Skin/Soft Tissue Infections in the Older Adult

Spencer H. Durham, Pharm.D., BCPS, BCIDP
Associate Clinical Professor of Pharmacy Practice
Director, Alumni & Professional Affairs
Auburn University Harrison School of Pharmacy

To enter the Q&A and polling questions for this activity, go to ascp.com/qa and click on the title of this activity, as seen below.

Skin/Soft Tissue Infections in the Older Adult
1:30pm – 2:30pm
© Spencer Durham
Disclosure

I have no conflicts of interest to disclose.

Learning Objectives

1. Recognize the signs, symptoms, and risk factors for purulent infections, non-purulent infections, and diabetic extremity infections
2. Classify skin/soft tissue infections according to severity, including mild, moderate, and severe disease
3. Identify key pharmacotherapy considerations for antimicrobial agents commonly used for skin/soft tissue infections in older adults
4. When given a patient case, recommend antimicrobial therapy for an older adult with a skin/soft tissue infection
Poll: ___________ is the most likely cause of purulent SSTIs, whereas ___________ is the most likely cause of non-purulent SSTIs.

To access the polling questions, go to this link: ascp.com/qa and select the “Skin/Soft Tissue Infections in the Older Adult” activity, as seen below.

---

Self-Assessment Question #1

___________ is the most likely cause of purulent SSTIs, whereas ___________ is the most likely cause of non-purulent SSTIs.

A. *Streptococcus pyogenes, Staphylococcus aureus*
B. *Staphylococcus aureus, Streptococcus agalactiae*
C. *Streptococcus viridans, Staphylococcus epidermidis*
D. *Staphylococcus aureus, Streptococcus pyogenes*
Introduction

• Skin/soft tissue infections (SSTIs) is a general term that encompasses a variety of different diseases
• Sometimes referred to as acute bacterial skin and skin structure infections (ABSSSTIs)
• SSTIs are common in the outpatient, inpatient, and long-term care settings
• Increase in both frequency and severity over the last couple of decades
  • Corresponds to increased bacterial resistance, particularly associated with methicillin-resistant *Staphylococcus aureus* (MRSA)

SSTI Pathogens

• Most SSTIs are caused by bacterial organisms, but viral and fungal causes also occur
• Gram-positive organisms – most common causes of SSTIs
  • *Staphylococcus aureus* (MSSA and MRSA)
  • *Streptococcus pyogenes*
• Gram-negative species and obligate anaerobes
  • Underlying immune suppression (diabetes mellitus)
  • Uncommon or unusual SSTIs
SSTIs and Older Adults

• Older adults are at a higher risk of SSTIs compared to the general population
• Anything compromising the integrity of the skin can lead to breakdown and provide portals of entry for pathogens
• Skin integrity naturally decreases with age
  • Decreased skin strength
  • Impaired skin barrier
  • Slower wound healing

• Older adults often have comorbidities which contribute to breakdown of the skin
  • Diabetes mellitus
  • Nutritional deficiencies
  • Edema
• Additionally, older adults experience a natural weakening of the immune system, which can also predispose to infections
  • Immunosenescence
SSTIs and Older Adults

• Clinical trials and other studies to specifically examine the incidence of SSTIs in the older adult population are lacking, although many trials include older adults as part of the patient population
• In general, the treatment approach to SSTIs in older adults is similar to their younger counterparts
• Consideration for patient specific factors must be considered, such as renal function, hepatic function, and drug-drug interactions
• Patient specific factors may necessitate drug therapy dosing adjustments

SSTI Classification

• In general, SSTIs can be divided into 2 broad categories:
  • Purulent SSTIs
  • Non-purulent SSTIs
• Each type has multiple different specific diseases that may manifest, each with slightly different clinical characteristics
• Pharmacists must be familiar with the clinical characteristics and different pathogenic causes to appropriately recommend pharmacotherapy
Purulent SSTIs

- **Folliculitis** – superficial infection of a hair follicle
- **Furuncle** – infected hair follicle extending through the dermis ("boil")
- **Carbuncle** – involves multiple hair follicles that drain pus from several sites
- **Abscess** – collections of pus within the dermis and deeper
  - Usually present as erythematous, tender, and fluctuant

Risk Factors for Purulent SSTIs

**Compromised Skin Integrity**
- Physical trauma
- Immunosuppression
- Inadequate blood supply
- Excessive skin moisture

**Other Risk Factors**
- Close physical contact
- Poor hygiene
- Sharing personal items
- Crowded living conditions
Purulent SSTI Pathogens

- Primary pathogen: *Staphylococcus aureus*
  - MSSA or MRSA
- Other pathogens:
  - *Streptococcus pyogenes*
  - Polymicrobial
    - Sometimes seen in patients with diabetes
- Classified as mild, moderate, or severe based on the presence of systemic signs and symptoms

