FEVER IN THE PEDS ED

Karen Gripp, MD, FAAP, FRCPC
September 29, 2022

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Learning Objectives

1. Define fever
2. Develop a strategy for focused and appropriate evaluation, accounting for risk factors and likelihood of etiology
3. Review various causes of fever by age and signs and symptoms

→ NEED paper and pen, access to Slido

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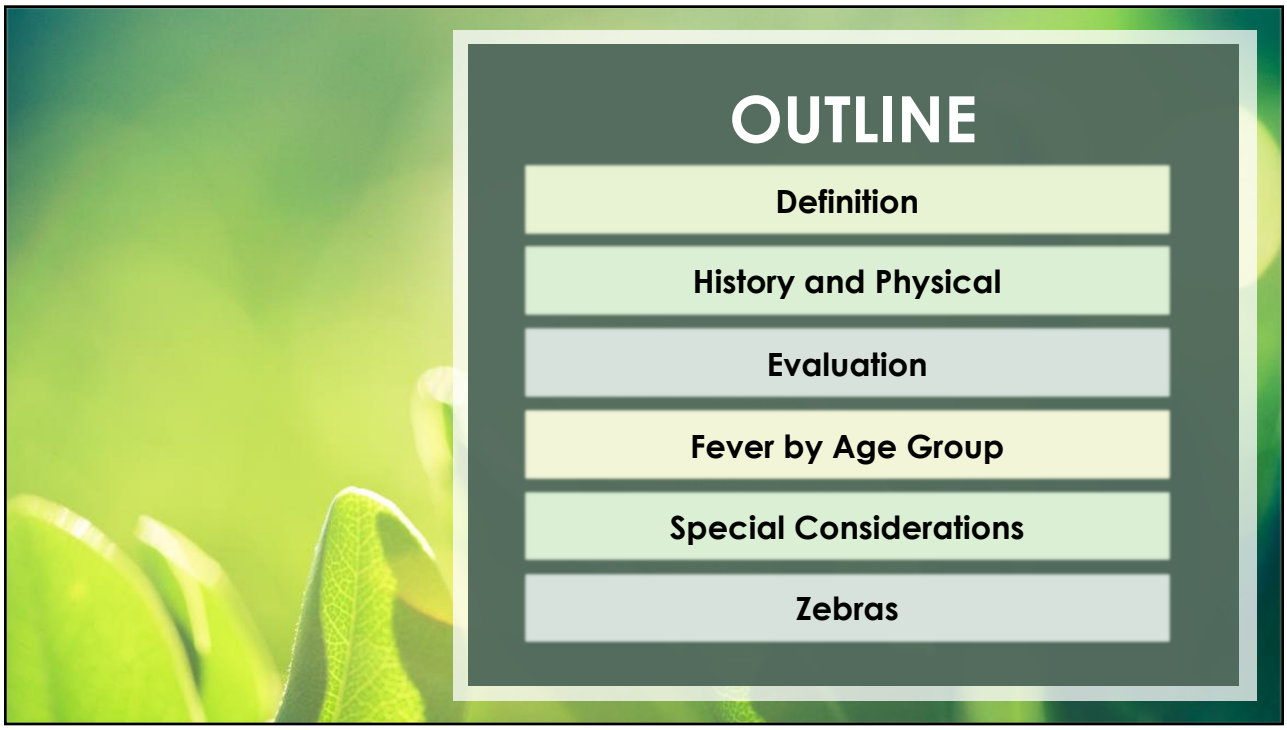

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What is a fever?

- **It depends!**

- AAP: ≥ 38.0 rectal, > 37.2 oral
- SickKids/About Kids Health: ≥ 38.0
- Merck Manual: > 38.2 rectal, > 37.8 oral
- Harrison's Principles of IM: > 37.2 oral in the AM and > 37.7 in the PM
- CDC: ≥ 38.0 or feels warm to touch or feels feverish

