Rash and fever are some of the most common chief complaints presenting to the emergency department. The evaluation of rashes in the febrile pediatric patient includes a broad differential diagnosis and use of the history and physical examination to identify red flags, such as hemodynamic instability, erythroderma, desquamation, petechiae/purpura, mucous membrane involvement, and severe pain, that should increase suspicion for worrisome disease. This issue reviews characteristics of common rashes as well as rarer, potentially life-threatening rashes, to guide management and treatment and improve patient outcomes.


**Case Presentations**

You arrive to a busy afternoon shift in the ED. Your first patient is a 1-year-old boy with rhinorrhea, congestion, cough, and 3 days of fever up to 39.4°C (103°F), measured rectally. His parents state that he has been playful at home and continues to eat and drink normally. They have been giving him acetaminophen and ibuprofen sporadically, but today he developed a generalized rash, and they became concerned. His vital signs are as follows: temperature, 38.7°C (101.7°F); heart rate, 135 beats/min; and blood pressure, 85/55 mm Hg. On examination, the rash is macular, erythematous, and blanching, but his eyes and mouth appear normal.

In the next room, there is a 3-year-old boy with a similar history who had mild rhinorrhea and a low-grade fever of 38.1°C (100.5°F) at home. His parents are concerned that he has been complaining of pain in his legs, on which they have noticed dark spots. He has continued to drink well, though he has been eating slightly less. His vitals signs are as follows: temperature, 37.5°C (99.5°F); heart rate, 120 beats/min; and blood pressure, 90/60 mm Hg. You observe some nonblanching spots on his lower extremities and buttocks, as well as mild edema and tenderness of his knees and ankle, but the boy is still able to bear weight with a mild limp.

Before you finish examining the boy, a nurse asks you to see another patient who she says does not look well. The patient is a 9-year-old girl with a history of ulcerative colitis who was seen from her pediatrician’s office. She has had 4 days of sore throat and low-grade fever at home, and her parents assumed she had a cold. She tested positive for strep throat at her appointment today. Her vital signs are as follows: temperature, 38.5°C (101.3°F); heart rate, 126 beats/min; and blood pressure, 85/60 mm Hg. On examination, her skin appears diffusely erythematous as if she has a severe sunburn.

These 3 patients all presented with dermatologic findings and fever. How do you determine which patients are truly ill, and which are not? Are there any red flags for recognizing rashes that could be life-threatening? Are there any key components to the history that are concerning? Do all of the patients need laboratory workup, or can you safely offer supportive care? Should any of these children be on isolation, either for their safety or for the safety of others?

**Introduction**

According to a 2015 United States Centers for Disease Control and Prevention (CDC) report, the single most common chief complaint for children aged < 15 years was fever, and the fifth most common was skin rash.

When paired, fever and rash may create a diagnostic dilemma for the emergency clinician. Although many relatively benign conditions present with these symptoms, some life-threatening disease states will also present as a rash in a febrile patient. Since the differential diagnosis is broad, most management decisions will be directed by key components of the history and physical examination, and any red flags. These findings should prompt consideration of diseases that would be severely detrimental to the child’s health if missed.

Some rashes, such as varicella, measles, and rubella, may represent a public health concern. Diseases such as these have become slightly more prevalent in the United States, due to caregiver concerns regarding vaccinations. Rates of meningococcal disease have decreased; however, this disease does have high rates of morbidity and mortality.

This issue of *Pediatric Emergency Medicine Practice* reviews various disease states, from benign to life-threatening, that can present as a fever with rash in a child. Workup, treatment, and disposition recommendations are provided based on key features of the history and physical examination.

**Critical Appraisal of the Literature**

A literature search was performed using PubMed. Search terms included fever, rash, viral exanthema, measles, scarlet fever, rubella, varicella, roseola, parvovirus, lyme disease, erythema migrans, Rocky Mountain spotted fever, acute rheumatic fever, erythema marginatum, Kawasaki disease, Henoch–Schönlein purpura, HSP and steroids, erythrodema, staphylococcal scalded skin syndrome, meningococcal disease, Neisseria meningitidis, purpura and fever, and toxic shock syndrome.

Multiple reviews and case reports were found, but, overall, evidence-based literature and original research was scarce. Information from the World Health Organization (WHO) and the CDC was also incorporated, as well as information from textbooks in infectious disease, emergency medicine, and pediatrics specialties.

**Etiology and Pathology**

The combination of rash and fever can be a chief complaint that many clinicians find challenging to manage, as there are a multitude of etiologies that can present with these symptoms; some are common diagnoses and others are “can’t miss” diagnoses. (See Table 1, page 3.) The can’t miss diagnoses, when not identified and treated in a timely manner, can cause significant morbidity and mortality.

Most well-recognized childhood exanthems are caused by viral etiologies. Many viruses can present with nonspecific exanthema; most commonly, a maculopapular/morbilliform pattern is seen. Table 2, page 4 describes some of the typical exanthema seen in pediatric patients. When attempting to determine the etiology, it is best to identify the characteristics of the rash first and then develop an appropriate differential diagnosis.
## Differential Diagnosis

The differential diagnosis is very broad for the febrile pediatric patient with rash and is narrowed down by the history and physical examination findings to differentiate potentially dangerous or life-threatening diseases from those that will need minimal testing and treatment. *(See Table 3, page 5.)*

Endemic diseases, including mosquito-borne and tick-borne illnesses will not be discussed in this issue. For more information on management of tick-borne illness, see the September 2018 issue of *Pediatric Emergency Medicine Practice,* “Tick-Borne Illnesses: Identification and Management in the Emergency Department,” available at: www.ebmedicine.net/ticks. If the history is consistent with these etiologies, they should be kept in the differential.

While beyond the scope of this article, drug reactions are both common (eg, serum sickness-like reaction) as well as dangerous (eg, Stevens-Johnson syndrome/toxic epidermal necrolysis and drug reaction with eosinophilia and systemic symptoms [DRESS]) and are important considerations in the differential of a febrile rash.

### Table 1. Common, Non–Life-Threatening Diagnoses and “Can’t Miss,” Life-Threatening Diagnoses

<table>
<thead>
<tr>
<th>Type of Disease</th>
<th>Diagnoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common, non–life-threatening</td>
<td>• Viral exanthema&lt;br&gt;• Roseola&lt;br&gt;• Parvovirus&lt;br&gt;• Coxsackievirus (hand, foot, and mouth disease)&lt;br&gt;• Varicella&lt;br&gt;• Measles&lt;br&gt;• Epstein-Barr virus/cytomegalovirus&lt;br&gt;• Eczema herpeticum&lt;br&gt;• Scarlet fever&lt;br&gt;• Lyme disease&lt;br&gt;• Erythema multiforme&lt;br&gt;• Henoch-Schönlein purpura&lt;br&gt;• Cellulitis/erysipelas</td>
</tr>
<tr>
<td>Life-threatening, “can’t miss”</td>
<td>• Staphylococcal scalded skin syndrome&lt;br&gt;• Meningococcal disease (<em>Neisseria meningitidis</em>)&lt;br&gt;• Toxic shock syndrome&lt;br&gt;• Stevens-Johnson syndrome/toxic epidermal necrolysis&lt;br&gt;• Kawasaki disease&lt;br&gt;• Drug reaction with eosinophilia and systemic symptoms (DRESS)&lt;br&gt;• Acute rheumatic fever&lt;br&gt;• Rocky Mountain spotted fever</td>
</tr>
</tbody>
</table>

## Prehospital Care

Prehospital care should begin with evaluation and management of the patient’s airway, breathing, and circulation; obtaining initial vital signs; and stabilizing an unstable patient. If prehospital personnel have acetaminophen or ibuprofen, either would be appropriate to administer to the febrile child, after checking with the caregivers for allergies and any previous medications given. If the patient appears severely dehydrated or is hypotensive, intravenous (IV) access should be obtained to start IV fluids. Care should be taken to assess blood pressure in relation to the patient’s age. If the patient is not alert and oriented, or if they have not been eating, point-of-care glucose is indicated.

If there is any concern for a communicable disease that would require isolation, emergency medical services should utilize personal protection equipment and alert hospital personnel so that the proper precautions can be taken on arrival to the emergency department (ED). One of the main barriers to proper isolation precautions is timely initiation.

## Emergency Department Evaluation

### History

Multiple etiologies of fever with rash are possible, and key components in the history can guide the clinician in determining the need for additional testing and the next steps in evaluation. The history should begin with determining the timeline (eg, Which came first, the rash or the fever? Has the fever resolved?) and characteristics of the rash as well as other symptoms of the illness. Additionally, consider the time of the year, the region in which the patient lives, and any recent travel history, as this will guide consideration of any endemic diseases.

