Key Clues to Identify Common Infections in Children

PCOM Resident Board Review
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This Happened After The Fever Went Away
Fast Facts

- Occurs throughout the year
- Most commonly affects children 6 months to 2 years
- The peak age 7 to 13 months
- 90% of cases occur in the first 2 years of life
- Affects males and females equally
- Incubation period is 5 to 15 days
- Children remain alert and are usually not ill appearing
What’s the Diagnosis?

Clinical Manifestations

- The fast-rising fever can trigger febrile seizures (in about 10%-15%) of young children with this virus
  - A blanching maculopapular rash appears as fever disappears and lasts 1 to 2 days
- Cough
- Coryza
- Eyelid edema has been noted
- Lymphadenopathy
Roseola

- **Etiology**
  - Major cause appears to be human herpesvirus 6 (HHV6)
  - Human herpesvirus 7 (HHV7) may also play a role
Roseola

• **Diagnosis**
  • Clinical
  • History very important (telltale rash)
  • Can check blood test

• **Treatment**
  • Supportive care
The Three “R’s”

**Rubeola (Ordinary Measles)**
- Conjunctivitis
- Cough
- Cervical fever
- Koplik spots on buccal mucosa

**Rubella (German Measles)**
- Headache
- Low-grade fever
- Sore throat
- Koplik spots on soft palate

**Roseola Infantum (Exanthem Subitum)**
- Affects young children 6-36 months old
- Caused by human herpes virus 6
- Abrupt high fever
- After fever subsides, a rash develops, starting on the neck and trunk and spreading to the face and extremities
How to tell the difference between Rubella, Measles, and Roseola rashes

Rubella:
- rash appears after mild fever (99-100°F)
- starts on face and moves down the body
- pink or light red spots that may merge
- may itch
- rash lasts a few days

Measles:
- rash appears about 3 days after first symptoms
- fever often spikes with appearance of rash, 104-105°F
- starts at hairline, moves down, disappears in same order
- red to reddish-brown spots
- may or may not be itchy
- rash lasts 4-6 days

Roseola:
- high fever (103°F+) ends abruptly after a few days
- rash appears when fever ends
- usually starts on the trunk
- pinkish-red flat or raised spots that turn white when touched
- usually is not itchy
- rash can last hours or days
The Golden “crusty” child
Hint – Two Types

- More common in children, higher incidence in Summer
- Staph, strep, or combined infection w/ discrete thin walled vesicles
- Stratified golden crusts when dry
- Mostly on exposed parts of the body, face and neck; spreads peripherally and clears centrally
- Methicillin-resistant *S aureus* (MRSA is an increasingly common cause of impetigo)
- Post-streptococcal glomerulonephritis is a rare complication – pedal edema and hypertension may be noted in a patient with non-bullous impetigo. If occurs, usually 10 days (1-5 week range) after lesions first appear
Impetigo
Non-Bullous Impetigo

- Begins with a single asymptomatic erythematous macule
- Rapidly evolves into a vesicle or pustule, ruptures, released serous contents dry, leave a crusted, honey-colored exudate over the erosion
- Skin on any part of the body can be involved - face and extremities most common
- Occasional pruritus
- Regional adenopathy is common
Bullous Impetigo

- Consists of small or large, superficial, fragile bullae
- Quickly appear, spontaneously rupture, and drain so that only the remnants, or collarettes, are seen at the time of presentation
- Minimal or no surrounding erythema and no regional lymphadenopathy
Impetigo Treatment

- Topical mupirocin or retapamulin for single lesions of non-bullous impetigo or small areas of involvement
- Systemic antibiotics are indicated for:
  - Non-bullous impetigo with extensive involvement, in athletic teams, childcare clusters, multiple family members, or for bullous impetigo
  - Semi-synthetic penicillin or first generation cephalosporin (unless MRSA is suspected)
- Soak crusts often
What’s the Diagnosis?

