Dermatologic Presentations of Infectious Diseases in Children

Walter Dehority, MD, MSc
April 20th, 2017
Head to Toe Conference
Just How Contagious is Measles?
Just How Contagious is Measles?

• July 20th, 1991
  • The International Special Olympics began with the opening ceremonies at the Minneapolis Metrodome
    • 6,058 athletes participate
    • 55,000 spectators in attendance

Just How Contagious is Measles?

• July 24th, 1991
  • A 16 yo athlete from Argentina is seen at a Minnesota ED with fever, a morbilliform rash and conjunctivitis
  • An epidemic of measles was ongoing at that time in Argentina

Just How Contagious is Measles?

• 2 Weeks later
  • 2 confirmed secondary cases occurred in unrelated spectators
  • Both sat in the same section of the upper deck of the stadium
  • None had any direct contact with athletes

Outline

1.) Terminology/Background
2.) Bacterial Rashes
3.) Viral Rashes
4.) Fungal Rashes
5.) Parasitic Rashes
6.) Red Flag Rashes
7.) Infectious Disease Mimics
8.) Conclusion
1.) Terminology/Background---The Language of Rashes
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

Being able to describe a rash helps

1.) Classify the rash in your own mind and diagnose the problem
2.) Communicate to other health care providers
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

1.) Morphology
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

1.) Morphology
   a.) Papular
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

a.) Papular

---Raised, typically symmetrical lesions
---May or may not be red/erythematous
1. General Approach To Rashes (or, how do I describe What I’m Seeing?)

- 1.) Morphology
  - b.) Macular
General Approach To Rashes (or, how do I describe What I’m Seeing?)

b.) Macular
   ---Flat lesions, typically red/erythematous
   ---May or may not be symmetrical
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

1.) Morphology
   c.) Erythrodermic
1.) General Approach To Rashes  (or, how do I describe What I’m Seeing?)

c.) Erythrodermic
---‘Sunburn’ type rash---diffuse, confluent, erythematous, flat
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

1.) Morphology
   
d.) Vesicular
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

d.) Vesicular
   ---Raised, fluid-filled lesions
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

1.) Morphology
   d.) Umbilication of vesicle
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

- 1.) Morphology
  - e.) Morbilliform
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

  e.) Morbilliform
    ---Confluent, erythematous
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

• 1.) Morphology
  f.) Bullous
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

f.) Bullous
Large, fluid-filled lesions which may unroof
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

1.) Morphology
   g.) Pustular
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

g.) Pustular---Look like vesicles, filled with pus
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

1.) Morphology
   h.) Urticarial
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

h.) Urticarial
   ---Erythematous, amorphous, raised lesions, often with central clearing
   ---Often seen in allergic rashes, but can also be seen with viruses as well
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

2.) Color
   a.) Erythematous
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

2.) Color
   b.) Violaceous
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

2.) Color
   
   c.) Influence of darker skin
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

3.) Distribution
   --- Palms and soles?
   --- Trunk?
   --- Extremities?
   --- Enanthem?
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

3.) Distribution

**Enanthem**
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

4.) Blanching/Vascular or not?
   a.) Blanching (vascular)
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

4.) Blanching/Vascular or not?
   b.) Pettechial (non-vascular)
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

4.) Blanching/Vascular or not?
   c.) Purpura (non-vascular)---coalescent
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

5.) Symptoms?
   ---Tender
   ---Itchy
1.) General Approach To Rashes  (or, how do I describe What I’m Seeing?)

6.) Other
   ---Scaling
   ---Peeling
   ---Weeping
   ---Bleeding
1.) General Approach To Rashes (or, how do I describe What I’m Seeing?)

7.) Overall Context
   What else is going on?
2.) Bacterial Rashes
10-year-old 4th grader brought in for concern of child abuse due to mouth burns
Impetigo

• Key Facts
  • Most often caused by *S. aureus* and Group A *Streptococcus*
  • Classic honey crusting of lesions
  • Not ill-appearing
  • Typically afebrile
  • Predilection for oral/nasal regions, particularly in young children
  • Most commonly seen in children 5 and under

17-year-old football player sent to the health office by his coach for concern of a foot fracture during practice.
Cellulitis

- Warmth over the affected area
- May rapidly spread
- Tender, painful
- Often a precipitating trauma/break in skin
- May be febrile
- Confluent
3.) Viral Rashes
5-year-old kindergartner is brought to the health office by his teacher after he showed up to class with this rash.
Clinical Presentation of Measles: Or, How Do I Recognize It?
Clinical Presentation of Measles: Or, How Do I Recognize It?