Vaccination status in pediatric patients should prompt the clinician to consider moving some diseases higher or lower on the differential diagnosis. Vaccine-preventable diseases, such as measles, varicella, and rubella, all have classic exanthems. If a patient has recently moved to the United States, the child may not only be unvaccinated but may also have been exposed to diseases that are considered to be eradicated in the United States. Questions related to immune compromise are important to include, as immunocompromised patients have different susceptibility to pathogens that do not affect the general population. Additional considerations include recent medication use that may indicate drug-related conditions, recently received vaccines, and sick contacts in the home.

### Physical Examination

The physical examination should begin with a review of the patient’s vital signs to determine whether the child requires immediate intervention. In general, a
happy, playful child indicates a more benign etiology in comparison to an irritable or ill-appearing child who might have a more serious illness. Key components of the physical examination include a thorough investigation of the skin as well as searching for associated signs in other body systems.

**Skin Examination**
The child should be completely undressed, and a good light source should be used during the examination. Correctly describing the qualities of the rash not only helps with documentation and when discussing the case with other clinicians but also facilitates formulation of the differential. When examining the skin, look for the major distribution of the rash, with particular attention to involvement of the palms and soles. Note whether the rash is primarily on the extremities or only in a localized area, whether the mucous membranes are involved (including the mouth, conjunctiva, and genitals), and whether the rash blanches or not. Another important clue is the presence or absence of the Nikolsky sign (the extension of peeling or blistering skin caused by separation of the layers of skin when firm, sliding pressure is applied to the skin). Tables 3 and 4, page 5 include identifying skin examination characteristics and rash morphologies that can guide the differential.

**Table 2. Common Exanthem Characteristics Seen in Pediatric Patients**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Measles</th>
<th>Scarlet Fever</th>
<th>Fifth Disease</th>
<th>Roseola</th>
</tr>
</thead>
<tbody>
<tr>
<td>Causative agent</td>
<td><em>Measles virus</em></td>
<td>Group A <em>Streptococcus</em></td>
<td><em>Human parvovirus B19</em></td>
<td><em>Human herpesvirus 6</em></td>
</tr>
<tr>
<td>Transmission method</td>
<td>Respiratory droplets</td>
<td>Respiratory droplets</td>
<td>Respiratory droplets</td>
<td>Saliva</td>
</tr>
<tr>
<td>Incubation period</td>
<td>8-12 days</td>
<td>2-5 days</td>
<td>4-21 days</td>
<td>10-15 days</td>
</tr>
<tr>
<td>First-stage symptoms</td>
<td>• Mild fever</td>
<td>• Fever</td>
<td>• Malaise</td>
<td>• Mild sore throat</td>
</tr>
<tr>
<td></td>
<td>• Cough</td>
<td>• Sore throat</td>
<td>• Fever</td>
<td>• Rhinorrhea</td>
</tr>
<tr>
<td></td>
<td>• Coryza</td>
<td>• Red “slapped” cheeks</td>
<td>• Conjunctivitis</td>
<td>• Conjunctivitis</td>
</tr>
<tr>
<td></td>
<td>• Conjunctivitis</td>
<td></td>
<td></td>
<td>• High fever</td>
</tr>
<tr>
<td></td>
<td>• Koplak spots</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-stage duration</td>
<td>2-4 days</td>
<td>1-2 days</td>
<td>4-14 days</td>
<td>3-5 days</td>
</tr>
<tr>
<td>Second-stage symptoms</td>
<td>Maculopapular rash beginning on head and spreading to the trunk and extremities</td>
<td>Fine, erythematous papular eruption</td>
<td>Pruritic, lacy rash sparing palms and soles</td>
<td>After fever, tiny erythematous papules on trunk spreading to neck/extremities</td>
</tr>
<tr>
<td>Second-stage duration</td>
<td>7-10 days</td>
<td>3-4 days</td>
<td>Up to 3 weeks</td>
<td>1-3 days</td>
</tr>
<tr>
<td>Treatment</td>
<td>Supportive</td>
<td>Penicillin or cephalosporin</td>
<td>Supportive</td>
<td>Supportive</td>
</tr>
<tr>
<td>Vaccine</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>


**Diagnostic Studies**

One of the more difficult aspects of diagnosing a pediatric patient who presents with a fever and rash is that no single test provides a diagnosis. To avoid unnecessary testing, diagnosis should rely on visual examination together with the history and other physical examination findings. Diagnostic testing specific to individual etiologies is discussed in the "Management of Specific Etiologies of Rash and Fever" section, beginning on page 5. Table 6, page 6 provides a summary of diagnostic testing that can be obtained based on suspicion for specific diseases.
Management of Specific Etiologies of Rash and Fever

Management should be based on the etiology of the rash. The majority of cases will be benign viral exanthema, and often, the only treatment necessary is supportive care. Giving acetaminophen 15 mg/kg every 4 hours or ibuprofen 10 mg/kg every 6 hours (in children aged > 6 months) will help with fever and discomfort. Etiology-specific treatment is discussed in the following sections.

Table 3. Differential Diagnosis Based on Rash Morphology

<table>
<thead>
<tr>
<th>Morphology</th>
<th>Additional Characteristics</th>
<th>Disease/Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maculopapular</td>
<td>Central, blanching</td>
<td>• Measles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Roseola</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Parvovirus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Viral exanthem</td>
</tr>
<tr>
<td></td>
<td>Central, nonblanching</td>
<td>• Acute rheumatic fever</td>
</tr>
<tr>
<td></td>
<td>Peripheral, targetoid</td>
<td>• Erythema multiforme</td>
</tr>
<tr>
<td></td>
<td>Peripheral, nontargetoid</td>
<td>• Meningococcemia</td>
</tr>
<tr>
<td>Vesicular/bullous</td>
<td>Diffuse</td>
<td>• Varicella</td>
</tr>
<tr>
<td></td>
<td>Localized</td>
<td>• Coxackievirus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Eczema herpeticum</td>
</tr>
<tr>
<td>Erythematous</td>
<td>Positive Nikolsky sign b</td>
<td>• Staphylococcal scalded skin syndrome</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Stevens-Johnson syndrome</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Toxic epidermal necrosis</td>
</tr>
<tr>
<td></td>
<td>Negative Nikolsky sign b</td>
<td>• Toxic shock syndrome</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Kawasaki disease</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Scarlet fever</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lyme disease</td>
</tr>
<tr>
<td>Petechial/purpuric</td>
<td>Palpable</td>
<td>• Rocky Mountain spotted fever a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Henoch-Schönlein purpura</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Meningococcemia</td>
</tr>
<tr>
<td></td>
<td>Nonpalpable</td>
<td>• Disseminated intravascular coagulation</td>
</tr>
</tbody>
</table>

Maculopapular Rashes

Measles

According to a survey from the CDC, rates of measles cases increased from 63 in 2010 to 667 in 2014. Most recent reports from the CDC have noted that, as of October 1, 2019, > 1000 cases of measles have been reported, the most since 1992. The virus is extremely contagious and is spread by both respiratory droplets and aerosolized particles that remain in the air for up to 2 hours. This leads to a high rate of transmission in those who are not immune and are exposed to the virus. Once exposed, there is an incubation period of approximately 10 to 14 days prior to the development of fever. Up to 9 out of 10 susceptible persons with close contact to a measles patient will develop measles. For this reason, the CDC recommends that anyone with suspected measles should be placed on airborne precautions immediately, including staying in a negative pressure room, and healthcare staff should use an N-95 respirator (or equivalent airborne precautions).

