This care process model (CPM) is produced by Intermountain Healthcare’s Pediatric Infectious Disease Team, a subgroup of the Pediatric Speciality Clinical Program. The CPM summarizes evaluation and treatment recommendations for skin and soft tissue infections (SSTIs) in children age 3 months and older. Recommendations are based on recent studies in peer-reviewed medical literature, local susceptibility data and practice patterns, and recent consensus guidelines from the Infectious Disease Society of America (IDSA). IDSA

**WHY FOCUS ON PEDIATRIC SKIN AND SOFT TISSUE INFECTION (SSTI)?**

- **It’s common:** Between 1997 and 2005, there was a 50% increase in national ambulatory SSTIs, with the largest increases occurring in emergency departments among patients younger than 18 years old. CHA

- **It’s costly:** In 2014, treatment costs for SSTIs in pediatric patients at Intermountain facilities exceeded $3 million.

- **Care varies widely and much of it is unnecessary:** In one recent study, two-thirds of children were exposed to either unnecessary broad-spectrum antibiotics, prolonged duration of antibiotic therapy, or both. MOR Similar unnecessary variation for diagnostic workup, ancillary testing, abscess management, and antibiotic prescribing likely exists across the Intermountain system.

- **There is an opportunity to reduce costs by eliminating care that is not beneficial:** Adult patients with SSTIs have benefitted from institutional guidelines that reduced exposure to testing and broad spectrum antibiotic therapy, without a change in rates of recovery from their infection. JEN We have a similar opportunity to improve the care we provide to children using a CPM and a robust local microbiologic database.

**KEY RECOMMENDATIONS IN THIS CPM**

- Ensure appropriate diagnostic testing.
- Ensure appropriate use of antibiotics.
  - Provide guidance about when antibiotics might not be necessary.
- Outpatient treatment is appropriate for the majority of patients.

**GOALS AND MEASURES**

In support of our overall goals of improving clinical outcomes and increasing appropriate use of resources, we will:

- Reduce the number of repeat procedures for pediatric patients with skin and soft tissue infections (SSTIs).
- Reduce admissions, readmissions, and unnecessary return for care.
- Increase compliance with SSTI antibiotic recommendations.
- Decrease antibiotic use in pediatric outpatients with purulent infections.
- Decrease use of preemptive antimicrobial therapy in patients with bite wounds.
- Monitor hospitalization trends.

The inside pages of this tool provide an algorithm and can be folded open and posted in your office or clinic. The back page provides a discussion of recommendations and information about resources and references.

Indicates an Intermountain measure
**Skin & Soft Tissue Infection**

*Pediatric patients over 3 months*

**ALGORITHM: ASSESSMENT, DISPOSITION, TREATMENT**

(Recommendations do NOT apply to postoperative infections or infections on preseptal or genital area.)

Child presents to physician office or ED with **SKIN OR SOFT TISSUE INFECTION**

**NONPURULENT (a)**
- cellulitis, erysipelas

**PURULENT**
- abscess, carbuncle, furuncle

**ANY of the following:**
- Infection size > 1% of child’s body (i.e., larger than area of child’s hand)?
- Failed outpatient therapy? (b)
- Systemic signs of infection (c)?
- Signs of necrotizing infection (d)?
- Immunocompromised (i.e., oncology or transplant patient)?
- Signs of deeper infection (e.g., bullae, sloughing)?

**NOTES**

(a) Nonpurulent cellulitis

Nonpurulent cellulitis is generally caused by *Streptococcus*. *Staphylococcus aureus* rarely causes cellulitis — except when associated with penetrating trauma.

(b) Outpatient therapy should be considered failed if:
- The patient has not responded to antibiotic therapy after 3 days.
- Systemic signs or symptoms have developed.
- Infection has progressed beyond expectations.
- The patient cannot take antibiotics.

(c) Systemic infection

- Systemic signs include fever, chills, nausea, vomiting, and weakness.
- Note that a child with SIRS (abnormal HR, RR, temp, WBC), hypotension, or organ dysfunction must be stabilized (per the Pediatric Sepsis Protocol).

(d) Necrotizing infection

Infection is more likely to be necrotizing if any of the following are present:
- Severe pain disproportionate to clinical findings
- Subcutaneous tissue with a hard, wooden quality that extends beyond the area of apparent skin involvement
- Edema or tenderness extending beyond cutaneous erythema
- Crepitus, indicating *Group A Streptococcus*
- Skin necrosis or ecchymosis
- Rapidly spreading erythema

**Treatment recommendations** for necrotizing infection:
- ID team and surgical consult
- Emergent surgical evaluation/debridement (obtain culture from OR, routine/anaerobic)
- MRI or CT may also be helpful but should not delay surgical intervention.

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**TREAT (See dosing guidelines, page 4)**

- cefazolin IV
- If allergic to cefazolin: clindamycin IV

**TREAT (See dosing guidelines, page 4)**

- clindamycin IV
- If allergic to clindamycin: vancomycin IV

**ADJUST therapy (See dosing guidelines, page 4)**

- When culture/susceptibilities return, if Group A *Streptococcus* or clostridial:
  1. penicillin G IV AND
  2. clindamycin IV
**Incision and drainage**

In general, skin abscesses should be drained. Compared to ultrasound-guided aspiration, incision and drainage is much more likely to result in successful resolution at 7 days. For small (<1–2 cm), more superficial abscesses that are pointing, application of heat may lead to spontaneous drainage.