- Toxin-mediated cleavage of the skin at granular layer resulting in a split
- Risk factors: newborn, children less than six or less commonly, immunocompromised
- Complete re-epithelialization in 2 weeks
What’s the Diagnosis?

- **Key Clues:**
- If affected, almost always in those less than six years of age
- Initial lesion is usually superficial and crusty
- Moves quickly, within 24 hours surrounding skin becomes painful and scarlet in color. Toxin enters circulation and spreads to other areas of skin
- In older children, the face is typical beginning site
- In infants primary infection often begins during first few days of life in diaper area or umbilical stump
Hint: positive Nikolsky Sign

- Positive when a blister occurs on normal appearing skin after application of lateral pressure with a finger
- Occurs in any superficial blistering process
What’s the diagnosis?
Staphylococcal Scalded Skin Syndrome

- Caused by the exfoliative toxins of some strains of *Staphylococcus aureus*.
- It is a syndrome of acute exfoliation of the skin typically following an erythematous cellulitis.
- Severity of staphylococcal scalded skin syndrome varies from a few blisters localized to the site of infection to a severe exfoliation affecting almost the entire body.
- A mild form of the illness involving desquamation of just the skin folds following impetigo has been described.
- The epidermis may peel easily, often in large sheets.
- Loss of protected skin barrier can lead to sepsis and fluid and electrolyte concerns.
Treatment Approach

- Once SSSS diagnosed, treatment consists of supportive care and eradication of the primary infection.

- Fluid rehydration, topical wound care similar to the care for thermal burns, and parenteral antibiotics to cover *S aureus*.

- Consideration must be given for community-acquired *S aureus* infection (CA-MRSA).

- Prompt treatment with parenteral anti-staphylococcal antibiotics is essential.

- Most staphylococcal infections implicated in staphylococcal scalded skin syndrome have penicillinases and are resistant to penicillin. Nafcillin, oxacillin, or vancomycin are indicated.

- Clindamycin may also be used to inhibit bacterial ribosomal production of exotoxin.
# KEY POINTS FOR BOARDS

## Staphylococcal Scalded Skin Syndrome (SSSS) versus Toxic Epidermal Necrolysis (TEN)

<table>
<thead>
<tr>
<th>Feature</th>
<th>SSSS</th>
<th>TEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients affected</td>
<td>Infants, young children, immunocompromised adults</td>
<td>Older patients</td>
</tr>
<tr>
<td>Patient history</td>
<td>Recent staphylococcal infection</td>
<td>Drug use, renal failure</td>
</tr>
<tr>
<td>Level of epidermal cleavage (blister formation)*</td>
<td>Within the granular cell (outermost) layer of the epidermis</td>
<td>Between the epidermis and dermis or at the level of the basal cell</td>
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</tbody>
</table>
From Normal to OUCH!

A. Normal TM.
B. TM with mild bulging.
C. TM with moderate bulging.
D. TM with severe bulging.

Courtesy of Alejandro Hoberman, MD

Lieberthal A S et al. Pediatrics 2013;131:e964-e999

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Acute Otitis Media

- Often arises as a complication of preceding viral respiratory infection
- Corresponds to the rhinovirus, RSV, and influenza season
- Acute suppurative infection of the middle ear cavity
- Prevalence is highest in those aged 2 years or younger, and it sharply declines in children older than 6 years
- The peak incidence is 6 – 18 months of life
Acute Otitis Media

- Common bacterial pathogens are
  - S. pneumoniae
  - H. influenza
  - M. catarrhalis
  - Group A streptococcus

- Sterile effusions occur in approximately 30% of cases
When to suspect AOM?
Acute Otitis Media = THE BIG THREE

1. **Acute onset** of signs and symptoms (fever, pain, URI)
2. Presence of **middle ear effusion** (MEE)
3. Presence of **middle-ear inflammation**
# Criteria for Initial Antibacterial Agent Treatment or Observation in Children with AOM