Table 5. Nondermatological Physical Examination Findings by Disease/Condition

<table>
<thead>
<tr>
<th>Disease/Condition</th>
<th>Physical Examination Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herpangina due to coxsackievirus</td>
<td>Vesicles in the posterior oropharynx</td>
</tr>
<tr>
<td>Measles</td>
<td>Koplik spots</td>
</tr>
<tr>
<td>Toxic epidermal necrosis</td>
<td>Mucosal ulcerations</td>
</tr>
<tr>
<td>Kawasaki disease</td>
<td>Conjunctival injection, mucous membrane changes</td>
</tr>
<tr>
<td>Kawasaki disease, undiagnosed streptococcal pharyngitis</td>
<td></td>
</tr>
<tr>
<td>Epstein-Barr virus</td>
<td>Posterior adenopathy, splenomegaly</td>
</tr>
<tr>
<td>Henoch-Schönlein purpura</td>
<td>Diffuse abdominal tenderness (bowel inflammation)</td>
</tr>
<tr>
<td>Erythema multiforme, acute rheumatic fever</td>
<td>Joint pain, swelling</td>
</tr>
</tbody>
</table>
Once a person is infected, the virus moves from the respiratory tract to the lymphatic system and the bloodstream. The disease begins with a viral prodrome characterized by mild to moderate fever, cough, coryza, and conjunctivitis. During this time, children may also develop Koplik spots that appear as small white, grey, or bluish spots with an erythematous base that develop along the buccal mucosa opposite the molar teeth. Koplik spots are pathognomonic for measles, and if noted by a clinician, the diagnosis of measles can be made even before the rash appears. Approximately 3 to 4 days after symptoms begin, a morbilliform rash appears, starting on the head, behind the ears and then extending to the torso and extremities. (See Figure 1.) As the rash progresses, confluent areas may appear.

The rash begins to fade around the fifth day after development, in the same cephalocaudad pattern. At this point, fever tends to be quite high, typically ranging from 39°C to 40.5°C (102.2°F-104.9°F). The patient is contagious from 4 to 5 days prior to and after appearance of the rash, and strict isolation precautions should be put into place.

Measles can have multiple complications, ranging from relatively benign to quite severe, including death. According to the WHO, in 2015, there were 134,200 deaths worldwide from measles. Death is most often the result of measles-associated pneumonia. It is estimated that 30% to 40% of patients infected with measles will suffer at least 1 complication, including hearing loss or blindness, or death. Those who suffer from malnourishment and vitamin A deficiency specifically have the highest rate of complications.

Treatment of measles is mainly supportive care, as well as treatment of any secondary infections. As vitamin A deficiency has been linked to worsened outcomes, patients with an acute case of measles (especially immunocompromised patients) should be treated with vitamin A. For more information on management of measles, see the December 2016 issue of *Pediatric Emergency Medicine Practice*, “Vaccine-Preventable Diseases in Pediatric Patients: A Review of Measles, Mumps, Rubella, and Varicella,” available at: [www.ebmedicine.net/vaccine](http://www.ebmedicine.net/vaccine).

### Table 6. Recommended Diagnostic Studies Based on Suspected Etiology

<table>
<thead>
<tr>
<th>Suspected Etiology or Signs/Symptoms</th>
<th>Recommended Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petechiae</td>
<td>Prothrombin time</td>
</tr>
<tr>
<td>Purpura</td>
<td>Partial thromboplastin time</td>
</tr>
<tr>
<td>Unexplained bleeding</td>
<td>International normalized ratio</td>
</tr>
<tr>
<td>Henoch-Schönlein purpura</td>
<td>Urinalysis</td>
</tr>
<tr>
<td>Kawasaki disease</td>
<td></td>
</tr>
<tr>
<td>Fever of unknown origin (evaluate for source of infection)</td>
<td>Urinalysis</td>
</tr>
<tr>
<td>Scarlet fever</td>
<td>Rapid strep test</td>
</tr>
<tr>
<td>Toxic shock syndrome</td>
<td>Throat culture</td>
</tr>
<tr>
<td>Acute rheumatic fever</td>
<td>Antiestreptolysin titers</td>
</tr>
<tr>
<td>Acute rheumatic fever</td>
<td>Electrocardiogram</td>
</tr>
<tr>
<td>Kawasaki disease</td>
<td></td>
</tr>
<tr>
<td>Lyme disease</td>
<td></td>
</tr>
<tr>
<td>Persistent tachycardia (evaluate for myocarditis)</td>
<td>Electrocardiogram</td>
</tr>
<tr>
<td>Measles</td>
<td>Disease-specific testing</td>
</tr>
<tr>
<td>Rubella</td>
<td></td>
</tr>
<tr>
<td>Varicella</td>
<td></td>
</tr>
<tr>
<td>Rocky Mountain spotted fever</td>
<td></td>
</tr>
<tr>
<td>Lyme disease</td>
<td></td>
</tr>
<tr>
<td>Myocarditis</td>
<td></td>
</tr>
<tr>
<td>Lyme disease with signs of meningitis</td>
<td>Cerebrospinal fluid studies</td>
</tr>
<tr>
<td>Concern for <em>Neisseria meningitidis</em></td>
<td></td>
</tr>
<tr>
<td>Concern for viral meningitis</td>
<td></td>
</tr>
<tr>
<td>Henoch-Schönlein purpura with abdominal pain (evaluate for intussusception)</td>
<td>Abdominal ultrasound</td>
</tr>
<tr>
<td>Kawasaki disease</td>
<td>Erythrocyte sedimentation rate</td>
</tr>
<tr>
<td>Acute rheumatic fever</td>
<td>C-reactive protein</td>
</tr>
</tbody>
</table>


To view full-color versions of the images in this issue, scan the QR code below with an enabled device or go to: [www.ebmedicine.net/fever-rash-figures](http://www.ebmedicine.net/fever-rash-figures).
Roseola
Roseola is caused by *Human herpesvirus 6* and is transmitted via saliva. Up to 90% of children are infected by the age of 2 years; however, only 20% of patients develop the nonspecific rash, so many will remain undiagnosed.9

After an approximate 10-day incubation period, roseola typically presents with upper respiratory symptoms accompanied by high fever and cervical lymphadenopathy. The hallmark of the illness is that the rash does not appear until approximately 12 to 24 hours after the fever resolves, and it is characterized by small, erythematous, blanching papules, often starting on the trunk and spreading outward.11 (See Figure 3.) A known complication of the disease is an increased prevalence of febrile seizure, occurring in up to 15% of those infected.12 Treatment is symptomatic.

Acute Rheumatic Fever
Acute rheumatic fever (ARF) is an inflammatory disorder caused by an autoimmune response following group A streptococcal infection,13 typically occurring within 2 to 4 weeks after the initial infection. His-

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**Erythema Infectiosum (Fifth Disease)**
Erythema infectiosum (also known as Fifth disease) is caused by *Human parvovirus B19*. The classic exanthema is best characterized by the “slapped cheek” appearance of the rash; the perioral region and nasal folds are spared. However, a whole-body, itchy, lacy rash can also develop, potentially lasting for weeks.9 (See Figure 2.) Prior to appearance of the rash, the patient will exhibit symptoms typical of an upper respiratory illness. By the time the rash appears and the diagnosis is suspected, the patient will no longer be contagious. The virus is spread via respiratory droplets. Patients with suspected Fifth disease should be placed in proper isolation, primarily because infection in a pregnant woman may cause severe hydrops fetalis or intrauterine fetal death, although in the vast majority of cases, the pregnancy is uncomplicated. Older individuals may develop arthralgias, and rarely may develop an itchy, irritating extremity rash referred to as papular-purpuric gloves and socks syndrome.10 Treatment for Fifth disease is symptomatic.

**Figure 2. Rash of Erythema Infectiosum (Fifth Disease)**

Note the appearance of the “slapped cheeks” and the full-body rash. Republished with permission of McGraw-Hill Education, from Atlas of Emergency Medicine, Kevin J. Knoop, et al, 4th edition, © 2016; permission conveyed through Copyright Clearance Center, Inc.

**Figure 3. Viral Exanthema of Roseola**

Historically, ARF has a higher incidence in developing countries as well as in certain geographical areas, such as among indigenous populations in Australia and New Zealand. Clinical manifestations of ARF include carditis, arthritis, chorea, and skin manifestations such as subcutaneous nodules and erythema marginatum. Subcutaneous nodules are firm, painless growths found on the extensor surfaces of the knees, elbows, and wrists; they can also occur on the occiput and along the thoracic and lumbar spinous processes. Erythema marginatum is a pink rash with pale centers and rounded or serpiginous margins. Confirmation of the diagnosis is made using the Jones criteria, which were last revised in 2015 by the American Heart Association. (See Table 7.)

If there is high suspicion for ARF, the patient should be admitted to the hospital for further diagnostic workup and management. Diagnostic studies in patients with concern for ARF include a complete blood cell (CBC) count with differential; inflammatory markers, including erythrocyte sedimentation rate (ESR), C-reactive protein (CRP); antistreptolysin O (ASO) titers; and electrocardiogram and echocardiogram.

