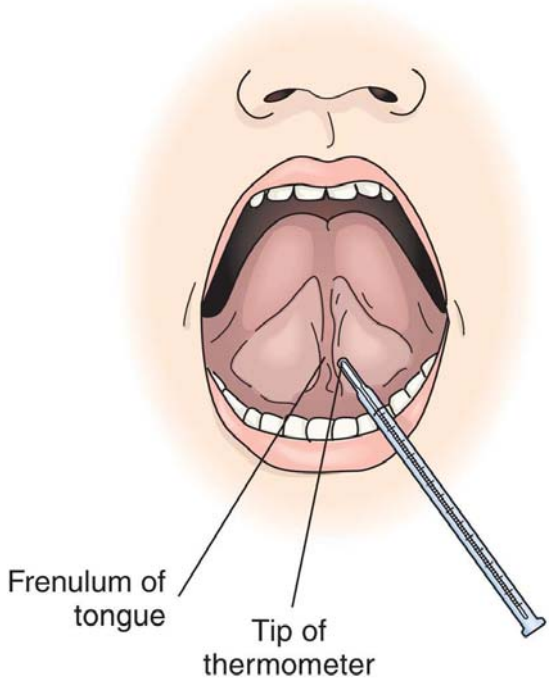
TEMPERATURE MEASUREMENT

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**
- **0.6ºC (1.0ºF) lower than rectal** temperature (because of mouth breathing, important in patients with tachypnea, recent ingestion of hot or cold liquids)



TEMPERATURE MEASUREMENT

Axillary thermometry

- 0.6ºC (1.0ºF) 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 ≥38.0ºC** (100.4ºF)

- **In older children (> 3y) and adults**

→ **oral temperature ≥37.8ºC** (100.4ºF) = rectal temperature > 38.3ºC (101ºF)

DEFINITIONS

- **Hyperpyrexia** - elevation of temperature to unusually high levels, 105.8ºF (41ºC) 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?

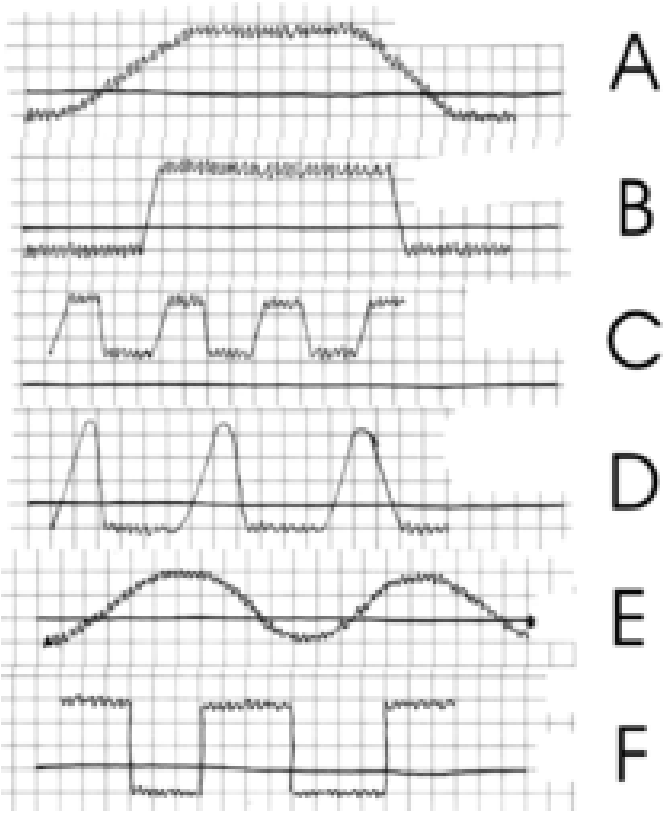
1) Neonates
2) Transplant recipients
   - Bone marrow
   - Solid organ
3) Oncology patients
   - Undergoing therapy, mucositis, central line
4) Asplenic patients, including sickle cell

WHEN TO REFER?

- **Age**: < 3 mo or < 6 mo with 39°C
- **High risk patients** due to chronic illnesses (oncology patients, immundeficiencies, 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 - **continua**: 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 - autoinflammatoric 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

} **no evidence in humans**

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 ≥40ºC (104ºF) is associated with increased risk of adverse outcome (e.g. brain damage)

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 CO_2 production and metabolic rate
- other condition with increased metabolic rate (eg, burn, postoperative state) – for decreasing CO_2 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!