Fever and Infectious Diseases in Children

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Disclosure Statement

Dr. Vail has nothing to disclose.

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Learning Objectives

1. Identify an approach to evaluate and manage infants/children with fever

2. Describe bacterial and viral illnesses of the respiratory tree with a focus on epidemiology, diagnosis, and treatment

3. List the characteristic features and describe the clinical courses of common exanthems
Fever

• An abnormal condition of the body characterized by an undue rise in temperature, quickening of the pulse, and disturbance of various body functions

• Fever (> 100.4°F or 38ºC)—rectal most accurate
  – Usually does not indicate serious illness
  – Can cause discomfort and seizures
  – Does not cause brain damage
  – Does help fight infection
1. 3-week-old infant brought to ED for fever of 102° F. Infant does not appear ill, but has not been feeding well. What should you do?

A. Sepsis work up and send home if negative
B. Admit and do sepsis work up
C. Observe in ED and send home if fever resolves with acetaminophen
D. Admit and observe until fever breaks
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B. Admit and do sepsis work up

11% A. Sepsis work up and send home if negative

82% B. Admit and do sepsis work up

4% C. Observe in ED and send home if fever resolves with acetaminophen

4% D. Admit and observe until fever breaks
Fever in First Month

- *Admit for temperature > 100.4°F
- CBC with differential
- Urinalysis and urine culture
- Blood culture
- Lumbar puncture for CSF studies and culture
- Bugs: Group B strep, E. coli, Listeria
- IV antibiotics: amp/gent or amp/cefotaxime ± acyclovir
  - No ceftriaxone less than 1 month (kernicterus risk)
Fever in Infant 1-3 Months of Age Who Appears Toxic

• What is toxic?
  – Cyanosis
  – Decreased activity
  – Inability to interact with surroundings
  – Irritability
  – Lethargy
  – Poor tone
  – Signs of poor perfusion
  – Tachycardia
  – Weak eye contact
  – Inadequate feeding

• Treat the same as infant < 1 month old
Outpatient Management of Fever in Infant 1-3 M/O

• If non-toxic and low-risk, may be managed outpatient if:
  – WBC < 15,000 and < 1,500 bands, negative gram stain
  – CSF < 8 WBC and negative gram stain
  – Blood culture
  – Urine culture (urethral catheterization)
  – Ceftriaxone 50 mg/kg (max 1 g) IM
  – Meets low-risk criteria
    • Term infant without chronic disease or hospitalizations
    • Reliable caretakers
    • Transportation and telephone available
    • Willingness to return in 24 hr
Febrile Seizures

- 3-4% of children
- 9-20 mo most common age
- 30-40% will have a recurrence
- Family history or underlying neurological condition
- Not associated with brain damage
- No evaluation other than work up of fever is indicated for first febrile seizure
2. 3 y/o girl presents with 4 day history of fever without other symptoms. Throat and lung exams are normal, but she appears quite ill. What should be your next step?

A. Order an abdominal sonogram  
B. Order UA with cultures  
C. Admit for IV fluids  
D. Reassure mother that it is viral and see her back the next day
2. 3 y/o girl presents with 4 day history of fever without other symptoms. Throat and lung exams are normal, but she appears quite ill. What should be your next step?

- A. Order an abdominal sonogram
- B. Order UA with cultures
- C. Admit for IV fluids
- D. Reassure mother that it is viral and see her back the next day
UTI

• Most common serious bacterial infection in children (look for it when there are no signs)
• 70-90% E. coli
• Newborns: males and premature infants more likely to have UTI
• Ages 1-5: girls 10-20 times more likely
• Urine culture needed: catheter or suprapubic tap
Treatment of UTI

• Positive culture > 50,000 CFU/ml
• Cephalosporin 1st choice for 7-14 days
• Follow up renal ultrasound
  – First febrile UTI
• Follow up VCUG
  – If US reveals hydronephrosis/scarring
  – Recurrent febrile UTIs
3. 4 y/o male seen in your office for sore throat. No fever, rash, or adenopathy. Tonsils are erythematous without exudates. Mother insists on antibiotics. What do you do?