<table>
<thead>
<tr>
<th>Criteria for Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major criteria:</td>
</tr>
<tr>
<td>• Carditis</td>
</tr>
<tr>
<td>• Chorea</td>
</tr>
<tr>
<td>• Polyarthritis in low-risk populations; monoarthritis or polyarthritis in moderate-risk and high-risk populations</td>
</tr>
<tr>
<td>• Erythema marginatum</td>
</tr>
<tr>
<td>• Subcutaneous nodules</td>
</tr>
<tr>
<td>Minor criteria:</td>
</tr>
<tr>
<td>• Fever &gt; 38.5°C (101.3°F)</td>
</tr>
<tr>
<td>• Polyarthritis in low-risk populations; monoarthritis in moderate-risk and high-risk populations</td>
</tr>
<tr>
<td>• Prolonged PR interval; patient cannot have carditis as a major criterion</td>
</tr>
<tr>
<td>• ESR &gt; 60 mm/h in low-risk populations, ESR &gt; 30 mm/h in moderate-risk and high-risk populations, or CRP &gt; 3 mg/dL</td>
</tr>
</tbody>
</table>

*Patient must have evidence of preceding group A streptococcal infection for diagnosis. Abbreviations: CRP, C-reactive protein; ESR, erythrocyte sedimentation rate.

Primary prophylaxis (ie, treatment of group A streptococcal pharyngitis) reduces the risk of developing ARF. Penicillin is the first-line treatment and may be given orally for a complete 10-day course. However, intramuscular penicillin G benzathine (patients weighing ≤ 27 kg, 600,000 units as a one-time dose; patients weighing > 27 kg, 1.2 million units as a one-time dose) can obviate the need for daily compliance. Secondary prophylaxis, intramuscular penicillin G benzathine every 3 to 4 weeks to prevent additional streptococcal infections, has been shown to reduce rheumatic valvular lesions over time. Due to the nature of this injection, this course of care should be discussed with the caregivers. Aspirin remains first-line treatment for carditis, although naproxen may be as effective with fewer side effects. Corticosteroids in addition to IV immunoglobulin G (IVIG) may also be considered in patients with moderate to severe carditis. Treatment goals include elimination of the group A streptococcal infection, supportive treatment, and treatment to prevent long-term sequelae, such as chronic rheumatic heart disease. Overall, the incidence of ARF is declining; however, the morbidity rate for rheumatic heart disease or its complications is still approximately 305,000 cases per year.

For more information on management of acute rheumatic fever, see the August 2016 issue of Pediatric Emergency Medicine Practice, “Acute Rheumatic Fever: An Evidence-Based Approach to Diagnosis and Initial Management,” available at: www.ebmedicine.net/ARF.

Vesicular Rashes

Varicella

Varicella-zoster virus is a herpesvirus responsible for chickenpox and shingles. Chickenpox is a vesicular rash that appears in different stages and is likened to a “dew drop on a rose petal.” The disease is highly contagious; however, rates of infection have dropped since a vaccine was licensed in the United States in 2006. Otherwise-healthy, unvaccinated children with varicella will often present with a chief complaint of a pruritic rash and may have a mild fever. Generally, there are minimal complications; infants and those who are immunocompromised are at risk for more severe disease.

Patients who have been vaccinated may develop “breakthrough varicella,” characterized by < 50 skin lesions (mainly maculopapular lesions with few or no vesicles) and a milder course of illness. This form of varicella may be missed by clinicians.
due to the less-defined rash and mild symptoms; it is important to perform confirmatory testing, as diagnosis by examination alone may prove difficult. Children who have had only 1 vaccine dose instead of the CDC-recommended 2-dose regimen may have more classic symptoms. Although vaccinated persons are less contagious than unvaccinated persons, all patients are contagious, and they will need contact isolation until all lesions have crusted over. Clinicians should also use airborne precautions.

The most common complications in children who are otherwise healthy are skin and soft-tissue infections from persistent scratching. More serious invasive infections, such as pneumonia and central nervous system infection, are rare but significant, especially in immunocompromised children.

Treatment is mainly supportive; however, in immunocompromised children, neonates, or patients with concern for severe systemic disease, IV acyclovir should be administered at 30 mg/kg daily divided every 8 hours for 5 days. Any superimposed soft-tissue infections should be monitored and treated with antibiotics, if needed.


Hand, Foot, and Mouth Disease

Hand, foot, and mouth disease is most commonly caused by coxsackievirus A16, although it may be caused by a range of other subtypes, as well as enterovirus 71. Hand, foot, and mouth disease is most prevalent in the summer months. After a brief prodromal stage, patients generally present with moderate to high fever, sore throat, and refusal to eat and drink. The characteristic rash appears as blister-like lesions on the hands and feet, including the palms and soles, and may be tender to palpation. Patients may develop oral lesions that can be visualized, or the lesions may be isolated to the posterior oropharynx (herpangina). Not all patients will present with lesions in all 3 areas, and some may have a more indistinct, widespread rash than others. The most common complication tends to be dehydration due to the refusal of oral intake. Rarely, central nervous system or cardiac complications (eg, myocarditis) may develop.

In cases in which the child has painful oral lesions, pain management is especially important to ensure that the patient can tolerate oral intake in order to avoid dehydration. A “magic mouthwash” solution can be tried, consisting of liquid diphenhydramine and a liquid antacid mixed in a 1:1 ratio, ideally as a swish-and-spit, to combat oral pain. Care should be taken to calculate the maximum doses (based on the weight of the child) of each medication to avoid overdose in the event that the medications are inadvertently swallowed. Ibuprofen can also be considered for pain relief, if tolerated. If the patient is still unable to maintain adequate fluid intake with these medications and attempts to give cold or frozen liquids, the patient should be admitted for further treatment and rehydration.

Erythematous Rashes

Kawasaki Disease

Kawasaki disease is an acute, multisystem vasculitis of unclear etiology and is the leading cause of pediatric acquired heart disease in the United States. Cardiac complications are secondary to coronary artery aneurysm, which occurs in 20% to 25% of untreated patients. Eighty percent of children diagnosed with Kawasaki disease are aged < 5 years; Kawasaki disease is rare in infants aged < 3 months and in children aged > 8 years.

Diagnosis is based on clinical criteria, and laboratory results can aid in diagnosis. Irritability and fever, often unresponsive to antipyretics, are hallmarks of the disease. Kawasaki disease is typically identified by fever lasting ≥ 5 days and at least 4 of the 5 following clinical features: (1) conjunctival
Clinical Pathway for Emergency Department Management of Rash and Fever in the Pediatric Patient

Pediatric patient presents to the ED with fever and rash

Assess the patient to determine whether isolation precautions are needed (eg, measles, Fifth disease, varicella)

Patient unstable or septic?

• Manage ABCs
• Order laboratory tests, as indicated, including blood culture
• Administer empiric antibiotics

UNSTABLE

STABLE

Continue stabilizing measures and order additional testing, as needed, until the patient can be admitted to the PICU

Petechnial/purpuric rash

Obtain PT, PTT, INR

Palpable rash?

YES

NO

• Rocky Mountain spotted fever
• Henoch-Schönlein purpura
• Meningococcemia

Erythematous rash

Obtain ASO, rapid strep, throat culture

DIC

Nikolsky sign present?

YES

NO

YET

NO

Vesicular/bullous rash

Maculopapular rash

continued on page 11

Obtain additional diagnostic testing, if needed, and determine disposition based on suspected etiology and other signs/symptoms (See Table 6, page 6 and the "Management of Specific Etiologies of Rash and Fever" section, beginning on page 5.)

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Important historical questions include asking about timing of the rash, medications, concurrent symptoms, vaccination status, recent travel history, and any immunodeficiency.

The physical examination should focus on the characteristics of the rash as well as concerning findings such as erythroderma, nonblanching lesions, desquamation, and severe pain.

Abbreviations: ABC, airway, breathing, and circulation; ASO, antistreptolysin O; DIC, disseminated intravascular coagulation; ED, emergency department; INR, international normalized ratio; PICU, pediatric intensive care unit; PT, prothrombin time; PTT, partial thromboplastin time.
Clinical Pathway for Emergency Department Management of Rash and Fever in the Pediatric Patient (Continued)

Maculopapular rash  
Rash distribution?  
Central  Peripheral

Blanching?  Targetoid?