Classification of Purulent SSTIs

<table>
<thead>
<tr>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Localized infection only</td>
<td>• Signs/symptoms of systemic infection</td>
<td>• Failed incision &amp; drainage (I&amp;D) plus oral antibiotics</td>
</tr>
<tr>
<td>• No signs/symptoms of systemic infection</td>
<td>• Clinically stable</td>
<td>• Immunocompromised</td>
</tr>
</tbody>
</table>
| | | • Signs/Symptoms of systemic inflammatory response syndrome (SIRS):
  - Temperature >38°C
  - Heart rate >90 bpm
  - Respiratory rate >24 bpm
  - WBC >12,000 OR <400 cells/µL |
Classification of Purulent SSTIs

- Mild infections are treated on an outpatient basis
- Moderate infections can be treated outpatient, but may require an initial hospitalization
- Severe infections require hospitalization
- How do you distinguish between moderate and severe?
  - Distinction isn’t always clear since both require the presence of systemic signs/symptoms
  - Patients with severe disease may display many systemic signs/symptoms or be clinically unstable

Treatment of Purulent SSTIs

- Incision & Drainage (I&D):
  - Should always be performed, no matter the level of severity
  - Antimicrobial therapy in addition to I&D reduces the risk of recurrent or subsequent SSTIs
  - Does not generally improve cure rates of localized infections
- Antimicrobial therapy is not indicated for mild infections
- Empiric antimicrobial therapy should be directed against MRSA due to increasing prevalence
## Purulent Infections – Treatment

<table>
<thead>
<tr>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>• I&amp;D only</td>
<td>• I&amp;D with culture/sensitivity, plus oral antimicrobial therapy</td>
<td>• I&amp;D with culture/sensitivity, plus oral antimicrobial therapy</td>
</tr>
<tr>
<td>• No systemic antimicrobial therapy is indicated</td>
<td>• Empiric therapy: - TMP/SMX - Doxycycline - Clindamycin (alternative)</td>
<td>• Empiric therapy: - Vancomycin - Daptomycin - Linezolid - Ceftaroline - Dalbavancin - Oritavancin - Clindamycin (if institutional resistance is &lt;10-15%)</td>
</tr>
</tbody>
</table>

## Purulent SSTIs - Treatment

- When culture & susceptibility (C&S) results are available, therapy can be targeted to a more narrow-spectrum option

  - **Targeted therapy**
    - MSSA – Cephalexin, dicloxacillin, amoxicillin/clavulanate
    - MRSA – trimethoprim/sulfamethoxazole (TMP/SMX), doxycycline, clindamycin

  - **Length of therapy**
    - 5-10 days for outpatient therapy
    - 7-14 days for inpatient therapy
Self-Assessment Question #2

• J.P. is a 69-year-old female who presents to her PCP for evaluation of an abscess on her left upper back.
• Vital signs: Temperature-38.2°C, HR-78 bpm, BP-132/72 mmHg, RR-18 bpm
• The PCP performs an I&D and sends for C&S.
• J.P. has a history of anxiety disorder, hypertension, and COPD.
• She has NKDA.

Poll: Which of the following is the best therapy for J.D. at this time?

To access the polling questions, go to this link: ascp.com/qa and select the “Skin/Soft Tissue Infections in the Older Adult” activity, as seen below.
Self-Assessment Question #2

Which of the following is the best therapy for J.D. at this time?

A. I&D only
B. I&D plus cephalexin
C. I&D plus TMP/SMX
D. I&D plus clindamycin

Self-Assessment Question #3

• Culture results reveal the following:
  • *Staphylococcus aureus*

<table>
<thead>
<tr>
<th></th>
<th>MIC</th>
<th>SUSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxacillin</td>
<td>&lt;4</td>
<td>R</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>&lt;2</td>
<td>S</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>&lt;4</td>
<td>S</td>
</tr>
<tr>
<td>Trimethoprim/sulfamethoxazole</td>
<td>&lt;4</td>
<td>S</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>1</td>
<td>S</td>
</tr>
<tr>
<td>Linezolid</td>
<td>&lt;2</td>
<td>S</td>
</tr>
</tbody>
</table>

**E-test – Positive**
Poll: Which of the following is the best therapy to initiate based on the C&S results?

To access the polling questions, go to this link: ascp.com/qa and select the “Skin/Soft Tissue Infections in the Older Adult” activity, as seen below.

Self-Assessment Question #3

Which of the following is the best therapy to initiate based on the C&S results?

