Fever and Hyperthermia (revised)

Key Points:
• The maximum normal temperature in adults is 37.7°C (should be late afternoon)
• For temperatures > 104°F (40°C), think about heat stroke, malignant hyperthermia, and neuroleptic malignant syndrome.
• In emergency settings, begin external cooling measures for temperatures > 105°F (40.5°C).

Fever Basics
• In normal individuals, body temperature is lowest at 6am, highest between 4 and 6pm
• The maximum normal temperature (99th percentile) is 37.2°C in the am and 37.7°C in the pm
• During a fever, pyrogens act at the hypothalamus to shift the “set-point” upward
  ♦ The body responds with vasoconstriction and shivering to raise the core body temp.
  ♦ With treatment, the set-point goes down with resulting sweating and vasodilation

Hyperthermia

Definition
• Elevation of core body temperature from a failure of thermoregulation (not pyrogens)
• Often with temperatures > 104°F (40°C)

Differential Diagnosis
• The 3 most important causes are:
  ♦ Heat Stroke
  ♦ Neuroleptic malignant syndrome
  ♦ Malignant hyperthermia
• Other causes are infectious, endocrine, CNS, toxic . . .

Heat stroke
• It is temps > 40.5°C with CNS dysfunction from inability to dissipate environmental heat
• Can be exertional in young individuals during heavy exercise in high heat and humidity
• Non-exertional heat stroke is from impaired thermoregulation (drugs) or prolonged exposure
• Clinical presentation
  ♦ Cutaneous vasodilatation, tachypnea, noncardiogenic pulmonary edema, DIC, altered mental status, seizures, acute renal failure, leukocytosis, etc.
  ♦ Skin my be moist OR dry depending on cause

Neuroleptic malignant syndrome
• Idiosyncratic reaction to antipsychotic agents
  ♦ Most common: haldol, stelazine, thorazine, navane, etc.
• Hyperthermia, “lead pipe” rigidity, altered mental status, tremors
• Also see autonomic dysfunction: diaphoresis, labile blood pressure, etc.

Malignant hyperthermia
• Rare genetic disorder associated with anesthetic agents: succinylcholine, halothane
• Mutations in ryanodine Ca2+ channel --> massive calcium efflux from sarcoplastic reticulum
• Hyperthermia, muscle rigidity, sinus tachycardia and lots of other problems . . .
• Treat with dantrolene (a non-specific skeletal muscle relaxant)

External Cooling
• In emergency settings, should start with temperatures > 105°F (40.5°C)
• Take off clothes, cover the patient in water, circulate air with a fan, etc.