YES  NO

Measles  Roseola  Parvovirus  Viral exanthem

Acute rheumatic fever  Erythema multiforme

Vesicular/ bullous rash  Rash distribution?  
Diffuse  Localized

Varicella

YES  NO

Coxsackievirus  Eczema herpeticum

Obtain additional diagnostic testing, if needed, and determine disposition based on suspected etiology and other signs/symptoms (See Table 6, page 6 and the "Management of Specific Etiologies of Rash and Fever" section, beginning on page 5.)
injection, (2) mucous membrane changes (bright red, cracked lips, strawberry tongue), (3) changes in peripheral extremities such as edema and peeling of the skin (usually a later finding), (4) polymorphous rash, and (5) cervical lymphadenopathy. The rash is typically a widespread targetoid, morbilliform, or macular exanthema. Although these are the classic findings, there are variations to this definition, and it is important to maintain a high level of suspicion for Kawasaki disease. Ancillary testing can aid in diagnosis of patients with an incomplete presentation. Laboratory findings may include white blood cell (WBC) count > 15,000 cells/mL, anemia, platelets > 450,000 platelets/mL, elevated CRP and ESR, elevated alanine transaminase and gamma-glutamyl transferase, albumin ≤ 3 g/dL, and pyuria.

An MDCalc online tool for the Kawasaki Disease Diagnostic Criteria is available at: www.mdcalc.com/kawasaki-disease-diagnostic-criteria.

According to the American Heart Association, children should be treated with IVIG and high-dose aspirin as soon as possible after diagnosis of Kawasaki disease. The goal of treatment is to decrease the incidence of coronary artery aneurysm. IVIG 2 g/kg should be administered over 12 hours. The dosing of aspirin is variable by institution; aspirin should be stopped after the child is afebrile for approximately 2 days.26

For more information on management of Kawasaki disease, see the January 2015 issue of Pediatric Emergency Medicine Practice, “Evidence-Based Management of Kawasaki Disease in the Emergency Department,” available at: www.ebmedicine.net/Kawasaki.

**Scarlet Fever**

Scarlet fever is a toxin-mediated childhood exanthem resulting from *Streptococcus pyogenes* (group A *Streptococcus*) infection, most commonly seen in patients aged 5 to 15 years. The diagnosis is made in approximately 10% of children presenting with streptococcal tonsillopharyngitis.27 Scarlet fever is caused by certain strains of group A beta hemolytic *Streptococcus* that release a streptococcal pyogenic exotoxin; the rash is a delayed hypersensitivity to this exotoxin.28

The classic scarlatiniform rash appears as a “sandpaper” rash that is blanching and maculopapular and spares the palms and soles.27 (See Figure 5.) The rash typically develops 1 to 2 days after the initial symptoms associated with pharyngitis. Patients may have palatal petechiae, circumoral pallor, and enlarged papillae on the tongue, with underlying erythema giving a “strawberry-like” appearance to the tongue. The rash may be erythematous, nonblanching, and erupt in a linear fashion, concentrated in the skinfolds, such as the axilla, antecubital fossa, and buttock creases, called *Pastia lines*. Desquamation of the skin generally occurs several weeks following acute infection.27

Cases of acute streptococcal pharyngitis with concern for scarlet fever can be diagnosed by clinical examination, but throat culture remains the gold standard for testing. Rapid antigen testing is of great benefit, as it is highly specific, and the results are immediately available. Negative rapid antigen testing should be confirmed with a throat culture.29

Treatment can shorten the duration and severity of scarlet fever, as well as limit severe complications. *S pyogenes* can spread from direct extension of the pharyngeal infection to adjacent structures. There is also the risk of hematogenous spread and lymphatic spread, leading to suppurative complications such as peritonsillar abscess, retropharyngeal abscess, sinusitis, otitis media, cervical lymphadenitis, bacteremia, endocarditis, pneumonia, and meningitis. Nonsuppurative complications such as ARF and poststreptococcal glomerulonephritis may also occur. Treatment of acute infection may help prevent the development of ARF; however, treatment has not been shown to provide the same benefit for glomerulonephritis.30 Of note, ARF can occur even in patients who are properly treated.31

Figure 5. Rash of Scarlet Fever

**Toxic Shock Syndrome**

Toxic shock syndrome (TSS) is a potentially fatal disease. The most common etiologies are *Staphylococcus aureus* or *S pyogenes*. Both bacteria produce superantigens that activate T cells directly and bypass certain antigen-mediated immune responses. This in turn causes uncontrolled T-cell activation leading to massive cytokine release.  

TSS is easily recognizable by physical examination. The hallmarks of presentation are fever, hypotension, and rash, and the patient can also present with multiorgan failure. Desquamation of the hands and feet may also occur. In staphylococcal-mediated TSS, viral-like symptoms, including chills, weakness, malaise, headache, sore throat, vomiting, diarrhea, abdominal pain, and lightheadedness, can be the first clinical signs. Streptococcal-mediated TSS most commonly arises from an invasive skin or soft-tissue infection, including necrotizing fasciitis, cellulitis, or myositis. Flu-like symptoms (eg, fever, sore throat, and lymphadenopathy) and gastrointestinal symptoms may be present early in the disease process. For both staphylococcal- and streptococcal-mediated TSS, patients develop diffuse erythema, watery diarrhea, decreased urine output, and extremity edema. Erythroderma is a diffuse, red, and macular rash that resembles a sunburn. Skin and mucous membranes can be involved, including the conjunctiva, vaginal mucosa, and oral mucosa. Patients may have neurological findings such as headache, confusion, somnolence, and agitation, and in severe cases, symptoms of cerebral edema. Cardiopulmonary symptoms include pulmonary edema with decreased heart contractility and pleural effusion. Decreased vascular resistance leads to increased leakage from the intravascular compartment causing hypotension, one of the defining criteria for TSS.

Medical evaluation for TSS includes screening for signs of multiorgan failure. Patients can have leukocytosis with increasing neutrophil counts, anemia, thrombocytopenia, and elevation in coagulation factors. Elevated blood urea nitrogen and creatinine levels indicate renal injury, with elevation of creatine kinase in the setting of rhabdomyolysis. Patients may develop hyponatremia, hypocalcemia, hypophosphatemia, and hypoalbuminemia. Hepatic involvement is evident by elevated transaminases. Though blood cultures are important, they are positive in < 5% of patients with staphylococcal TSS, and in approximately 60% of patients with streptococcal TSS. Definitive criteria for staphylococcal TSS and streptococcal TSS are presented in Table 8.

Recognizing TSS early is paramount, as patients will require aggressive fluid resuscitation to increase intravascular volume. The examination should include a search for a nidus of infection, such as a foreign body (eg, a tampon), which, if found, should be removed promptly. A comprehensive skin examination should be performed, as even subtle wounds can be the originating source of infection. In TSS, penicillinase-resistant penicillins and first-generation cephalosporins have proven to be effective.

### Table 8. Differentiating Staphylococcal and Streptococcal Toxic Shock Syndrome

<table>
<thead>
<tr>
<th>Staphylococcal TSS</th>
<th><strong>Clinical Criteria</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever &gt; 38.9°C (102°F)</td>
<td></td>
</tr>
<tr>
<td>Diffuse rash with macular erythoderma</td>
<td></td>
</tr>
<tr>
<td>Desquamation 1-2 weeks after rash onset</td>
<td></td>
</tr>
<tr>
<td>Hypotension with SBP ≤ 5th percentile by age (for children aged &lt; 16 years), SBP ≤ 90 mm Hg (for adolescents aged &gt; 16 years)</td>
<td></td>
</tr>
<tr>
<td>Multiorgan involvement (≥ 3 systems)</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal: vomiting/diarrhea</td>
<td></td>
</tr>
<tr>
<td>Muscular: myalgias or CK ≥ 2 times upper limit of normal</td>
<td></td>
</tr>
<tr>
<td>Renal: BUN or Cr ≥ 2 times upper limit of normal; sterile pyuria</td>
<td></td>
</tr>
<tr>
<td>Hepatic: bilirubin, AST, or ALT ≥ 2 times upper limit of normal</td>
<td></td>
</tr>
<tr>
<td>Hematologic: platelets ≤ 100,000 platelets/mL</td>
<td></td>
</tr>
<tr>
<td>Neurologic: AMS in the absence of fever or hypotension</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laboratory Criteria</th>
<th>Must be negative:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood and/or CSF cultures; blood culture may be positive for <em>Staphylococcus aureus</em></td>
<td></td>
</tr>
<tr>
<td>Serologies for Rocky Mountain spotted fever, leptospirosis, and measles</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Classification</th>
<th>Probable: combination of 4 clinical criteria and laboratory criteria met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirmed: combination of 5 clinical criteria and laboratory criteria met, including desquamation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Streptococcal TSS</th>
<th><strong>Clinical Criteria</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypotension with SBP ≤ 5th percentile by age (for children aged &lt; 16 years), SBP ≤ 90 mm Hg (for adolescents aged &gt; 16 years)</td>
<td></td>
</tr>
<tr>
<td>Multiorgan involvement (≥ 3 systems)</td>
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<tr>
<td>Renal: BUN or Cr ≥ 2 times upper limit of normal; sterile pyuria</td>
<td></td>
</tr>
<tr>
<td>Hepatic: bilirubin, AST, or ALT ≥ 2 times upper limit of normal</td>
<td></td>
</tr>
<tr>
<td>Hematologic: platelets ≤ 100,000 platelets/mL, DIC</td>
<td></td>
</tr>
<tr>
<td>Pulmonary: acute respiratory distress syndrome</td>
<td></td>
</tr>
<tr>
<td>Skin: soft-tissue necrosis, generalized erythematous macular rash</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laboratory Criteria</th>
<th><strong>Group A Streptococcus</strong> isolation from culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification</td>
<td>Probable: all clinical criteria met; isolation of group A <em>Streptococcus</em> from nonsterile site; absence of other etiology for illness</td>
</tr>
<tr>
<td>Confirmed: all clinical criteria met; isolation of group A <em>Streptococcus</em> from sterile site (blood, CSF, pleural/pericardial fluid)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: ALT, alanine aminotransferase; AMS, altered mental status; AST, aspartate aminotransferase; BUN, blood urea nitrogen; CK, creatine kinase; Cr, creatinine; CSF, cerebrospinal fluid; DIC, disseminated intravascular coagulation; SBP, systolic blood pressure; TSS, toxic shock syndrome.
SSSS is most commonly seen in children and neonates. The diaper area of newborns is a very common surface for skin rashes associated with SSSS. Other symptoms of SSSS include intense pain around the infection site, weakness, fatigue, and dehydration. In some instances, a prodromal localized skin infection precedes the illness that may originate in the throat, mouth, nose, umbilicus, or gastrointestinal tract. SSSS has a low mortality rate of 1% to 5%, but has complications including cellulitis, sepsis, pneumonia, and scarring. Patients with SSSS should be hospitalized, and IV antistaphylococcal antibiotics should be administered once blood cultures are obtained.