A. Treat with amoxicillin
B. Treat with penicillin
C. Do rapid strep screen and if negative do strep culture prior to treating
D. Explain to mother that it is probably viral and that antibiotics are not indicated
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Pharyngitis

- Viral: most common
- Group A β-hemolytic streptococcus: 15%
  - Mod to severe tonsillar swelling with exudate
  - Mod to severe anterior cervical adenopathy
  - Absence of moderate to severe cough
  - Fever
  - Treatment with penicillin (erythromycin or clindamycin if pen allergic) prevents rheumatic fever but not glomerulonephritis
  - Suppurative complications: peritonsillar abscess & retropharyngeal abscess
Peritonsillar Abscess & Retropharyngeal Abscess

• Symptoms
  – Severe throat or neck pain
  – Painful swallowing
  – High fever
  – Poor oral intake (dehydration)

• Physical
  – Cervical adenopathy
  – Uvular deviation
  – Muffled voice with trismus

• Elevated WBC with a left shift

• Treatment: surgical drainage, IV antibiotics
Epiglottitis

- Rare since Haemophilus influenzae vaccine
- Can visualize swollen, cherry red epiglottis
- X-ray shows “thumb print” sign
- Airway management
- Antibiotic treatment
  - Cephalosporin +/- clindamycin
- Steroids and racemic epinephrine are not used
4. A 2 y/o child is brought to the ED. She has a barking cough and some stridor that worsened tonight, and a temperature of 101°F. What is the treatment?

A. Nebulized epinephrine and dexamethasone
B. Albuterol
C. Humidified oxygen
D. Inhaled steroids
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76%  A. Nebulized epinephrine and dexamethasone
5%   B. Albuterol
13%  C. Humidified oxygen
5%   D. Inhaled steroids
Croup (Laryngotracheobronchitis)

- Viral illness causing edema of upper airways
- Etiology
  - Parainfluenza viruses 1, 2, 3, cause 75%
  - Adenovirus
  - Respiratory syncytial virus (RSV)
  - Mycoplasma pneumoniae
- Symptoms: URI symptoms, “barky” cough, hoarseness, tachypnea, mild stridor—worse at night
- X-rays show subglottic narrowing (“steeple” sign) in 40-50%
Treatment of Croup

- Cool, moist air widely used: no evidence
- Dexamethasone 0.6 mg/kg IM (or oral) reduces hospitalization rates and shortens ED stay
  - Single dose (multiple dose may lead to bacterial or fungal infections)
  - Indicated for croup of any severity
- Nebulized epinephrine for immediate relief: followed by admission or at least 3-hr observation and/or corticosteroids
- Beta-agonist bronchodilators not effective
5. 9-month-old child is admitted in Jan. for cough, wheezing, ↓ feeding, and fever of 38°C. CXR shows mild peribronchial cuffing. Which treatment is indicated?

A. Amoxicillin/clavulanate (Augmentin)
B. Systemic corticosteroids
C. Supplemental oxygen and fluids
D. Nebulized ipratropium (Atrovent)
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Respiratory Syncytial Virus (RSV)

- Most common cause of bronchiolitis and pneumonia in infants under 1 year
- Rhinorrhea, pharyngitis, cough, wheezing, rhonchi, rales, CXR often normal, fever and WBC inconsistent
- Diagnosis: antigen detection assays
- **Treatment is supportive (oxygen, acetaminophen, fluids)/inhaled bronchodilator albuterol or epinephrine only if effective
- No evidence for steroids, antibiotics, or ribavirin
Pertussis

• Symptoms
  – URI symptoms
  – Paroxysms of coughing with “whoops” on inspiration 2-4 weeks
  – Coughing to the point of vomiting
  – Dyspnea
  – Seizures 20-25%