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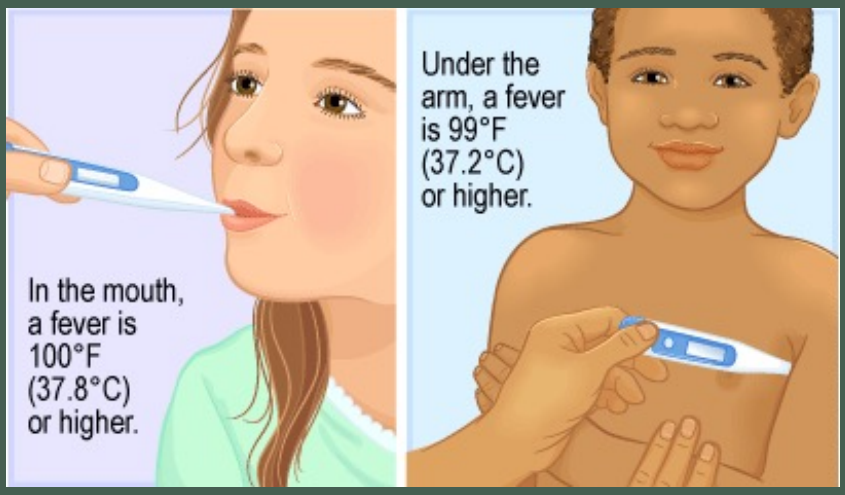

https://kidshealth.org/en/parents/fever.html

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How to best measure temperature?

- **It is confusing for parents!**

- SickKids/About Kids Health: Rectal if < 3 years, oral if ≥ 3 years
  Axillary and TM less reliable
  No forehead or pacifier thermometer

- AAP: Rectal if < 4 years, oral if ≥ 4 years
  Temporal artery and TM okay
  Axillary not accurate

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History

- Fever duration, height, pattern, prodrome
- Chronology
- Associated symptoms
- Events, injuries

- **ROS:** respiratory, GI, pain
- **PMHx:** co-morbidities, recent surgery, immunizations
- **FamHx:** rheumatologic
- **SocHx:** exposures, animals, travel, bites, pica

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Physical Exam

- **Vital signs**: relative bradycardia
- **Skin:** rash, petechiae, ECM, erythema nodosum, malar erythema, salmon pink rash, diaphoresis or lack thereof
- **HEEN:** conjunctivitis (palpebral, bulbar, limbic-sparing), hemorrhage, sinus tenderness/drainage
- **OP:** erythema, ulcers, dentition, gingival changes
- **Lymph Nodes:** local, diffuse, tender
- **Chest/❤:** crackles, wheeze, new murmur
- **Abd:** tenderness, HSM
- **MSK:** tender bones, joints, muscles
- **GU:** perianal abscess/tag, ulcers, discharge, tenderness

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Evaluation

- **CBC with differential**
  - WBC ↑ . . . neutrophils, lymphocytes, eosinophils
  - WBC ↓
  - WBC morphology . . . atypical, toxic granulation
  - Hemoglobin ↓
  - Platelets ↑
  - Platelets ↓
  - Pancytopenia
- ESR/CRP
- Electrolytes/transaminases (Na, AST/ALT)
- Blood culture
- UA/urine culture
- CXR
- TB skin test

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CRP vs. ESR

CRP	ESR
• Direct measurement of protein	• Indirect test of RBC behaviour
• No variations based on age, gender, temperature, other conditions	• Varies with age, pregnancy, anemia, plasma proteins, certain drugs
• More sensitive to clinical changes	• Slower response to changes
• Rapid rise and fall	• Slower rise and fall

