Skin and soft tissue infection and animal bite wound management, immunocompetent > 3 months of age

Child presents with skin soft tissue infection

Purulent skin soft tissue infection?

Abscess, carbuncle, furuncle

• Perform incision and drainage (e)

• Consider ultrasound imaging if feasibility of drainage is unclear (f)

• Collect specimen for gram stain and culture

Need for inpatient care?

Assess need for inpatient care:
If any of the following consider inpatient care:

• Fever > 38.5°C or other systemic signs (c)

• Patient looks unwell

• Need for surgical drainage

• Failed outpatient therapy (b)

• Signs of necrotizing infection (d)

• Signs of deeper infection (i.e. bullae, sloughing)

Treat empirically

• May consider CBC and CRP, in general unnecessary

• Initiate Cefazolin IV preferred or if allergy to cefazolin consider Clindamycin IV preferred

• If sepsis is present, see sepsis protocol

Inpatient Care

Consider treatment with oral adjunctive antibiotics

• For non mucosal abscesses, MRSA should be treated. TMP/SMX or clindamycin similarly increase efficacy and decrease new lesion development in randomized controlled studies when MRSA was isolated

• TMP/SMX or clindamycin for 5 day duration

Outpatient Care

Consider inpatient care if 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)

• Signs of deeper infection (i.e. bullae, sloughing)

Cefazolin IV preferred

Consider ibuprofen to help with pain and inflammation

Clindamycin IV preferred

Consider ibuprofen to help with pain and inflammation

Patient clinically improving?

Transition to oral therapy equivalent

Discharge to complete 5-7 days of total antibiotics

Hospital antibiotic days count toward total duration

Consider: new abscess formation

Consider non infectious rashes

Consider unusual pathogens

Consider Dermatology or ID consult

Concern for necrotizing infection (see text box in bottom right corner)?
Child presents with mammalian bite wound (e.g. dog, cat, human) for other animals consider discussion with infectious diseases

Notify appropriate animal control authority for animal bites. Contact local health department for information on rabies risk and need for prophylaxis

### Criteria for antibiotic prophylaxis
- Immunocompromised
- Asplenic
- Advanced liver disease
- Injury >2.5 cm with significant gaping
- Suturable wound on face
- Wound on hand of any size
- Injury that may have punctured periosteum or joint capsule

### Does patient meet any of the criteria for prophylaxis?

- **YES**
  - **Infected?**
    - **YES**
      - **Abscess suspected or confirmed?**
        - **YES**
          - **Drain and culture (e)**
        - **NO**
      - **NO**
    - **NO**

- **NO**
  - **Systemic signs of infection (c) OR failed prophylactic antibiotic therapy?**
    - **YES**
      - **Treat as outpatient**
        - Clean the wound: copious irrigation (h), cautious debridement.
        - Give Tdap or DTaP vaccine as needed. (i)
        - NO antibiotics are needed.
    - **NO**

### Treat as outpatient
- **Clean the wound: copious irrigation (h), cautious debridement.**
- **Do NOT close the wound, unless it's on the child's face.**
  - For other locations, cover and consider loose closure for cosmetic reasons (especially large wounds).
  - Do NOT use tissue adhesives (e.g., Dermabond).
  - Give Tdap or DTaP vaccine as needed. (i)
  - Give amoxicillin/clavulanate PO
  - If allergic to amoxicillin: clindamycin
  - See dosing guidelines page 4
  - Duration: 7-10 days of therapy (continue for 1-2 days after signs and symptoms have resolved)

### Treat as outpatient
- **Open and clean wound with copious irrigation and cautious debridement.**
- **Give Tdap or DTaP vaccine as needed (i)**
- **Give antibiotics**
- **Amoxicillin/clavulanate PO preferred**
- **If allergic to amoxicillin: TMP/SMX plus clindamycin**
- **See dosing guidelines page 4**
- **Duration: 7-10 days of therapy (continue for 1-2 days after signs and symptoms have resolved)**