<table>
<thead>
<tr>
<th>Age</th>
<th>Certain Diagnosis</th>
<th>Uncertain Diagnosis</th>
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<tbody>
<tr>
<td>&lt; 6 months</td>
<td>Antibacterial Tx</td>
<td>Antibacterial Tx</td>
</tr>
<tr>
<td>6 mo to 2 y</td>
<td>Antibacterial tx</td>
<td>Antibacterial Tx if <strong>Severe</strong> illness, observation option only if non-severe</td>
</tr>
<tr>
<td>≥ 2 y</td>
<td>Antibacterial therapy if <strong>Severe</strong> illness; Observation option if <strong>NOT severe</strong> illness</td>
<td>Antibacterial therapy if <strong>Severe</strong> illness; Observation option if <strong>NOT severe</strong> illness</td>
</tr>
</tbody>
</table>

**Severe**: Moderate to Severe Otitalgia OR Fever ≥ 39°C (102.2°F) in the previous 24 hours

**Observation Period**: 48-72, schedule follow-up if symptoms do not improve
Acute Otitis Media

- **Initial Antibiotic Treatment at AOM Diagnosis or After Observation**
  - *Amoxicillin (80-90 mg/kg/day) – first line therapy*
  - Cefdinir -14 mg/kg/day (1 or 2 doses/day)
  - Cefuroxime - 30 mg/kg/day (in 2 divided doses)
  - Amoxicillin-clavulanate - 90 mg/kg/day (based on Amoxicillin component) with (6.4 mg/kg/day of clavulanate) – use if previous Amoxicillin within 30 days or if patient has OM+ conjunctivitis
  - Cefpodoxime (10 mg/kg/day in 2 divided doses)
  - Ceftriaxone (50 mg/kg/day IM or IV)

*Pediatrics 2013;131(3):e964-e999*
Acute Otitis Media

- **Recurrent acute otitis media/treatment failure**
  - Amoxicillin-clavulanate - 90 mg/kg/day (based on Amoxicillin component) with (6.4 mg/kg/day of clavulanate) or
  - Ceftriaxone (50 mg/kg/day IM for 3 days) – maximum one gram/24 hours
  - Cefdinir 7 mg/kg q12h or 14 mg/kg q24h for 5-7d or
  - Cefpodoxime 10 mg/kg/day as a single dose or
  - Cefprozil 15 mg/kg q12h for 5-7d or
  - Cefuroxime 30 mg/kg/day divided q12h for 5-7d or
  - Typanocentesis
  - Consult specialist

*Pediatrics 2013;131(3):e964-e999*
Say Aah!
Pharyngitis

**Diagnosis**

- The challenge is to distinguish pharyngitis caused by group A beta-hemolytic streptococci (GABHS) from pharyngitis caused by other organisms
- If symptoms suggestive of GABHS - Rapid streptococcal antigen tests
- If positive = antibiotic treatment, if negative – throat culture
- Throat culture is the diagnostic “gold standard”
What’s the Diagnosis?

Quick Clues

- Relatively uncommon before 3 years of age
- Increased incidence school-age children
- Decreased incidence in late adolescence and adulthood
- Occurs throughout the year in temperate climates
- Peaks during the winter and spring
- Easily spreads to siblings and classmates
- Exposure to confirmed case within preceding two weeks is risk factor
Streptococcal Pharyngitis

- Characterized by fever, sore throat, **tonsillar exudates**, and **tender** adenopathy.
  - Cough, coryza (e.g., nasal discharge/congestion), and diarrhea usually do **NOT** occur.
  - Frank exudates alone are **NOT** diagnostic of streptococcal pharyngitis.
Modified Centor Score

Estimates probability that pharyngitis is streptococcal in nature, and suggests management course
Streptococcal Pharyngitis

Treatment

- Untreated most episodes of streptococcal pharyngitis resolve

- Antimicrobial therapy accelerates clinical recovery by 24- 48 hours

- Major benefit of antimicrobial therapy is the prevention of acute rheumatic fever - to prevent this sequela, institute adequate antimicrobial therapy within 9 days of infection*

- Penicillin given orally three or four times daily for a full 10 days

*Pediatric Pharyngitis Harold K Simon, MD, MBA; Medscape May 26, 2015
What’s the Diagnosis?