• Pertussis and bronchiolitis may present with apnea under 3 mo of age
• No specific physical findings, but high WBC
• Pneumonia most frequent
Treatment of Pertussis

- Admission for most children < 3 mo
- Supportive: hydration, pulmonary toilet, oxygen
- Antibiotics: erythromycin, clarithromycin, azithromycin, TMP-SMX for 14 days
- Treat patient and all household contacts
- Adults should get Tdap as single booster dose
Impetigo

• Caused by group A β-hemolytic Streptococcus or Staphylococcus aureus
• “Honey-colored crusts”
• Treatment recommended because of contagiousness
• Mupirocin cream is treatment of choice
• Cephalexin (Keflex) if oral
MRSA

- Consider even in neonates
- Any abscess is MRSA until proven otherwise
- Culture and treat by sensitivity
  - Sulfamethoxazole/trimethoprim
  - Clindamycin
  - Tetracyclines
6. A 2 y/o boy has very red cheeks and a fine rash but does not appear ill. He had a fever a couple of days ago. When can he return to day care?

A. Today
B. Tomorrow
C. 5 days
D. After the rash is gone
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Fifth Disease

- Common disease, rarely clinically significant
- Caused by parvovirus B19
- Rash is immune-mediated and occurs after acute infection, so children with rash may attend school or day care
  - Phase I: facial flushing (slapped cheeks)
  - Phase II: macular rash
  - Phase III: reticular rash
- Arthritis rarely in adolescents
- Pregnant women: rare complication fetal hydrops and fetal demise; women develop arthritis
Guess the Exanthem

Human herpesvirus 6 (HHV-6)
Presents with high fever,
followed by transient rash
Roseola Infantum (Exanthem Subitum)

- “Sudden Rash” herpes virus HHV-6 or HHV-7
- Usually mild and sporadic
- Children 6 months to 4 years
- Natural course
  - Days 1-2: Anorexia/vomiting, occipital adenopathy
  - Days 2-3: High fever (103-106°F), possible seizures
  - Day 4: Rash begins as fever abates
  - Pink almond-shaped macules on trunk/neck
  - Confluent then fade in hours to 2 days
Roseola

- Pink, blanchable, discrete maculopapular rash mainly on trunk; resolves in 1-2 days
- Nearly 100% of children have antibodies to HHV-6 by 3 years of age
What Is This?
Henoch-Schönlein Purpura

- Usually follows URI with low-grade fever, fatigue
- Triad of purpura, colicky abdominal pain, and arthritis
- Rash: pink maculopapules progressing to nonthrombocytopenic palpable purpura on buttocks and legs
- Hematuria and proteinuria
- ↑ESR, ↑WBCs, ↑platelets, ↓RBCs
- Can treat with prednisone in severe cases (renal complications)
Guess the Exanthem

- Lesions on hands and feet
- Late summer and early fall
Hand, Foot, and Mouth (Coxsackie A)

- Usually in children < 5 years
- Late summer, early fall
- Oral-oral, oral-fecal spread
- Incubation period 4-6 days
- Prodrome of fever, sore throat, and anorexia 1-2 days before the rash
- Small vesicles, erythematous base
- Hands (nail borders), feet (heel margins), buttocks
- Spontaneous resolution in a few days
- Sometimes magic mouthwash preparations needed
7. A 7 y/o male has 7 days of spiking high fevers, diffuse erythematous rash. His tongue and lips are red, dry, and cracked and he has large cervical lymph nodes. What next?

A. Admit and treat with IV antibiotics
B. Admit and treat with a single injection of immune globulin and high-dose aspirin
C. Send home with frequent sips of rehydration solution
D. Admit and treat with aspirin 40 mg/kg/d
7. A 7 y/o male has 7 days of spiking high fevers, diffuse erythematous rash. His tongue and lips are red, dry, and cracked and he has large cervical lymph nodes. What next?