### Admit inpatient
- **Open and clean wound with copious irrigation and cautious debridement.**
- **Give Tdap or DTaP vaccine as needed (i)**
- **Give antibiotics**
- **Ampicillin/sulbactam IV preferred**
- **If allergic to amoxicillin:**
  - ceftriaxone plus clindamycin
- **See dosing guidelines page 4**
- **Oral transition is appropriate when patient is improving**
- **Duration: change to oral therapy to complete 7-14 days of therapy (continue for 1-2 days after signs and symptoms have resolved)**
NOTES

(a) Nonpurulent cellulitis is generally caused by streptococci. 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 “appropriate” 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.

(e) 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, 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 image below. This has comparable success as traditional incision and drainage with daily packing.

   - Loop can be removed by family or PCP after 3-4 days.
   - 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.

(f) 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.

(g) 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.

(h) 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.

(i) For a guide to tetanus prophylaxis in routine wound management, see health.state.mn.us/divs/idepc/diseases/tetanus/hcp/tetwmdgmgtc.pdf

Table 1. Antibiotic dosing for skin and soft tissue infections

<table>
<thead>
<tr>
<th>Inpatient dosing</th>
<th>Drug</th>
<th>Route and dose by patient weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cefazolin</td>
<td>33 mg/kg/dose (max 2000 mg) IV q 8 hrs</td>
</tr>
<tr>
<td></td>
<td>Clindamycin</td>
<td>10-13 mg/kg/dose (max 600 mg) IV q 8 hrs</td>
</tr>
<tr>
<td></td>
<td>Vancomycin</td>
<td>20 mg/kg/dose (max 1000 mg) IV q 8 hrs</td>
</tr>
<tr>
<td></td>
<td>Ampicillin/sulbactam</td>
<td>50 mg/kg/dose (max 2000 mg) IV q 6 hrs</td>
</tr>
<tr>
<td></td>
<td>Ceftriaxone</td>
<td>50-75 mg/kg (max 2000 mg) IV q 24 hrs</td>
</tr>
<tr>
<td></td>
<td>Metronidazole</td>
<td>10 mg/kg/dose (max 500 mg) IV/PO q 8 hrs</td>
</tr>
<tr>
<td></td>
<td>Piperacillin/tazobactam</td>
<td>75 mg/kg/dose (max 4,000 mg) IV q 6 hrs</td>
</tr>
</tbody>
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<tbody>
<tr>
<td></td>
<td>Cephalexin</td>
<td>15-20 mg/kg/dose (max 750 mg) PO TID. Pills available as 250 mg and 500 mg. Suspension available as 125 mg/5 ml or 250 mg/5 ml concentrations</td>
</tr>
<tr>
<td></td>
<td>Clindamycin</td>
<td>10-13 mg/kg/dose (max 450 mg) PO TID. Pills available as 150 mg and 300 mg. Solution available as 75 mg/5 ml concentration</td>
</tr>
<tr>
<td></td>
<td>Trimethoprim/sulfamethoxazole</td>
<td>6 mg/kg/dose (max 320 mg) PO BID. Pills available as 400 mg/80 mg and DS = 800 mg/160 mg. Solution available as 40 mg/5 ml of trimethoprim</td>
</tr>
<tr>
<td></td>
<td>Amoxicillin/clavulanate</td>
<td>25 mg/kg/dose (max 875 mg) PO BID. Pills available as 250 mg/125 mg, 500 mg/125 mg or 875 mg/125 mg. Suspension is available as 250 mg/5 ml, and 400 mg/5 ml concentrations of amoxicillin</td>
</tr>
</tbody>
</table>

Ampicillin/sulbactam dosing is based on ampicillin component
Piperacillin/tazobactam dosing is based on the piperacillin component
Amoxicillin/clavulanate dosing is based on the amoxicillin component