- Seen one week ago and given amoxicillin for pharyngitis. Parents called as their child just developed this exanthem:
Infectious Mononucleosis

- Acute disease
- Caused by a widespread human γ-herpes virus, the Epstein-Barr virus (EBV) or a human β-herpes virus, the cytomegalovirus
- Primary infection predominantly in children, adolescents and young adults
- Symptoms start with a prodromal phase including subfebrility, malaise, arthralgia and myalgia
- The classic features, fever, tonsillo-pharyngitis, lymphadenopathy, leukocytosis and hepatosplenomegaly
Main symptoms of Infectious mononucleosis

Central
- Fatigue
- Malaise
- Loss of appetite
- Headache

Visual
- Photophobia

Tonsils
- Reddening
- Swelling
- White patches

Throat
- Soreness
- Reddening

Respiratory
- Cough

Systemic
- Chills
- Fever
- Aches

Lymph nodes
- Swelling

Spleen
- Enlargement
- Abdominal pain

Gastric
- Nausea
- Mobiliform rash
- Hypersensitivity reaction
- Pruritic
- Appears 7–10 days after antibiotics (Beta-lactams such as ampicillin, amoxicillin and cephalosporins)

Amoxicillin-Induced Rash Secondary to Mononucleosis (EBV) Infection
Infectious Mononucleosis

- Infections in younger children are usually more mild and often go undiagnosed whereas older adults are more likely to present with hepatomegaly and jaundice

- COMPLICATIONS!!!
  - Concomitant GABHS infection reported between 3-30%
  - 0.2% peritonsillar abscess
  - 0.2% splenic rupture (half of which are atraumatic) almost all occur within first 3 weeks of illness
  - 0.2% rheumatic fever
  - Rare: acute interstitial nephritis, hemolytic anemia, thrombocytopenia, myocarditis, meningitis/encephalitis, CN palsies
Maculopapular Exanthem

- May be due to the viral infection itself, the incidence of skin eruption development in acute IM is 4.2-13% without drug intake.

- Following amoxicillin intake within acute IM the incidence of skin reactions ranges between 27.8% and 69%, while in children, morbilliform skin eruptions nearly always develop following amoxicillin intake within acute IM.


Erythroderma

In severe cases the progressive maculopapular exanthem may turn into erythroderma
Infectious Mononucleosis

- DDX: GABHS, CMV, HIV, toxoplasmosis, other viral pharyngitis

- Testing:
  - Monospot – Sensitivity 87%, Specificity 91% (up to 25% false negative in 1st week of illness)
  - Antibody testing – Sensitivity 97%, Specificity 94%

- Antibody interpretation

<table>
<thead>
<tr>
<th>Possible Results</th>
<th>VCA IgG</th>
<th>VCA IgM</th>
<th>EBNA IgG</th>
<th>Interpretation</th>
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<tr>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>No previous exposure</td>
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<tr>
<td>+</td>
<td>+</td>
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<td>-</td>
<td>Recent infection</td>
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<td>-</td>
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<td></td>
<td>Past infection</td>
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<td>+</td>
<td>-</td>
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<td></td>
<td>See note*</td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td>Past infection</td>
</tr>
</tbody>
</table>

*Results indicate infection with EBV at some time, however, the timing of the infection cannot be predicted (ie, recent or past).
Infectious Mononucleosis

Recommended diagnostic strategy

Suspected IM
Patient 10 to 30 years of age with sore throat and significant fatigue, palatal petechiae, posterior cervical or auricular adenopathy, marked axillary adenopathy, or inguinal adenopathy

- ≥20 % atypical lymphocytosis
  - or
  - ≥10 % atypical lymphocytosis and ≥ 50 % lymphocytes
  - or
  - Positive heterophile antibody test

  Yes ➔ Symptomatic treatment for IM and rapid test for GABHS pharyngitis; antibiotics only if positive

  No ➔ Rapid test for GABHS pharyngitis (if not already obtained) and symptomatic treatment for IM

  No ➔ Return in 5 to 7 days for re-evaluation and possible repeat heterophile antibody test. Consider IgM for EBV VCA test if diagnostic confirmation is important.

