



CrackCast Episode 12 – Fever

Episode overview:

- 1) Describe the physiologic mechanism of increasing the body's temperature
- 2) What is the change in HR and RR with every increase of 1°C core body temperature?
- 3) What is the emergency medicine specific approach to defining the infectious differential?
- 4) List 15 causes of non-infectious hyperthermia

Wisecracks:

- 1) Description of fever vs. hyperthermia
 - Approach to a patient with an elevated temperature
- 2) Points on fever in the elderly, chronically ill, or immunosuppressed
- 3) What is the most accurate way of measuring core body temperature?

Rosen's in Perspective:

- Fever is a common presenting complaint with a variety of causes ranging from benign to terrifying and life threatening!
- 70-80% of febrile patients over the age of 65 will be admitted to hospital, and have a 7-9% incidence of death within 1 month of admission

1) Describe the physiologic mechanism of increasing the body's temperature

Pathophysiology of fever:

- normal body temperature is tightly regulated between 36-37.8°C
- controlled by the pre-optic area of hypothalamus
- neurons directly sense temperature in the blood then cause a host of vasomotor changes (eg. shivering), metabolic and behavioural changes
- cytokines and pyrogens signal the hypothalamus to release prostaglandin, which resets the temperature set-point
- age, malnutrition and chronic disease can all blunt prostaglandin (PGE) release and response
- PGE2 is what antipyretics work on (eg. COX inhibitors: ASA/Acetaminophen)
- non-PGE mediated processes can cause fever as well: increased O2 consumption, metabolic demands, protein breakdown and gluconeogenesis

**NOTE: Important to delineate fever from hyperthermia. Fever rarely goes above 41°C.



2) What is the change in HR and RR with every increase of 1°C core body temperature?

As a general rule, for every 1°C core body temperature increase, the HR will increase ~10-20 BPM and the respiratory rate will also climb ~2-4 resps/min

Note: there could also be a relative bradycardia

3) What is the emergency medicine specific approach to defining the infectious differential?

There are critical must-not-miss diagnoses, emergent diagnoses, and non-emergent diagnoses.

Table 12-1 Differential Diagnoses—Infectious Causes

| ORGAN SYSTEM | CRITICAL DIAGNOSES | EMERGENT DIAGNOSES | NONEMERGENT DIAGNOSES |
|----------------------|--|---|---|
| Respiratory | Bacterial pneumonia with respiratory failure | Bacterial pneumonia, peritonsillar abscess, retropharyngeal abscess, epiglottitis | Otitis media, sinusitis, pharyngitis, bronchitis, influenza, tuberculosis |
| Cardiovascular | | Endocarditis, pericarditis | |
| Gastrointestinal | Peritonitis | Appendicitis, cholecystitis, diverticulitis, intra-abdominal abscess | Colitis or enteritis |
| Genitourinary | | Pyelonephritis, tubo-ovarian abscess, pelvic inflammatory disease | Cystitis, epididymitis, prostatitis |
| Neurologic | Meningitis, cavernous sinus, thrombosis | Encephalitis, brain abscess | |
| Skin and soft tissue | | Cellulitis, infected decubitus ulcer, soft tissue abscess | |
| Systemic | Sepsis or septic shock, meningococemia | | |

Table 12-1. Differential Diagnoses - Infectious Causes. Rosen's 8th Edition. Chapter 12 - page 120.

If they look sick start **early** broad-spectrum antibiotics to cover suspected source.



4) List 15 causes of non-infectious hyperthermia

Box 12-1 Differential Diagnosis—Noninfectious Causes of Fever

Critical Diagnoses

- Acute myocardial infarction
- Pulmonary embolism or infarction
- Intracranial hemorrhage
- Cerebrovascular accident
- Neuroleptic-malignant syndrome
- Thyroid storm
- Acute adrenal insufficiency
- Transfusion reaction
- Pulmonary edema

Emergent Diagnoses

- Congestive heart failure
- Dehydration
- Recent seizure
- Sickle cell disease
- Transplant rejection
- Pancreatitis
- Deep vein thrombosis

Nonemergent Diagnoses

- Drug fever
- Malignancy
- Gout
- Sarcoidosis
- Crohn's disease
- Postmyocardiotomy syndrome

Figure 12-1. Differential Diagnoses: non-infectious causes of fever. Rosen's 8th Edition. Chapter 12 - page 120.

Perhaps a more practical way to think about it is **DIMS**:

Drugs (NMS, sympathomimetic)

Infection/Inflammation

Structural (can impact hypothalamus)

Metabolic (hyperthyroid, acute adrenal insufficiency)

Wisecracks:

1) Description of fever vs. hyperthermia and the approach to a patient with an elevated temperature

- Fever is caused from an increase in the body's set-point (like a thermostat in the house) and this is rarely above 41°C (because body autoregulates around new elevated set-point)
- Hyperthermia is caused by an inability to dissipate enough heat, and the temperature can increase until there is multi-organ dysfunction and eventually death



17 male presents with ALOC, status epilepticus and a temp of 42 degrees!!!

- don't let your patient's brain melt in front of you!!!
- any temperature over 41⁰C should prompt you to aggressively treat for hyperthermia (fever rarely goes above 41⁰C)
- cool early using: ice baths, cold packs to head, neck, pits and groin, cold saline boluses, or commercial cooling devices
- get antipyretics on board early
- avoid overcooling and causing hypothermia
- remember to treat the underlying cause

2) Special consideration for fever in the elderly, chronically ill, or immunosuppressed

The patient's response to prostaglandin release can be blunted, and thus they may not mount the expected febrile response (some can actually be cold)

3) What's the most accurate way of measuring core body temperature?

- 1) gold standard is a temperature probe on a pulmonary artery catheter... not often feasible!
- 2) esophageal, bladder or rectal probes are next best
- 3) axillary and tympanic measurements are often unreliable (peripheral measurements vs. core) and oral temps are highly biased by smoking, consumed liquids and hyperventilation