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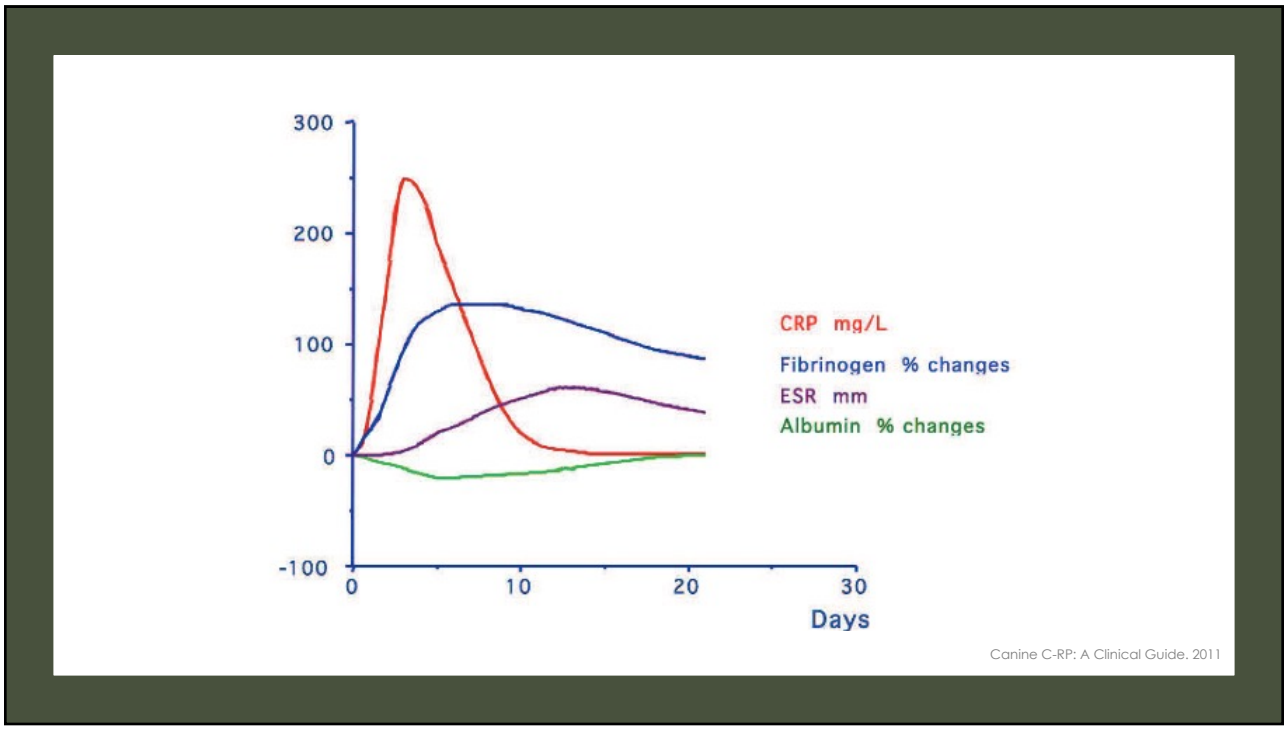

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CRP vs. ESR

CRP	ESR
• Direct measurement of protein	• Indirect test of RBC behaviour
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Procalcitonin: helpful in bacterial infection, sepsis

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- 5 days → easy
- 55 days → not so easy
- 555 days (18 mo) → could be anything
- 5 years → at least they can talk
- 15 years → think of adult-y things

Age Groups

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5 days old

Abigail has had fevers to at least 39 degrees daily x 2 days

- No other symptoms

What tests would you order on this patient?

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5 days old

Easy!

- CBC/Blood culture
- UA/Urine culture
- LP
- Anything else?
  - CXR, viral swabs, HSV

→ Empiric antibiotics and admit

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55 days old

Brayden has had fevers to at least 39 degrees daily x 2 days

- No other symptoms

→ Not so easy . . .

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CLINICAL PRACTICE GUIDELINE

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

Evaluation and Management of Well-Appearing Febrile Infants 8 to 60 Days Old

Robert H. Pantell, MD, FAAP,[a] Kenneth B. Roberts, MD, FAAP,[b] William G. Adams, MD, FAAP,[c] Benard P. Dreyer, MD, FAAP,[d] Nathan Kuppermann, MD, MPH, FAAP, FACEP,[e] Sean T. O'Leary, MD, MPH, FAAP,[f] Kymika Okechukwu, MPA,[g] Charles R. Woods Jr, MD, MS, FAAP[h] SUBCOMMITTEE ON FEBRILE INFANTS