  Yes ➔ Urgent return to sports considered or other urgent need to establish diagnosis?

  Yes ➔ Order VCA-IgM test to rule out IM.
Infectious Mononucleosis

- Treatment is mostly supportive (i.e. NSAIDs, hydration, rest)
- Steroids only indicated for significant tonsillar/pharyngeal edema, otherwise, no clear benefit demonstrated by research
- Treat concomitant GABHS if present but not with amoxicillin or ampicillin (similar rashes have been reported with cephalosporins and macrolides but macrolides generally less incidence of the exanthem)
- Avoidance of contact sports or other activities that could increase risk of splenic rupture for at least 4 weeks
- EBV considered “chronic active” if symptoms persist beyond 6 months (9-22%)
- Can Mono recur???
  - Very rarely, mostly in immunocompromised host
  - More likely “recurrence” is CMV, toxoplasmosis or other viral infection
Quick Quiz - What’s the Diagnosis?

- A 12-year-old male was seen two weeks ago with a sore throat. The rapid strept test was positive and treatment was started with amoxicillin. His parents call regarding a new rash that has erupted all over his body. The palms and soles remain uninvolved. What is this???
Link to infection – drop-like papules
Which one of the following is the most likely diagnosis of this patient’s exanthem?

- a. Drug rash
- b. Pityriasis rosea
- c. Streptococcal scalded skin syndrome
- d. Mycoplasma pneumonia cutanie
- e. Guttate Psoriasis
Guttate Psoriasis

- Small, salmon-pink (or red) papules usually appear suddenly on the skin two to three weeks after a streptococcal respiratory infection
- The drop-like lesions may itch
- The outbreak usually starts on the trunk, arms, or legs and sometimes spreads to the face, ears, or scalp
- The palms and the bottoms of the feet are usually not affected.
Guttate Psoriasis

- Trigger is usually a streptococcal infection
- More common in children and young adults
- The eruption of the scaly, “drop-like” papules on the trunk and extremities usually appears two to three weeks after a streptococcal throat infection
- Streptococcal superficial perianal dermatitis in children has also been linked with guttate psoriasis
- Often mistaken for a drug rash because antibiotics may have been initiated for the streptococcal infection
- Throat cultures for streptococcal pharyngitis should be obtained
- Has a good prognosis and may disappear spontaneously or may benefit from phototherapy
Treatment

- Usually goes away in a few weeks without treatment

- Simple reassurance and moisturizers to soften the skin may be sufficient care

- Treatment depends on the severity of the outbreak. Topical steroids, although effective, could be bothersome because the outbreak occurs over a large portion of the body in most cases of guttate psoriasis

- Antibiotics: If someone has a history of psoriasis, the doctor will most likely take a throat culture when that individual has a sore throat. If the culture results are positive, start antibiotics if not already begun

- Phototherapy: Sunlight can help clear up this type of psoriasis

- The doctor may prescribe a short course of broadband ultraviolet B or narrowband ultraviolet B
What’s the Diagnosis?

Key Clue - Geographic Blisters
Hand Foot Mouth Disease (HFMD)

- Enterovirus family
- Coxsackie virus A16 infection – most common cause
Hand Foot Mouth

- More common Spring to Fall
- More common in infants children under 5 y/o
- Spread to other children through hand contamination and close contact
- 3-7 day incubation period
Hand Foot Mouth

- Exam shows ulcers or blisters in the pharynx, lips and or tongue
- Red rash may develop on hands and feet – may blister but not itch
- Fevers, loss of appetite, headache
- Supportive treatment. Control fever, good hydration
- Usually has a benign course
POTENTIAL CARDIAC CONCERN?