Wound packing is associated with increased pain and probably does not significantly improve outcomes. For larger abscesses, a wick can be placed. An acceptable alternative is placement of two incisions with a loop of flexible sterile material (a vessel loop or thin rubber catheter) between the incisions and tied outside the skin. See illustration on page 4.

Local anesthesia can be suboptimal for incision and drainage, as the procedure may require a deep incision or breaking of abscess loculations. Procedural sedation is a useful adjunct for many children with abscesses.

**Ultrasound imaging**

Ultrasound is more sensitive than clinical exam alone and is most useful when the clinical exam is equivocal. In a study of adult patients without a clear physician finding of abscess, ultrasound altered clinical management more than 50% of the time.

**MRSA risk factors** in the pediatric population include contact with an infected person, recurrent skin infections, attendance at a child care facility or other group care setting, and participation in a contact sport.

**About irrigation**

- **Goals:** Clean the wound while avoiding trauma to wound bed.
- **Irrigate** with a minimum of 200 cc per cm of wound.
- **Use** a 19-gauge blunt syringe or a ZeroWet splash guard or similar device.

**For a guide to tetanus prophylaxis in routine wound management**, see health.state.mn.us/divs/idepc/diseases/tetanus/hcp/tetwdmgmtc.pdf
Rationale for Empiric Antibiotic Selection

Purulent SSTIs: *Staphylococcus aureus*, including methicillin-resistant *S. aureus* (MRSA), is commonly associated with purulent SSTIs. Incision and drainage are sufficient for simple cutaneous abscesses. However, when adjunctive antibiotics are indicated, drugs active against MRSA are encouraged. Antibiotic choices include trimethoprim/sulfamethoxazole, clindamycin, and vancomycin.

Nonpurulent SSTIs: Streptococcus species are the predominant pathogens responsible for nonpurulent SSTIs. Antibiotics active against these organisms include cephalexin, cefazolin, clindamycin, and vancomycin. These agents also have activity against methicillin-susceptible *S. aureus* (MSSA). Clindamycin and vancomycin have activity against MRSA. The addition of anti-MRSA therapy to cephalexin did not improve outcomes in uncomplicated cellulitis.

Necrotizing fasciitis: Polymicrobial or monomicrobial infections, such as Group A Streptococcus, can cause necrotizing fasciitis. Broad-spectrum antibiotics are indicated as an adjunct to surgical management. Clindamycin should be included in the empiric choices to decrease pathogen toxin production.

Bite wound infections: These are generally polymicrobial. The organisms that cause these infections include oral flora of the biting animal: *Pasteurella* species (animal bites), *Eikenella corrodens* (human bites), *Streptococcus* species, *S. aureus*, and a number of anaerobes. Antimicrobials active against these organisms include amoxicillin/clavulanate or trimethoprim/sulfamethoxazole PLUS clindamycin. MRSA is infrequently isolated.

### TABLE 1. Inpatient Dosing for Skin and Soft Tissue Infections

<table>
<thead>
<tr>
<th>Drug</th>
<th>Route and Dose by Patient Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefazolin</td>
<td>33 mg/kg/dose (max 2,000 mg) IV every 8 hours</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>10–13 mg/kg/dose (max 600 mg) IV every 8 hours</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>20 mg/kg/dose (max 2,000 mg) IV every 8 hours</td>
</tr>
<tr>
<td>Ampicillin/sulbactam</td>
<td>50 mg/kg/dose (max 2,000 mg) IV every 6 hours (dose on ampicillin component)</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>50–75 mg/kg/dose (max 2,000 mg) IV every 24 hours</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>10 mg/kg/dose (max 500 mg) IV or by mouth every 8 hours</td>
</tr>
<tr>
<td>Piperacillin/tazobactam</td>
<td>75 mg/kg/dose (max 3,000 mg) IV every 6 hours (dose on piperacillin component)</td>
</tr>
</tbody>
</table>

### TABLE 2. Outpatient Dosing for Skin and Soft Tissue Infections

<table>
<thead>
<tr>
<th>Drug</th>
<th>Route and Dose by Patient Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cephalexin</td>
<td>≤33 kg: 15 to 20 mg/kg/dose (max 500 mg) by mouth three times daily; &gt; 33 kg: 500 mg by mouth four times daily. Pills available as 250 mg and 500 mg. Suspension available as 125 mg/5 mL and 250 mg/5 mL concentrations.</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>10–13 mg/kg/dose (max 450 mg) by mouth three times daily. Pills available as 150 mg and 300 mg. Solution available as 75 mg/5 mL concentration.</td>
</tr>
<tr>
<td>Trimethoprin/ sulfamethoxazole</td>
<td>6 mg/kg/dose (max 320 mg) by mouth twice daily (dose on trimethoprim component). Pills available as 400 mg/80 mg, DS = 800 mg/160 mg. Solution available as 40 mg/5 mL trimethoprim concentration.</td>
</tr>
<tr>
<td>Amoxicillin/ clavulanate</td>
<td>20–45 mg/kg/dose (max 875 mg) by mouth twice daily (dose on amoxicillin component). Pills available as 250 mg/125 mg, 500 mg/125 mg, and 875 mg/125 mg. Suspension available as 200 mg/5 mL, 250 mg/5 mL, and 400 mg/5 mL amoxicillin concentrations.</td>
</tr>
</tbody>
</table>

This CPM is based on best evidence at the time of publication. It is not meant to be a prescription for every patient. Clinical judgment based on each patient’s unique situation is vital. We welcome your feedback; contact Carolyn.Reynolds@imail.org.