• Key Findings
  • Fever
  • Rash
  • Koplik spots
  • The 3 “C’s”
    • Cough
    • Coryza (runny nose)
    • Conjunctivitis
Clinical Presentation of Measles: Or, How Do I Recognize It?

• **Key Details**
  • Fever
  • The 3 “C’s”
    • Cough
    • Coryza (runny nose)
    • Conjunctivitis (non-exudative)
  • All appear at onset at same time
Clinical Presentation of Measles: Or, How Do I Recognize It?

• Koplik Spots
  • White spots typically on buccal mucosa lateral to molars
  • Appear 2-3 days after fever and last 1-3 days
  • Typically disappear before rash appears
Clinical Presentation of Measles: Or, How Do I Recognize It?

• Key Details
  • Rash
    • Involves palms and soles in 50%

Non-exudative conjunctivitis vs. Exudative
Measles Timeline

- Fever
- Cough
- Conjunctivitis
- Coryza

Fever: 2-3 days
Cough: 2-3 days
Conjunctivitis: 2-3 days
Coryza: 8 days
Koplik Spots: 2-3 days
Rash: 2-3 days
Koplik spots gone: 2-3 days
Fever/cough gone: 10 days

Contagious 4 days before and 4 days after rash appears.
Complications of Measles: It’s not ‘Just a Virus’*

<table>
<thead>
<tr>
<th>Complication</th>
<th>Overall rate (out of 66,800 patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any</td>
<td>29.1%</td>
</tr>
<tr>
<td>Death</td>
<td>0.3%</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>8.2%</td>
</tr>
<tr>
<td>Encephalitis</td>
<td>0.1%</td>
</tr>
<tr>
<td>Hospitalization</td>
<td>19.2%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>5.9%</td>
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</table>

*----data from United Kingdom and the United States

Source: CDC.gov
Re: the Kindergartner---how worried are you about other students in the school getting measles?

• A.) Very
• B.) Not at all
• C.) Kind of
• D.) Run screaming from your office yelling ‘Measles is coming! Measles is coming!’
• E.) It depends
Re: the Kindergartner---how worried are you about other students in the school getting measles?

• E.) It depends (on your vaccination rate for measles at the school)
Herd Immunity: Measles

- Reproductive number of 12-18
- Herd Immunity Threshold=92-94% (very high for a vaccine preventable disease)
- Vaccine---95% effective for 1 dose, 99% for 2

What type of infection control measures does the child need?

• A.) None
• B.) He should wear a mask
• C.) Airborne precautions for 4 days after the rash appeared
• D.) No return to school for 1 week after the rash resolves
Airborne Precautions!
A 12-year-old girl is brought to the school’s nurse for the following rash noted just after arrival in the morning.
Varicella
Varicella---Characteristics

- Dew drop on a rose petal (vesicle on a red base)
- Different stages of lesions (crusted, vesicular, macular, etc)
- Multiple lesions (250-500 at a time)
- Fever
- May be unimmunized
# Different Types of Varicella

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<th>Post-Vaccine</th>
<th>Breakthrough Varicella</th>
<th>Shingles</th>
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<td>Distribution</td>
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<td>All over</td>
<td>Focal---dermatome</td>
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<tr>
<td># Lesions</td>
<td>300-500</td>
<td>10-30</td>
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<td>&lt;100</td>
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<td>Yes</td>
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<tr>
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<td>No</td>
<td>No</td>
<td>No</td>
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<td>Yes---respiratory and contact</td>
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Breakthrough Varicella
Primary Varicella
Shingles
6-year-old first grader with several days of fevers and red cheeks
Parvovirus B19 (slapped cheeks syndrome)
Seroprevalence of Parvovirus by Age
Variables Affecting Parvovirus Seropositivity