KEY CLUES

• Persistent fever – 5 days or more of 102-104°F without a source
• Usually does not respond to acetaminophen or NSAID’s
• Oral mucous membrane changes
• “Strawberry tongue”
• Cervical adenopathy
Keyword hint - “Strawberry tongue”
KAWASAKI DISEASE

Kawasaki Syndrome

Mucocutaneous Lymph Node Syndrome

- Slightly more common in boys
- Epidemics primarily occur in the late winter and spring, at 2- to 3-year intervals
- Most cases occur in children age 5 or younger
- More common in children of Asian and Pacific Island descent
- Affects mucous membranes, walls of blood vessels (inflammation), lymph nodes AND potentially, the heart
- Leading cause of acquired heart disease
Diagnosis

Requires the presence of fever lasting at least 5 days (without known source) combined with 4 out of 5 of the following:

- Oral mucous membrane changes including injected or fissured lips, injected pharynx, or strawberry tongue – 96.5%*
- Polymorphous rash – 96%*
- Bilateral bulbar conjunctiva injection without exudate – 89%*
- Peripheral extremity changes including erythema of palms or soles, edema of hands or feet and periungual desquamation of fingers and toes – 75.6%*
- Cervical lymphadenopathy at least one node greater than 1.5 cm – 62.7%*

*American Family Physician: Diagnosis and Management of Kawasaki Disease March 15, 2015
Clinical Feature Frequency by %
Kawasaki Disease

- Rarely occurs in adults
- Typically a self-limited condition, with fever and manifestations of acute inflammation (vasculitis) lasting for an average of 11 days without therapy
- Besides the coronary arteries, the heart muscle, lining, valves, and the outer membrane around the heart can become inflamed – Arrhythmia potential

- PRESENCE OF CORONARY ARTERY ANEURYSMS IS A MAJOR CONCERN!
**Treatment** – aimed at early control of acute inflammation and monitoring for aneurysmal complications

- **Intravenous Immunoglobulin IVIG**
- **ASPIRIN**
- Heart problems usually won't develop if treated within 10 days of the start of symptoms
- Disease is self limited and patients will ultimately recover, however if left untreated increased risk of coronary aneurysm
- Screening and serial echocardiography (if needed)
BEST OF SUCCESS ON BOARDS
Additional Information
“Just in Case”
Really itches and currently wrestling with other kids in waiting room!

Missouri Department of Health
Scabies

- Infestation of the skin by the mite Sarcoptes scabiei
- Intensely pruritic eruption especially after warm bath or shower and at night
- Characteristic distribution pattern (finger web space, linear lines)
- Hands, feet, inner wrists and axilla most affected
TRANSMISSION

- Person to Person - direct contact
- Parents to children
- Young adults, the mode of transmission is usually sexual contact
Pathophysiology

- Pruritus - result of a delayed type-IV hypersensitivity reaction to the mite, mite feces, and mite eggs
- Occurs 4 to 6 weeks after initial exposure
- Previously sensitized individuals can develop symptoms within hours of exposure
- Persistent scratching of skin = increased chance of secondary infection with impetigo
Treatment

- **Permethrin cream 5%**
  - Can be used in those age 2 **months** and **older**
  - Kills the scabies mite and eggs
  - Two (or more) applications at least 1 week apart may be needed

- **Ivermectin – may help BUT**
  - Not FDA approved for this use
  - Safety in children less than 15 Kg and in pregnant women not established
Is It Just A Cough?
Key Clues

- Most often seen in pre-school and school aged children
- Be suspicious of a cough lasting more than two weeks
- Characterized by
  - a prolonged dry cough, with paroxysmal spasms, that may last weeks to months
  - Sleep disturbing cough
  - Cough may be followed by an inspiratory “whoop” in children
  - Post-tussive emesis
Pertussis