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61% B. Admit and treat with a single injection of immune globulin and high-dose aspirin
Kawasaki Disease

- Diffuse vasculitis of unknown etiology
- Leading cause of acquired cardiac disease in children in US
- Diagnostic criteria:
  - Fever > 5 days duration
  - Bilateral conjunctival injection
  - Oropharyngeal erythema, strawberry tongue, fissuring and crusting of the lips
  - Induration of hands and feet, erythema of palms and soles; desquamation of fingertips and toes
  - Erythematous rash (scarlatiniform or morbilliform)
  - Enlarged lymph node mass (> 1.5 cm)
  - May also be irritable and have perineal rash
Sequelae of Kawasaki Disease

• Development of giant aneurysms (> 6 mm)
  – Can lead to coronary thrombosis or stenosis
  – Treat with warfarin and aspirin: INR 2.0-2.5

• Long-term effects
  – Persistent vascular changes
  – Altered lipid metabolism
  – Thickened coronary artery walls
  – Abnormal reactivity with less flow during reactive hyperemia
Meningococcal Meningitis

- Neisseria meningitidis: gram negative diplococcus.
- Clinical manifestations of meningococcemia or meningitis
  - Abrupt onset: fever, chills, malaise, prostration
  - Rash: maculopapular, macular, petechial
  - Waterhouse-Friderichsen syndrome: purpura, DIC, shock, coma, death
Meningococcal Meningitis

- Sporadic, usually type B in infants (no vaccine available yet)
- **Rifampin is used for exposure prophylaxis (family/close contacts)
- Treatment:
  - Ceftriaxone (80-100 mg/kg/dose) bid on day 1
  - Cefotaxime (50-75 mg/kg q 6 h)
  - Ceftazidime (75 mg/kg/dose q 8 h)
  - No evidence that vancomycin increases survival
  - Dexamethasone 0.6 mg/kg/d q 6 h for 4 days
Rash typically begins on day 3-5 of the illness, first appearing peripherally (hands, wrists, feet, ankles). Palm and sole involvement occurs in 50%-70% of individuals. However, the classic triad of fever, rash, and tick exposure only occurs in 20% at the time of presentation.
Rocky Mountain Spotted Fever

- Rickettsia rickettsii, gram negative bacteria
- Most common fatal tick-borne disease in the U.S.
- The American dog tick is the vector—found in tall grass
- Symptoms: sudden onset of fever, muscle pain, nausea, vomiting, then rash, abdominal and joint pain, hypotension, headache
- Lesions: begin as blanching macules and papules which become nonblanching, petechial, and hemorrhagic
- Usually starts on the legs, palms, and soles, spares the face
RMSF Management

- Elevated serum creatinine associated with increased risk for fatality
- Antibiotics have reduced mortality from 30% to 40%
- Doxycycline 100 mg bid if > 45 lbs.
  (4 mg/kg/day if < 45 pounds)
8. Infants < 1 month old should be admitted for septic work-up if temperature is:

A. > 100°F
B. > 100.4°F
C. > 102°F
D. No set temperature
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9. RSV bronchiolitis treatment might include:

A. Steroids
B. Antibiotics
C. Ribavirin
D. Oxygen and fluids
9. RSV bronchiolitis treatment might include:

- **A. Steroids** (2%)
- **B. Antibiotics** (0%)
- **C. Ribavirin** (0%)
- **D. Oxygen and fluids** (97% ✔️
10. The drug of choice for exposure prophylaxis of meningococcal meningitis is:

A. Ceftriaxone
B. Dexamethasone
C. Rifampin
D. Vancomycin
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A. Ceftriaxone

B. Dexamethasone

C. Rifampin

D. Vancomycin
Take Home Pearls

- Admit any infant < 1 mo. old with fever > 100.4
- RSV treatment is supportive
- Rifampin for meningococcal post-exposure prophylaxis
Answers

1. B
2. B
3. D
4. A
5. C
6. A
7. B
8. B
9. D
10. C