PEDIATRICS Volume 148, number 2, August 2021

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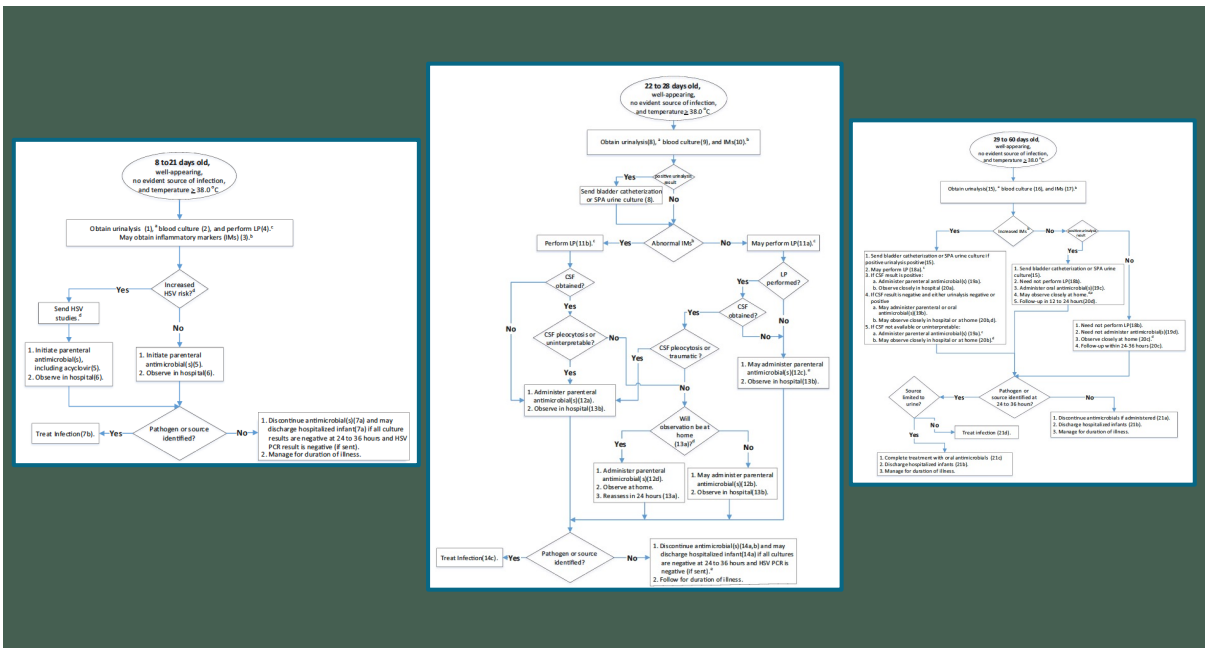

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Chronological Age

8-21 days

- **Blood culture**
- **Urinalysis +/- Ucx**
- **LP**
- **(HSV risk/test/ACV)**
- **(IMs: ANC, CRP,ProC)**

→ Abx, admit

→ Discharge 24-36 hours

22-28 days

- **Blood culture**
- **Urinalysis +/- Ucx**
- **IMs: ANC, CRP, ProC**
- **If IMs abN, LP**
- **(HSV risk/test/ACV)**

→ Abx, admit

→ No abx, admit

→ Abx, home, f/u 24 hours

29-60 days

- **Blood culture**
- **Urinalysis +/- Ucx**
- **IMs: ANC, CRP, Procalcitonin**
- **If IMs abN, consider LP**
  - → LP+ : abx, admit
  - → LP– : parenteral/oral abx, admit or home
  - → LP? : parenteral abx, admit or home

→ UA+: home, PO abx, f/u 12-24 h

→ All neg : home, no abx, f/u 24-36 h

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TABLE 3 Initial Empirical Antibacterial Therapy for Well-Appearing Febrile Infants 7 to 60 Days Old

Suspected Source of Infection	8–21 d Old	22–28 d Old	29–60 d Old
UTI[a]	Ampicillin IV or IM (150 mg/kg per d divided every 8 h) and either ceftazidime IV or IM (150 mg/kg per d divided every 8 h) or gentamicin IV or IM (4 mg/kg per dose every 24 h)	Ceftriaxone IV or IM (50 mg/kg per dose every 24 h)	Ceftriaxone IV or IM (50 mg/kg/dose every 24 h). Oral medications for infants older than 28 d.[b] Cephalexin 50–100 mg/kg per d in 4 doses or cefixime 8 mg/kg per d in 1 dose
No focus identified[c]	Ampicillin IV or IM (150 mg/kg per d divided every 8 h) and either ceftazidime IV or IM (150 mg/kg per d divided every 8 h) or gentamicin IV or IM (4 mg/kg per dose every 24 h)[d]	Ceftriaxone IV or IM (50 mg/kg per dose every 24 h)	Ceftriaxone IV or IM (50 mg/kg/dose every 24 h)
Bacterial meningitis[e]	Ampicillin IV or IM (300 mg/kg per d divided every 6 h) and ceftazidime IV or IM (150 mg/kg per d divided every 8 h)	Ampicillin IV or IM (300 mg/kg per d divided every 6 h) and ceftazidime IV or IM (150 mg/kg per d divided every 8 h)	Ceftriaxone IV (100 mg/kg or d once daily or divided every 12 h) or Ceftazidime IV (150 mg/kg or d divided every 6 h) and vancomycin[f] IV (60 mg/kg or d divided every 8 h)