- Commonly known as “whooping cough”
- Bordetella pertussis
- **Reservoir:** Adolescents and adults with waning immunity are source for infant infections
- **Transmission:** Respiratory droplets
- **Communicability:** High
  - Attack rates of 80-100% in non-immunized household contacts & 20% in immunized household contacts
  - Most infectious during the first 2-3 weeks after cough onset

**Incubation Period:**
7–10 days w/ a range of 4 –21 days
Stages of Whooping Cough

Disease Progression:

Weeks

0  1  2  3  4  5  6  7  8  9  10  11  12

Stage 1 - Catarrhal Stage
May last 1 to 2 weeks

- Symptoms: runny nose, low-grade fever, mild, occasional cough
- Highly contagious

Stage 2 - Paroxysmal Stage
Lasts from 1-6 weeks; may extend to 10 weeks

Symptoms: fits of numerous, rapid coughs followed by "whoop" sound; vomiting and exhaustion after coughing fits (called paroxysms)

Stage 3 - Convalescent Stage
Lasts about 2-3 weeks; susceptible to other respiratory infections for many

Recovery is gradual. Coughing lessens but fits of coughing may return.
Laboratory Diagnosis

Gold standard: 7-day bacterial culture of nasopharyngeal secretions—cultures positive by day 3

*Cultures in untreated pertussis remain positive for 3 weeks after illness onset (catarrhal phase when pertussis is usually not suspected). Therefore, small window of opportunity for culture-proven diagnosis*

Polymerase chain reaction (PCR) testing of nasopharyngeal swabs or aspirates.

- Rapid results within 1-2 days, sensitive, and specific
- PCR should be used in addition to culture, not as a replacement for culture
Treatment

Antibiotics – eradicates organism from secretions, decreases communicability, and, if given during the catarrhal stage, may modify clinical course:

- **Erythromycin**, 1-2g daily in 4 divided doses x 7-14 days OR 40-50 mg/kg/d (not to exceed 2 g/d) in 4 divided doses x 14 days.
- **Clarithromycin**, 500mg daily, 2 divided doses x 7 days OR 15-20 mg/kg/d PO in 2 divided doses, not to exceed 1 g/d for 5-7 days
- **Azithromycin**, 500mg on day 1, then 250 mg po x 4 days OR 10-12 mg/kg/day po x 5 days.

Alternative for pts allergic to macrolides:
- **Trimethoprim-sulfamethoxazole**, 160 mg trimethoprim, 800 mg sulfamethexole in 2 divided doses x 14 days OR trimethoprim 8 mg/kg/d and sulfamethoxazole 40 mg/kg/d in 2 divided doses.
What’s the diagnosis?

Barking cough

Possible steeple sign on lateral neck x-ray
Symptom Pattern

- Often begins as a cold – potential low grade fever (but can elevate to 104°F)

- Characteristic symptom pattern - wake up in the middle of the night with a croupy cough and may have trouble breathing – symptoms often better during the day

- Distinctive cough – seal-like barking sound

- Hoarseness

- Inspiratory stridor

- Symptoms come back again at night, but are usually less intense each night

- Cool or moist air, such as in a steamy bathroom or outside in the cool night air may offer some breathing relief
Croup - Laryngeotracheobronchitis

- Results in inflammation, increased mucous production, and edema of the upper airways – larynx, trachea and bronchi

- Major cause – Human Parainfluenza Viruses (HPIV) - type 1 more common* (other viruses such as adenovirus and RSV can cause croup)

- Occurs most often during the Fall and Early Winter

- Commonly affects children between 6 months to three years of age
HPIV and Illness

- The incubation period from exposure to HPIV to onset of symptoms is generally 2 to 7 days
- HPIV-1 and HPIV-2 are most often associated with croup (laryngotracheobronchitis)
- HPIV-1 more often causes croup in children
- Symptoms caused by inflammation, edema and buildup of mucus in the larynx, trachea and bronchial tubes
Croup

- X-ray may show "steeple" sign (from narrowed subglottic space)
- X-ray indicated only to evaluate when the diagnosis is unclear (pneumonia, foreign object, etc.)
Steroid Treatment Tips for Croup

- If administered within the first 4 – 24 hours of symptoms, a single dose of dexamethasone has been shown to be effective in reducing the overall severity of croup.