<table>
<thead>
<tr>
<th>Variable</th>
<th>% Seropositive</th>
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<tr>
<td>Female</td>
<td>64%</td>
</tr>
<tr>
<td>Contact with children 5-18 yo at work</td>
<td>64%</td>
</tr>
<tr>
<td>Elementary school worker</td>
<td>64%</td>
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N=2,730

Risk of Fetal Demise with Parvovirus Infection

• Assuming
  • 50% seropositivity
  • Epidemic setting (1-4% infection rate during pregnancy)\(^1\)
  • 5-10% fetal demise

...Risk of fetal death after exposure in a woman with unknown serological status is 1:500 to 1:4,000

9 year old 3\textsuperscript{rd} grader sent to the health office for concern of chicken pox.
Molluscum contagiosum
12 year old 6th grader sent to the health office for concern of measles. A student nurse with whom you are working states she sees Koplik spots, and that the child recently immigrated from Guatemala.
Hand, foot and mouth disease (Coxsackie virus)

- Generally benign and self-resolves
- Febrile, may be ill-appearing
- More common in the fall
4.) Fungal Rashes
16-year-old High School student taken to health office for severe rash over abdomen
Tinea Infections

- *Tinea corporis*= body
- *Tinea capitis*= scalp
- *Tinea cruris*= inguinal (jock itch)
- *Tinea pedis*= foot (athlete’s foot)
Tinea Infections

• Red
• Ring-shaped
• Well-demarcated
• Central clearing
• Scaly borders
• May become confluent
5.) Parasitic Rashes
9-year-old 3rd grader brought out of class for excessive scratching of his fingers
Scabies
Scabies---Key Facts

- Symptoms may take 2-6 weeks to occur after infection
- Predilection for flexural areas, finger/toe webbing, groin
- Linear burrows
- Very pruritic

Infection Control Issues

When can the child return to school?

• A.) Immediately, as long as he is treated within the week
• B.) After beginning treatment
• C.) After completing treatment
• D.) After he AND all other children in the classroom have been treated
• E.) When his rash has completely resolved
Infection Control Issues

When can the child return to school?

• C.) After completing treatment

Infection Control Issues

What needs to be done for the rest of the class?

• A.) All children should receive preventive therapy
• B.) Only close school contacts (e.g. deskmates) should receive preventive therapy
• C.) No one should receive preventive therapy
• D.) Treat the whole class only if one other student develops scabies
• E.) It depends

Infection Control Issues

What needs to be done for the rest of the class?

• E.) It depends---may use prophylactic treatment if prolonged skin-to-skin contact existed (like household contact)

6.) ‘Red Flag’ Rashes---What is it and Why?
‘Red Flag’ Rashes---Measles

- Measles
  - Morbilliform, erythematous rash
  - Koplik spots (lesions in mouth, often near molars)
  - Non-exudative conjunctivitis
  - Should be febrile with the rash
  - Rash starts on the head and works its way down to the feet
  - Does involve the palms and soles
8-year-old 2\textsuperscript{nd} grader sent to office in first period with this rash
'Red Flag' Rashes

- Varicella
  - Vesicular rash, with umbilication
  - Different stages of lesions
  - Erythematous base
  - Febrile, ill-appearing
‘Red Flag’ Rashes

• ---Non-exudative conjunctivitis present
• ---Palms and soles involved
• ---Blanching
• ---Ill-appearing, dizzy, confused
• ---Febrile
‘Red Flag’ Rashes

• Toxic Shock Syndrome
  • ---Erythrodermic, erythematous blanching rash
  • ---Febrile, ill appearing
  • ---May be associated with tampon use or ear ring placement (from *S. aureus* on skin)
• ---Need hospitalization, often in an ICU setting
‘Red Flag’ Rashes

15 yo boy comes to the nurses’ office over lunch hour with complaint of ‘not feeling well’ and a sense that ‘something bad is about to happen’
‘Red Flag’ Rashes

• Meningococccemia (*N. meningitidis*)
  • ---Very ill-appearing (febrile, shock)
  • ---Petechiae/purpura common
  • ---Virtually 100% death rate if untreated
  • ---Rapid progression
  • ---EMS/Ambulance ASAP
When to Call the DOH?

• Which of the following illnesses require DOH notification (may be more than one)?