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ELSEVIER

Archives de Pédiatrie

Volume 28, Issue 8, November 2021, Pages 683-688

Research paper

Lumbar puncture in infants with urinary tract infection: Assessment of infant management in the emergency department

L. Issa [a] ✉, C. Sarret [a, b], B. Pereira [c], E. Rochette [a, d], E. Merlin [a, d], N. Caron [a]

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55 days old

WHAT IF FEVER AND . . .

- Exam shows bulging fontanel
- Exam shows hepatosplenomegaly
- Exam shows swelling and tenderness to palpation over multiple extremities

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55 days old

WHAT IF FEVER AND . . .

- Exam shows bulging fontanel → meningitis, roseola
- Exam shows hepatosplenomegaly → EBV, CMV, HLH, malignancy
- Exam shows swelling and tenderness to palpation over multiple extremities → infantile cortical hyperostosis (Caffey disease)

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555 days old = 18 months

Charlotte has had fevers to at least 39 degrees daily x 2 days

- Evaluation dependent on other symptoms/findings
- Consider screening investigations (e.g., UA/urine culture in girls)

WHAT IF:

Charlotte has had fevers to at least 39 degrees daily x **5 days**

- Most would consider screening investigations
- Some viral illnesses consistently have fever 5+ days

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555 days old = 18 months

- Pallor
- Fatigued
- Fussy
- Doesn't want to walk
- Gums sensitive when brushing teeth

→ Acute lymphocytic leukemia

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555 days old = 18 months

WHAT IF . . .

- Known diagnosis of ALL and recent chemotherapy
- Recent return from month in India
- Exam showed warm and tender knee joint
- Exam showed conjunctivitis and red cracked lips
- Exam showed abnormal appearance of teeth and absence of sweating

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555 days old = 18 months

WHAT IF FEVER AND . . .

- Known diagnosis of ALL and recent chemotherapy → febrile neutropenia
- Recent return from month in India → malaria, dengue, leptosporosis
- Exam showed warm and tender knee joint → septic arthritis, osteo, JIA
- Exam showed conjunctivitis and red cracked lips → KD, SJS, TSS, MIS-C, adeno
- Exam showed abnormal appearance of teeth and absence of sweating → ectodermal dysplasia

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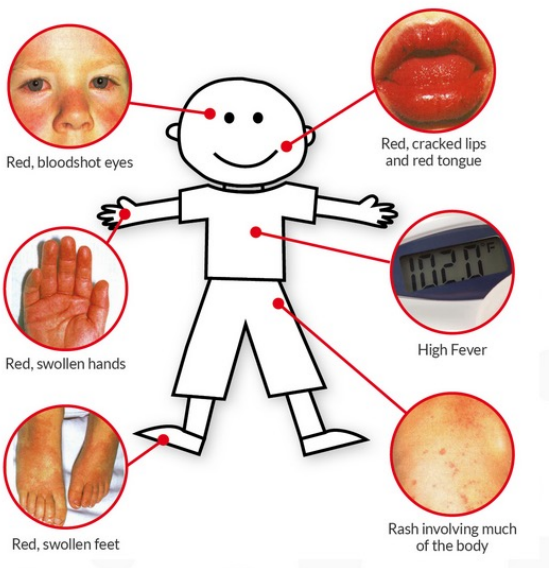

https://www.kawasakikidsfoundation.org/kawasaki-disease-symptoms/

KAWASAKI DISEASE

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CRASH AND BURN

Conjunctivitis (non-purulent, limbic-sparing)
Rash (polymorphous, maculopapular, diffuse)
Adenopathy (cervical lymph node >1.5 cm)
Strawberry tongue/mucous membrane changes
Hand and feet changes (edema, erythema)
Burn (fever at least 38.5 for at least five days)

KAWASAKI DISEASE

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KAWASAKI DISEASE

Adapted from: McCrindle BW, Rowley AH, Newburger JW, et al. Diagnosis, treatment, and long-term management of Kawasaki disease: A scientific statement for health professionals from the American Heart Association. Circulation 2017; 135:e927.