Petechial/Purpuric Rashes

Meningococcal Disease

Neisseria meningitidis is an aerobic, gram-negative diplococcus present in the nasopharynx of approximately 4% to 24% of the population. It is transmitted through respiratory secretions and saliva. Most cases occur in preschool-aged children, especially infants, with other peaks in adolescents and in people aged > 65 years. Purpura, caused by bleeding into the skin or mucosa from small vessels, may be the presenting symptom of serious and potentially life-threatening meningococcal disease, such as meningococcal sepsis. The cardinal sign of purpura is that it does not blanche with pressure. Small petechiae can also be present. When a patient presents with fever and purpura or petechiae, the diagnosis of meningococcal disease must be considered, and intervention should occur immediately.

The development of invasive meningococcal disease will typically cause life-threatening meningitis or sepsis. Meningococcemia is a rapidly invasive disease, and mortality in patients in whom the disease is recognized early and who are treated appropriately is still 5% to 10% within 24 to 48 hours after developing symptoms. Long-term sequelae, including severe skin necrosis, loss of limb, neurologic damage, and hearing loss, will occur in 10% to 20% of survivors. Some patients have a genetic predisposing factor that increases their risk for invasive meningococcal disease. In addition, preceding viral infection, crowding, smoke exposure, and working in a healthcare environment can increase the risk of this disease.

Given the devastating and life-threatening effects of meningococcal disease, guidelines have been proposed to recognize and identify this disease early upon presentation. The Petechiae in Children (PiC) study developed in the United Kingdom and Ireland evaluated point-of-care testing for meningococcal disease and procalcitonin levels. Loop-mediated isothermal AMPlification (LAMP) testing is a rapid molecular amplification test that identifies serogroups of meningococcal infection; the results take approxi-
Henoch-Schönlein Purpura
Henoch-Schönlein purpura (HSP) is the most common pediatric vasculitis, and cutaneous manifestations occur in 100% of cases. HSP is caused by an abnormal immune response in which immunoglobulin A (IgA)-mediated systemic small-vessel vasculitis leads to the formation of IgA immune complexes that deposit in the skin, joints, gastrointestinal tract, and kidneys. This necrosis of small blood vessels results in a nonthrombocytopenic purpura. Rash is the initial presenting feature in approximately 75% of cases. HSP may affect all age groups but is most common in children aged 2 to 6 years, with peak incidence in the fall and winter months.

The classic presentation is an otherwise well child with purpura, arthralgias, and colicky abdominal pain 1 to 3 weeks after upper respiratory infection symptoms. Patients with HSP are not always febrile, but may present with low-grade fever; higher temperatures are unlikely. The characteristic rash of HSP is a symmetric, dark red or purple, nonblanching, palpable exanthem. During the first 24 hours, the rash may have a maculopapular or urticarial appearance that evolves into typical purpura. The rash may also appear as deep bruises, or bullous or hemorrhagic lesions. Typically, the lesions are not painful and are not pruritic. The rash tends to predominate in pressure areas, such as the buttocks, and in the extensor surfaces of the lower extremities. Of note, HSP may also present with tender, localized, subcutaneous edema affecting the forehead, periorbital region, or hands and feet.

Figure 7. Meningococcemia Lesions

A. Scattered petechiae in the early stages of meningococcemia.
B. Early disseminated intravascular coagulation, presented as petechial and purpuric lesions.
C. Purpura fulminans and cutaneous infarction in disseminated intravascular coagulation.

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Special Populations

Pregnant Patients

Some diseases that present with rash and fever have a higher likelihood of crossing the placenta, and thus represent a threat to the fetus. Table 9 provides the mnemonic TORCH to aid in recall of these diseases. Once diagnosed with one of these diseases, the patient should avoid contact with pregnant women. If a pregnant woman comes into contact with a patient who has one of these diseases, the woman’s obstetrician should be notified. Additionally, pregnant healthcare workers should always exercise caution when evaluating patients who have a rash.

Unvaccinated Patients

Rash and fever in an incompletely vaccinated or unvaccinated child should raise a concern for diseases that are seen less often in the United States, such as measles and varicella. These patients are also at a higher risk for more serious bacterial complications and may require more extensive testing than other patients. Travelers from other countries who have different vaccine schedules or who have not received any vaccines may also present with diseases that are no longer common in the United States, such as rubella.

Immunocompromised Patients

Immunocompromised patients are a high-risk population in the setting of many diseases. They often require more extensive testing than otherwise healthy individuals with the same symptoms, and they are more susceptible to complications from illness. Early empiric broad-spectrum antibiotics or antiviral therapy (if available) may be required.

Table 9. TORCH Diseases

| T | Toxoplasmosis |
| O | Other (syphilis, varicella, Human parvovirus B19) |
| R | Rubella |
| C | Cytomegalovirus |
| H | Herpes simplex virus |

Neonates

The evaluation of the febrile neonate is very specific, and is not discussed in detail in this article. Workup for febrile neonates should most likely include a sepsis evaluation, and, when rash is present, neonatal herpes simplex virus should be high on the differential. Neonatal SSSS should also be considered if suspicion is high based on the physical examination. For more information on management of the febrile young infant, see the July 2019 issue of Pediatric Emergency Medicine Practice, “Evaluation and Management of the Febrile Young Infant in the Emergency Department,” available at: www.ebmedicine.net/FebriInfant.

Patients With Predisposition to Hemolytic Anemia

For patients with a predisposition to hemolytic anemia, such as those with sickle cell disease, thalassemia, and hereditary spherocytosis, a CBC count and reticulocyte count should be obtained in the setting of possible parvovirus infection. The decreased survival of red blood cells and the reticulocytopenia that is caused by Human parvovirus B19 increases the risk of a patient developing acute aplastic crisis. Fortunately, this complication is usually transient. Although rare, acute aplastic crisis can also develop in otherwise healthy individuals, so if there are signs, such as severe pallor, laboratory tests should be obtained. Some of these patients may have functional or anatomic asplenia as well, putting them at higher risk for diseases caused by encapsulated organisms.

Controversies and Cutting Edge

Blood Cultures

Recent studies have worked toward developing algorithms for determining when to obtain cultures in pediatric patients, suggesting that more strict criteria may aid in decreasing the number of blood cultures obtained, without increasing mortality. In some patients, such as febrile neutropenic patients or those who have signs of sepsis, blood cultures are indicated. However, in the non-ill patient with a nonspecific rash, the decision to obtain blood cultures should be weighed heavily against the risks of obtaining a false-positive result with its subsequent implications in management.