• A.) Measles
• B.) Varicella
• C.) Scabies
• D.) Toxic Shock Syndrome
• E.) Meningococcemia
When to Call the DOH?

• Which of the following illnesses require DOH notification (may be more than one)?

• A.) Measles

• E.) Meningocococcemia
7.) Infectious Disease Mimics
Infectious Disease Mimics

- 8-year-old girl has been on Bactrim for 3 days for a UTI, comes to the nurses’ office for a rash that began earlier in the day
Infectious Disease Mimics

• 8-year-old girl has been on Bactrim for 3 days for a UTI, comes to the nurses’ office for a rash that began earlier in the day
Infectious Disease Mimics

Stevens-Johnson syndrome
---Associated with antibiotic exposure
---Mucous membrane involvement (e.g. conjunctivitis)
---Very ill---require hospitalization
Infectious Disease Mimics
12-year-old 6th grader with this rash after starting amoxicillin for strep throat
Infectious Disease Mimics

• Erythema multiforme
• Often seen with drug rashes and viruses
Infectious Disease Mimics

• 12-year-old boy comes to the nurses’ office after his teacher notices a rash. Upon reviewing his file, you see that he is due for a dose of amoxicillin at the lunch hour.
Infectious Disease Mimics

Possible drug rash
--- Red flag signs
  --- Rash starts within 24 h of the first dose of the drug
  --- Airway compromise (e.g. wheezing, tongue swelling)
  --- Rash is urticarial
Infectious Disease Mimics

Signs that it may not be too worrisome

---Rash starts >3 days from first dose of drug
---No urticaria
---No sloughing of skin/bullae
---No mucous membrane involvement
---No airway involvement
• What Percentage of patients self-reporting a penicillin allergy actually have one when tested?

• A.) 10-20%
• B.) 20-40%
• C.) 40-60%
• D.) 60-80%
• E.) 80-100%
• What Percentage of patients self-reporting a penicillin allergy actually have one when tested?
• A.) 10-20%

13-year-old 7th grader brought in to the health office for concern of shingles
Bed Bug Bites---Key Facts

• Bitten during sleep
• Painless bites
• Occurs mainly over exposed skin (face, neck, hands, arms)
• Often a linear pattern of lesions (the bugs probe multiple sites along a blood vessel for food)
• May have specks of blood on sheets/bedding
Fun (or gross) Bed Bug Facts!

• How long can bed bugs last without feeding in a mattress?

• A.) 1 week
• B.) 1 month
• C.) 6 months
• D.) 1 year
• E.) 5 years
Fun (or gross) Bed Bug Facts!

• How long can bed bugs last without feeding in a mattress?

  D.) 1 year

11-year-old 5th grade boy brought in for concern of cellulitis over his right arm.
Spider Bites---Key Facts

• No way to confirm most cases
• History of a bite may be absent
• Often circular and circumscribed
• Erythematous
• Variable pain
• May see bite marks in the center of the lesion
• Typically does not spread much (as opposed to cellulitis)
• Most due to the Brown Recluse and the Black Widow

Conclusion

An Ancient Plague...

Petrarch
“...I still have, and do not know how long it will torment me, a dry and ugly scabies...Since 5 months...this illness oppresses me so much...my hands...serve only to scratch and scrape it...I certainly know only one thing about my illness: that it will soon leave me or I will leave it: we cannot be together for a long time”.

Francisco Petrarca, age 61
“...I had and I still have a continuous and fiery itching and a dry scabies, to remove these arid scales and slag, there is just barely the assiduous nail at day and night...and after long scratching the scabies, the sleep is very sweet.”

Giovanni Bocaccio
Tel-Amarna, Egypt
250 miles South of Cairo
• Archeologists conduct an excavation in el-Amarna Egypt
• The city was founded in 1352 b.c. by the Pharaoh Akhenaten
• The city housed workers who helped build tombs and other Egyptian monuments---“The Workers’ Village”
• Later the city housed guards during the reign of Tut-ankhamun (1350-1323 bc)
• Living condition were likely sub-standard
Cimex lectularius L., the common bed bug from Pharaonic Egypt

EVA PANAGIOTAKOPULU & PAUL C. BUCKLAND*