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5 years old

David has had fevers to at least 39 degrees daily x **5 days**

- Bilateral leg pain
- Refuses to walk
- Exam: swollen knees and ankles with limited ROM secondary to pain
- Exam: diffuse macular rash

- WDYWTK?

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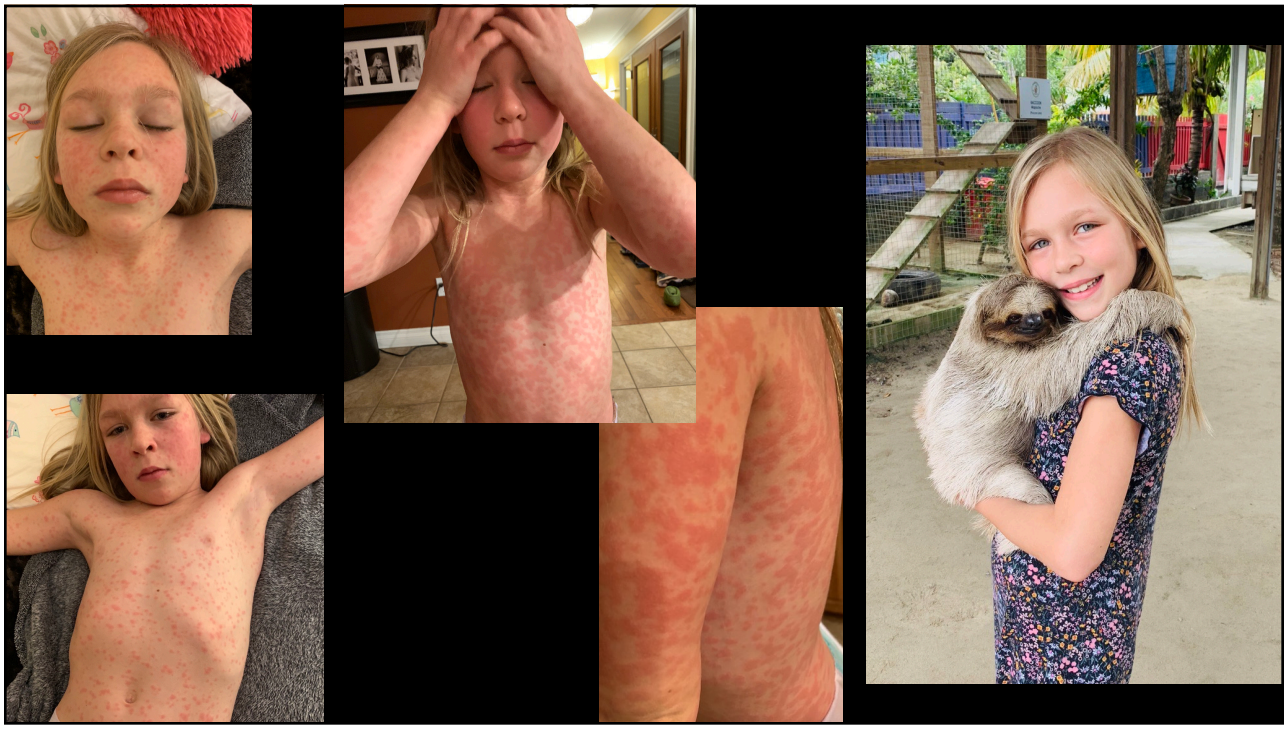

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- Fever, arthralgia/arthritis, lymphadenopathy, rash, edema of hands/feet
- Type 3 hypersensitivity reaction to drug
  - Primary: 6-21 days after exposure
  - Recurrent: 1-4 days after exposure to same antigen
- Common triggers include: amox, cefaclor, septra, penicillin
- Clinical diagnosis
- Self-limited
- NSAIDs, antihistamines, steroids
- Labs if ill-appearing

SSLR

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5 years old

WHAT IF FEVER AND . . .