Corticosteroid Use in Patients With Henoch-Schönlein Purpura and Other Rashes

HSP is generally a self-limited disease that requires supportive treatment only. However, corticosteroids are typically considered in patients with severe extrarenal symptoms and patients who present with renal involvement. Corticosteroid use in HSP remains controversial; a literature review found varying results regarding improvement following corticosteroid use. Two studies found corticosteroid use
Risk Management Pitfalls for Pediatric Patients With Rash and Fever

1. “This child had a sore throat with exudate and a rash. I thought it must be scarlet fever and gave him antibiotics.”
   Prior to prescribing antibiotics, the characteristics of the rash, associated symptoms, history, and physical examination findings should be taken into account to develop the differential diagnosis. Many viruses can cause skin rash and exudative pharyngitis that would not benefit from antibiotics (e.g., mononucleosis).

2. “The patient did not have strep throat recently, so it can’t be acute rheumatic fever.”
   Often, children have an episode of pharyngitis and do not have a rapid strep test performed to make the diagnosis of “strept throat.” Additionally, the symptoms of ARF appear after a 2- to 3-week latent period following the streptococcal pharyngitis, so prior infection may not be evident at the time of presentation.

3. “The patient has had 5 days of fever and now has a rash; this is probably just a viral exanthem.”
   In the setting of 5 days of fever, Kawasaki disease should be considered, especially in infants who may not have the classic presentation of fever ≥ 5 days and at least 4 out of the 5 following clinical features: (1) conjunctival injection, (2) mucous membrane changes (bright red, cracked lips, strawberry tongue), (3) changes in peripheral extremities (usually a later finding), (4) polymorphous rash, and (5) cervical lymphadenopathy.

4. “This patient had a rash and fever for 5 days, but no cervical lymphadenopathy or conjunctival injection, so I ruled out Kawasaki disease.”
   Patients can have an incomplete presentation of Kawasaki disease that still necessitates the standard workup and treatment. Furthermore, they may not have conjunctival injection at the time of presentation to the ED, but may have it at some point during the illness; it is important to clarify this with the caregivers. Additionally, changes in the peripheral extremities are a later finding.

5. “The patient was upset and had a fever, so I figured that was why he was tachycardic.”
   Often, pediatric patients with fever are tachycardic due to elevated body temperature, anxiety, and crying. However, clinicians should ensure that the patient’s vital signs normalize prior to discharge. If not, consider less common diagnoses such as meningococcemia or alternative diagnoses such as underlying sepsis, bacteremia, and myocarditis.

6. “This patient had a pretty nasty rash. I thought corticosteroids would help.”
   Often corticosteroids are not indicated and may, in fact, worsen the underlying disease process. For many rashes, research does not support routine corticosteroid use, and corticosteroids can cause a bounce-back phenomena.

7. “This patient presented with symptoms of joint pain, rash, and fever, but I didn’t think it could be acute rheumatic fever because the patient completed the full course of antibiotics for treatment of a streptococcal infection.”
   ARF can still occur even in patients who received complete antibiotic treatment for streptococcal pharyngitis. If the presentation is suggestive of ARF, then appropriate testing should be performed. Diagnostic studies in patients for whom there is concern for ARF include a CBC with differential; inflammatory markers, including ESR and CRP; ASO titers; and electrocardiogram and echocardiogram.

8. “The patient had the varicella vaccination, so he can’t have chicken pox.”
   Vaccines can fail, and mild cases of breakthrough varicella can occur as well. If the symptoms and morphology are consistent with the diagnosis, varicella should be considered, especially in immunocompromised patients.

9. “This 4-week-old had obvious mild cellulitis in her left leg, so I discharged her home on oral antibiotics.”
   Even if the skin infection appears to be localized, the immature immune system of a neonate may increase susceptibility to spread of the infection to other parts of the body. Therefore, it is reasonable to perform an evaluation for sepsis and admit the neonate for empiric IV antibiotics. Additionally, with any skin rash in this age group, neonatal HSV infection must be considered, as this is a diagnosis that cannot be missed.

10. “The patient had a rash on the palms of her hands and the soles of her feet, so I diagnosed her with hand, foot, and mouth disease.”
    Although this would be the likely diagnosis, clinicians should keep the differential wide so that other more-serious diagnoses, such as Rocky Mountain spotted fever, are not missed.
seemed to improve abdominal and joint pain as well as renal symptoms when compared to placebo.\textsuperscript{51,52} Other studies, including a recent meta-analysis, did not find any significant difference between corticosteroid administration and placebo in resolution of renal involvement.\textsuperscript{53-55} Additionally, the use of corticosteroids was not found to prevent renal disease.\textsuperscript{51}

The proposed use of corticosteroids in HSP is generally at high doses and for at least 2 weeks. High-dose corticosteroids have their own associated risks in children and should be used with caution. For children with mild HSP, corticosteroid therapy is not warranted. There may be some benefit in patients with severe gastrointestinal symptoms who are unable to tolerate oral medication and require hospitalization. In this case, other etiologies, such as intussusception, should be ruled out before initiating corticosteroid therapy. In patients who present with severe renal involvement, aggressive therapy is indicated and this generally includes corticosteroids. For patients who present with mild renal involvement, the benefit of corticosteroids remains unclear, and corticosteroid use is left to clinician judgment.

The role of corticosteroids is controversial in other illnesses as well. The management of Kawasaki disease with IVIG and aspirin is well established; however, a Cochrane review suggests that the addition of corticosteroids may have increased benefit.\textsuperscript{56} Additional research is needed to define the role of corticosteroids in these disease processes.

Very little evidence is available to support the use of corticosteroids for treatment of a rash of unknown etiology. However, given the negative side-effect profile of systemic corticosteroids (eg, immunosuppression, adrenal suppression) as well as the lack of evidence of benefit of corticosteroids when treating a rash of unknown etiology, it is recommended for clinicians to proceed with caution.

**Disposition**

If the child is well appearing after administration of antipyretics, has no concerning findings on history and physical examination, and is able to tolerate oral intake without difficulty, then the child can be discharged and the caregivers instructed to follow up with the primary care provider, generally within the following 2 to 3 days. Younger patients, especially those aged < 6 months, are more prone to rapid decompensation, and, therefore, should be re-evaluated in 1 to 2 days. Most school-aged children can return to school after they have been afebrile for 24 hours without using antipyretics and symptoms have resolved.

Reasons for admission may include the inability to tolerate oral intake in the case of painful oral lesions or abdominal pain in the setting of HSP. Patients with fever and a bacterial etiology of the rash may require admission for IV antibiotics, and patients with rheumatologic disease may require admission for IV corticosteroids or other standard treatments. Extra caution should be taken for children who are immunocompromised, as they may require admission for close observation and empiric IV antibiotics until blood culture results are available; the decision to admit and/or treat with IV antibiotics should be made in conjunction with the patient’s primary care provider. Patients with signs of shock (septic or cardiogenic) that is not improved with IV fluids should be admitted to a pediatric intensive care unit for close monitoring and management. Patients with SSSS or TEN with significant skin sloughing may be better served in a burn unit, as management may be complicated by ongoing skin fluid loss and/or superinfection. Patients with concern for Kawasaki disease should be admitted for additional testing, observation, and an echocardiogram.

From a public health standpoint, some diseases require special consideration upon discharge. Refer to the local Office of Public Health for a list of reportable diseases. Some require immediate reporting via telephone, while others should follow up within days.

**Summary**

Fever and rash is a very common combination of chief complaints seen in the ED setting. Keys to differentiating deadly from benign causes are in obtaining a detailed history and performing a thorough physical examination looking for red flags. Evaluation should always begin with a general impression and assessment of vital signs to identify children who need immediate intervention. Important historical questions include asking about medications, concurrent symptoms, vaccination status, recent travel history, and any immunodeficiency. The physical examination should focus on the characteristics of the rash as well as concerning findings such as erythoderma, nonblanching lesions, desquamation, and severe pain. If there are any concerns for sepsis, shock, meningitis, or other severe bacterial infection, empiric antibiotics should be started, with investigation of underlying causes dependent on the stability of the patient. Treatment and disposition depend on etiology, but symptomatic care is often the mainstay of treatment.
Time- and Cost-Effective Strategies

- Ensure that a thorough history and physical examination are completed to guide the choice of diagnostic testing and treatment. The history should include the timeline and characteristics of the rash, other symptoms of the illness, immune compromise, recent medication use, vaccination status, recently received vaccines, and sick contacts in the home. Additionally, consider the time of the year, the region in which the patient lives, and any recent travel history. The physical examination should begin with a review of the patient’s vital signs to determine whether the child requires immediate intervention. Key components of the physical examination include a thorough investigation of the skin as well as searching for associated signs in other body systems. It is important to correctly describe the qualities of the rash. When examining the skin, look for the major distribution of the rash, with particular attention to involvement of the palms and soles. Note if the rash is primarily on the extremities or only in a localized area, if the mucous membranes are involved (including the mouth, conjunctiva, and genitals), and if the rash blanches or not.