- Onset of action occurs within 6 hours after oral or intramuscular administration.

- The long half-life of dexamethasone (36-54 hrs) often allows for a single injection or dose to cover the usual symptom duration.

- Dexamethasone dosed at 0.15 mg/kg is as effective as 0.3 mg/kg or 0.6 mg/kg (with a maximum daily dose of 10 mg) in relieving the symptoms of mild-to-moderate croup.
Treatment Summary For Croup

- Cornerstones for the treatment of croup are corticosteroids and nebulized epinephrine*
- Steroids have proven beneficial in mild, moderate and severe croup
- The anti-inflammatory action of corticosteroids reduces laryngeal mucosal edema and decreases the need for nebulized epinephrine
- Nebulized epinephrine is typically reserved for patients in moderate to severe distress*
- Nebulized epinephrine is associated with a clinically and significant transient reduction of symptoms for 30 minutes post-treatment*
<table>
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<tr>
<th>Croup</th>
<th>Epiglottitis</th>
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<tbody>
<tr>
<td>Edema of the mucosa in the subglottic area of the larynx</td>
<td>No seasonal predilection</td>
</tr>
<tr>
<td>More prevalent during the wintertime</td>
<td>Drooling and dysphagia with absence of coughing in epiglottitis.</td>
</tr>
<tr>
<td>More gradual onset than acute epiglottitis</td>
<td>A preference to sit, and refusal to swallow</td>
</tr>
<tr>
<td>Commonly associated with low-grade fever</td>
<td>Trouble speaking</td>
</tr>
<tr>
<td>Same symptoms of inspiratory stridor, suprasternal, intercostal and substernal retractions and hoarseness</td>
<td>Leaning forward to breathe</td>
</tr>
<tr>
<td>Differentiation in early illness is possible by additional observation of barking cough and absence of drooling and dysphagia in croup</td>
<td>Taking rapid, shallow breaths</td>
</tr>
<tr>
<td></td>
<td>Looks very ill</td>
</tr>
</tbody>
</table>
A 12 year old complained of very itchy skin between the finger webs of his thumb and index finger. There is no pain but the itching wakes him up at night. Upon inspection there are linear “burrows” or lines on the skin of his abdomen and left wrist. The most likely diagnosis is:

- A. Community MRSA
- B. Lichen Planus
- C. Hypersensitivity reaction to the Scabies mite
- D. Bed bug bites
- E. Atopic Eczema

Answer on slide: 66
Question

- A widespread “drop-like” rash developed on the trunk of a teenager. No known exposure and it is a little itchy, but not bad. No fever and no pain from the exanthem. She did have a “strept throat” that was treated with Amoxicillin approximately two weeks prior to this skin concern. There may be a link to her previous strept throat and her skin concern. The diagnosis is most likely:

  - A. Pityriasis Rosea
  - B. Guttate psoriasis
  - C. Scabies
  - D. Exzema
  - E. Papular exzematosus

Answer on slide: 49
Question

Which of the following is true regarding Kawasaki’s Disease?

- A. It affects mucous membranes, walls of blood vessels and potentially, the heart
- B. The diagnosis is made once evidence of skin “sloughing” occurs
- C. Once diagnosed, the treatment is amoxicillin and acetaminophen for ten days
- D. Beta 2 agonists are key treatment approaches due to the persistent coughing spells
- E. Post-streptococcal glomerulonephritis is a potential complication.

Answer is on slide: 58
This viral illness is characterized by a rash on the face that starts at the hairline and moves downward. It is often accompanied by a high fever, sometimes to 103 F-104 F. The most likely diagnosis for this viral illness is:

A. German measles
B. Roseola
C. Pityriasis Rosea
D. Measles
E. Human Parainfluenza

The answer is on slide: 7