- Joint pain is migratory, affecting one joint at a time
- Bone pain
- Recurrent fevers every few weeks associated with mouth ulcers
- Myalgias to calf muscles, toe-walking, tender to gastrocnemius squeeze
- Recent COVID infection one month ago
- Night sweats, arthralgias, recent travel to South America
- Cervical lymphadenopathy, splenomegaly

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5 years old

WHAT IF FEVER AND . . .

- Joint pain is migratory, affecting one joint at a time → ARF, JIA
- Bone pain → leukemia, osteomyelitis, brucellosis
- Recurrent fevers every few weeks associated with mouth ulcers → PFAPA
- Myalgias to calf muscles, toe-walking, tender to gastrocnemius squeeze → influenza
- Recent COVID infection one month ago → MIS-C
- Night sweats, arthralgias, recent travel to South America→ brucellosis, malaria
- Cervical lymphadenopathy, splenomegaly → EBV, Kikuchi-Fujimoto disease

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15 years old

Emily has had fevers to at least 39 degrees daily **x 5 days**

- Intermittent history of RUQ pain
- Worsening pain in the last week
- Looks unwell on exam
- Abdomen tense, tender RUQ and lateral to umbilicus with guarding
- Murphy's sign positive

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15 years old

WHAT IF FEVER AND . . .

- History of recent weight loss and hematochezia
- Recent immigrant from African country
- Recent appendectomy and abdominal pain
- Headaches and hypernatremia
- Jaundice and recent travel to Mexico
- Petechiae
- Dysphagia, cervical LAD, abdominal pain and tenderness BUQ
- Abdominal pain and tenderness lower abdomen, vaginal discharge

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15 years old

WHAT IF FEVER AND . . .

- History of recent weight loss and hematochezia → IBD
- Recent immigrant from African country → Sickle Cell Disease
- Recent appendectomy and abdominal pain --> intra-abdominal pyogenic abscess
- Headaches and hypernatremia → pituitary tumor
- Jaundice and recent travel to Mexico → Hepatitis A
- Petechiae → meningococcus
- Dysphagia, cervical LAD, abdominal pain and tenderness BUQ → mono
- Abdominal pain and tenderness lower abdomen, vaginal discharge → PID

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- Recent chemotherapy
- Sickle cell disease
- Immigrant/returning traveler
- Periodic/recurrent fever
- Prolonged fever

Special Considerations

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Special Considerations

- **Chemotherapy**
  - Febrile neutropenia → increased risk for opportunistic infections
  - Precautions
  - Management
    - Blood cultures line + peripheral, broad-spectrum antibiotics
    - Admit
- **Sickle cell disease**
  - Functionally asplenic → increased risk for encapsulated, invasive infections
  - Management
    - Urgent antibiotics: ceftriaxone or levofloxacin +/- vancomycin
    - CBC, blood culture, swab for flu/COVID

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Special Considerations

- **Recent travel**
  - Malaria
  - Dengue fever
  - Salmonella/typhoid
  - Tuberculosis
  - Hepatitis A
- **Periodic fever**
  - PFAPA
  - Muckle-Wells syndrome

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Special Considerations

- **Prolonged fever** (> 1 week)
  - Infections 50% - prolonged or sequential
  - Connective tissue disorder
  - Malignancy
  - Kawasaki Disease
  - Zebras
    - Drug fever
    - Central/CNS dysregulation
    - Factitious
    - HLH
    - IBD
    - And more - hyperthyroid, ectodermal dysplasia, immunodeficiencies, familial dysautonomia, Kikuchi-Fujimoto disease