- Given the overall paucity of specific guidelines regarding when to obtain diagnostic testing, many clinicians tend to overtreat children, especially if the patient is not known to them. The most effective strategies to reduce cost and time to treatment include having a specific question or potential diagnosis prior to ordering testing in children, not drawing routine blood cultures, and not overtreating patients with empiric medications, such as corticosteroids.

Case Conclusions

The 1-year-old boy received antipyretics and was smiling, playful, and eating a cookie. After reviewing the history and physical examination findings, you decided that he did not exhibit any red flags. He had been vaccinated appropriately for his age, had not traveled recently, had a blanching rash that spared the mucous membranes, and he otherwise looked very well. You explained this to his parents and discussed that this was most likely a benign viral exanthem related to his viral upper respiratory infection and that it should self-resolve. You recommended supportive care, as needed, until the rash resolved.

The 3-year-old boy in the next room was also looking well. You gave him ibuprofen for his joint pain, and he was able to ambulate well. Given the purpuric lesions on the lower extremities and the joint pain, you suspected HSP. His platelet, PT/INR, and creatinine levels were within normal limits, and there was no proteinuria. As he was not complaining of abdominal pain and was tolerating fluids and food, you determined that he did not need an abdominal ultrasound. You discussed supportive care with his parents, who planned to follow up in 2 days with their PCP for re-evaluation. You also discussed with them the need to have his urine rechecked for protein at some point as well, and noted that if he were to develop severe abdominal pain, severe swelling of the extremities, or any changes in urination, then they should return to the ED.

You obtained rapid IV access in the 9-year-old girl and gave her 2 boluses of 20 mL/kg normal saline as well as antipyretics, with only mild improvement in her heart rate and blood pressure. You quickly obtained blood cultures and started her on the appropriate antibiotics for toxic shock syndrome, as you were concerned for this based on her positive rapid strep test and her immunocompromised state from the medications she takes for ulcerative colitis. She was transferred quickly to the PICU, as she required close monitoring and possibly vasopressors to maintain an adequate blood pressure.

References

Evidence-based medicine requires a critical appraisal of the literature based upon study methodology and number of subjects. Not all references are equally robust. The findings of a large, prospective, randomized, and blinded trial should carry more weight than a case report.

To help the reader judge the strength of each reference, pertinent information about the study, such as the type of study and the number of patients in the study is included in bold type following the references, where available. The most informative references cited in this paper, as determined by the authors, are noted by an asterisk (*) next to the number of the reference.


3. Aber C, Alvarez Connelly E, Schachner LA. Fever and rash in children, not drawing routine blood cultures, or potential diagnosis prior to ordering testing in children, not drawing routine blood cultures, and not overtreating patients with empiric medications, such as corticosteroids.

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children” (PiC) study: evaluating potential clinical decision rules for the management of feverish children with non-blanching rashes, including the role of point of care testing for procalcitonin & Neisseria meningitidis DNA - a study protocol. BMC Pediatr. 2018;18(1):246. (Prospective diagnostic accuracy study)


**CME Questions**

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1. Which of the following is a red flag in the history of a pediatric patient with a fever and rash?
   a. The patient’s temperature at home was 40.3°C (104.6°F), measured rectally.
   b. The patient has been eating and drinking less than normal.
   c. The patient returned from a trip to the Middle East 6 days ago.
   d. The rash has been itching.

2. Your intern discusses a patient with you. The patient is a 15-year-old boy who has had a fever for 1 day and has now developed a rash. The intern describes the rash as nonpainful, nonpruritic, sparing the palms and soles, but including the face and genitals, and it is diffusely erythrodermic. The patient’s vital signs are: temperature, 38.9°C (101.6°F); heart rate, 120 beats/min; and blood pressure, 115/75 mm Hg. Which of the following should be considered a red flag for serious infection?
   a. The fever does not improve with an antipyretic.
   b. The rash spares the palms and soles.
   c. The patient has diffuse erythroderma.
   d. The fever presented prior to the rash.
3. A 7-year-old boy presents with fever for 2 days, sore throat, anterior lymphadenopathy, headache, and a spreading “rough feeling” rash. On examination, his lips and tongue are red, he still complains of headache, and you notice the coarse rash on his torso and arms, with linear areas of petechiae in his arm folds and the fold on the back of his neck. After the physical examination, what is the next BEST step in management?
   a. Order blood work and blood cultures, and begin treatment to cover meningococcemia.
   b. Obtain a rapid strep throat swab, and treat the headache and fever with an antipyretic.
   c. Admit the patient due to concern for Kawasaki disease, and order appropriate blood work.
   d. Check coagulation studies and platelets for an underlying bleeding disorder.

4. According to the Jones criteria, which of the following patients with a known recent history of culture-confirmed strep throat could be diagnosed with acute rheumatic fever?
   a. A child with temperature of 38.2°C (100.8°F), a CRP of 4 mg/L, and a rash
   b. A child with temperature of 38.4°C (101.1°F), polyarthritis, subcutaneous nodules, and generalized rash
   c. A child with a prolonged PR interval on electrocardiogram and a generalized rash
   d. A child with a temperature of 38.6°C (101.5°F), an ESR of 75 mm/hr, and diffuse arthralgias

5. Special care must be taken with pregnant individuals, as well as family members and healthcare workers, in the setting of TORCH diseases. Which of the following is a TORCH disease?
   a. Measles  b. Meningococcemia
   c. Lyme disease  d. Parvovirus B19

6. What study is important to obtain in a patient with presumed HSP who has emesis and abdominal discomfort?
   a. Liver function tests
   b. Lipase levels
   c. Abdominal ultrasound
   d. Upright and decubitus abdominal x-rays

7. Which of the following is considered one of the clinical diagnostic criteria for Kawasaki disease?
   a. Inguinal lymphadenopathy
   b. Conjunctival injection
   c. Small bluish-white patches along the buccal mucosa
   d. Electrocardiographic changes

8. A 2-year-old boy is brought in to the ED by his babysitter who is watching him for the week. She is unsure of his past medical history or vaccination status. She brings him in after 3 days of high fever, tearing red eyes, nonproductive cough, and a new morbilliform rash. On examination, you notice bluish-white spots on the inside of his cheeks. According to the CDC, what kind of precautions should be taken?
   a. Airborne
   b. Contact
   c. Neutropenic
   d. Contact plus

9. A 16-year-old boy presents with a severe headache, a temperature of 40°C (104°F), blood pressure of 98/45 mm Hg, and a nonblanching rash on both legs. Which of the following is the BEST first step in management?
   a. Order a variety of blood work and a rapid lumbar puncture to determine the etiology of the rash.
   b. Order coagulation studies, including fibrinogen and D-dimer.
   c. Order blood work, rapidly obtain IV access, and administer IV ceftriaxone prior to receiving the results of testing.
   d. Administer corticosteroids for treatment of potential HSP.

10. A 2-year-old boy presents in July with 2 days of fever. He now refuses to eat and has decreased urine output. His mother is concerned that he has something transmitted by an insect, as she has noted what she believes are bug bites on his feet and hands. She last gave him ibuprofen the evening before, and he has not had any acetaminophen. On examination, you note vesicles in the posterior oropharynx. He is febrile and mildly tachycardic in proportion to temperature; however, his blood pressure is within normal limits. What is the BEST first step in management?
    a. Administer weight-based dosing of ibuprofen and acetaminophen, and attempt oral rehydration with cold or frozen fluids.
    b. Order a CBC and comprehensive metabolic panel, and place an IV line to administer 20 mL/kg of normal saline.
    c. Test the patient for tick- and mosquito-borne diseases, given parental concern.
    d. Prescribe a topical corticosteroid cream for the lesions on the hands and feet, and discharge the patient to follow up with his primary care provider.
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Pediatric Stroke: Diagnosis and Management in the Emergency Department

Pediatric stroke, which presents with a variety of clinical scenarios, is a challenging topic that requires a nuanced approach. This issue offers comprehensive guidance for diagnosing and managing pediatric stroke, with a focus on key aspects such as recognition, evaluation, and treatment. The articles included highlight the importance of early identification and intervention, as well as the importance of multidisciplinary collaboration in the care of these patients.