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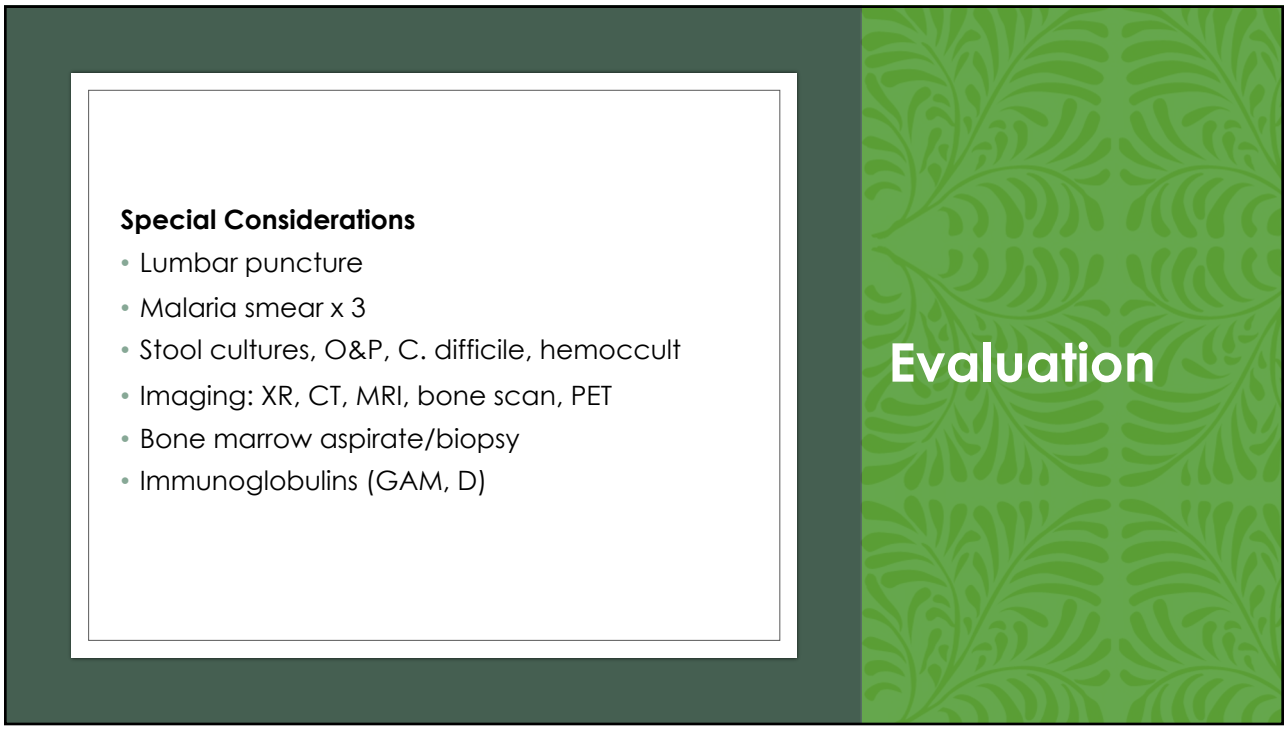
Special Considerations
• Lumbar puncture
• Malaria smear x 3
• Stool cultures, O&P, C. difficile, hemoccult
• Imaging: XR, CT, MRI, bone scan, PET
• Bone marrow aspirate/biopsy
• Immunoglobulins (GAM, D)
Evaluation

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• Fever can be a sign of a large variety of conditions
• Tailor evaluation to appearance, signs, symptoms, and risk factors (including age)
• Special circumstances require increased clinical vigilance
• Phone a friend when you need one
SUMMARY

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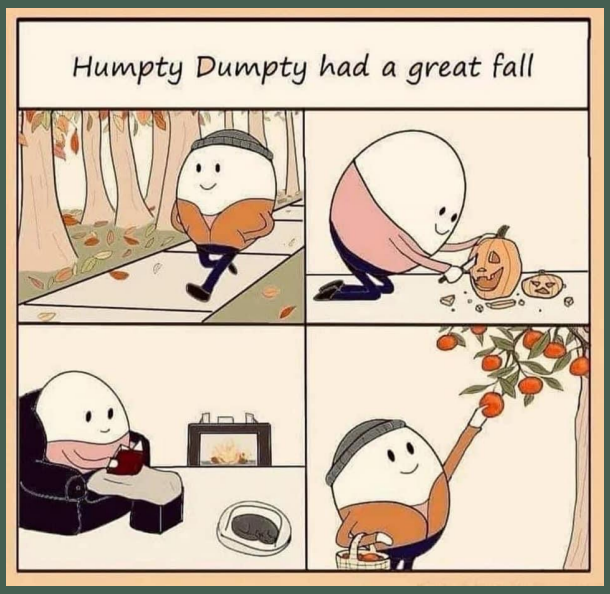

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