A. Cephalexin
B. **TMP/SMX**
C. Clindamycin
D. Linezolid
Nonpurulent SSTIs

• **Cellulitis** – Acute, spreading inflammation of the skin characterized by erythema and edema
  - Margins are poorly defined and **not** elevated
  - Any area of the body can be affected
• **Erysipelas** – Sub-form of cellulitis
  - Elevated, clearly defined margins
  - Legs and feet are most commonly affected
• The term “cellulitis” should **not** be used to describe cutaneous inflammation with purulent infections

Causes of Nonpurulent SSTIs

• **Risk factors**
  - Compromised skin integrity
  - Surgery
  - Peripheral vascular disease
  - Obesity
• **Causative organisms**
  - *Streptococcus pyogenes* – most common
  - Other *Strep* species, *S. aureus* – less common
Classification of Nonpurulent SSTIs

• Similar to purulent infections, with classifications of mild, moderate, and severe

• Mild infections
  • Typical cases of cellulitis/erysipelas
  • **No** systemic signs/symptoms of infection

• Moderate infections
  • Typical cases of cellulitis/erysipelas
  • **With** systemic signs/symptoms of infection

Severe Nonpurulent SSTIs

• Patients who have failed oral antimicrobial therapy
• Signs and symptoms of systemic infection such as the following:
  • Temperature >38°C
  • HR >90 bpm
  • RR >24 bpm
  • WBC >12,000 OR <400 cells/µL

• Patients characteristics:
  • Immunocompromised
  • Clinical signs of deeper infections, such as bullae
  • Skin sloughing
  • Hypotension
  • Evidence of organ dysfunction
Treatment of Nonpurulent SSTIs

- Antimicrobial therapy is **always** indicated, no matter the severity classification
- I&D **not** indicated (no focal point for drainage)
- Mild infections can often be treated with oral antimicrobials in the outpatient setting
- Moderate and severe infections must be treated with IV antimicrobials in the inpatient setting
- Patients with severe infections should undergo immediate evaluation for the need for surgical intervention

### Empiric Therapy

<table>
<thead>
<tr>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Empiric Therapy</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Penicillin VK  | Penicillin G                           | Vancomycin + 
| Cephalexin     | Cefazolin                             | piperacillin/tazobactam                     |
| Dicloxacillin  | Clindamycin                           | Vancomycin + 
| Clindamycin (alternative) | Ceftriaxone              | imipenem/cilastatin                         |
|               |                                       | Vancomycin + meropenem                      |

***MRSA coverage is appropriate if specific risk factors are present***
Non-purulent SSTIs - Treatment

- Length of therapy is at least 5 days
  - Patient specific depending on how quickly symptoms resolve
  - Extend length of therapy if only slow improvement occurs
  - Length of therapy extension is based on clinical judgement
- Prednisone 40 mg once daily x 7 days
  - Adjunctive treatment for inflammation can be considered
  - Although sometimes used in practice, topical steroids are not indicated
  - Contraindicated in patients with diabetes mellitus
  - Comorbidities may limit use in older adults

Recurrent Cellulitis

- Recurrence rates can be as high as 20%
- Recurrent cellulitis can occur in patients with predisposing conditions:
  - Obesity
  - Venous insufficiency
  - Eczema
  - Tobacco use
  - Malignancy
- Identification and management of predisposing factors may decrease the risk
Prophylaxis for Recurrent Cellulitis

- Prophylaxis can be considered for patients who have 3-4 recurrent episodes per year despite controlling for predisposing conditions
- Options for prophylaxis:
  - BID penicillin or erythromycin for 4-52 weeks
    - Erythromycin is uncommonly used
  - IM benzathine penicillin every 2-4 weeks
    - Therapy is indefinite if predisposing factors cannot be controlled
- Must balance need for prophylaxis with potential to increase bacterial resistance

Self-Assessment Question 4

- M.M. is a 70-year-old white female who presents to the ED for evaluation of her left leg, which has become bright red and edematous.
- She noticed the redness starting about 3 days ago, but has gotten slightly worse during that time. The redness covers most of the anterior of the leg, is raised, and has a well-defined margin.
- Vital signs: Temperature-37°C, HR-76 bpm, BP-126/78 mmHg, RR-21 bpm
- Allergies: Penicillin (mild rash as a child)
Poll: What is the most appropriate treatment for M.M. at this time?

To access the polling questions, go to this link: ascp.com/qa and select the “Skin/Soft Tissue Infections in the Older Adult” activity, as seen below.

Self-Assessment Question #4

What is the most appropriate treatment for M.M. at this time?

A. Admit to the hospital and begin IV penicillin G
B. **Discharge home with cephalexin**
C. Admit to the hospital and begin IV vancomycin plus meropenem
D. Discharge home with TMP/SMX
Necrotizing Fasciitis

- A highly aggressive, fast-spreading, subcutaneous infection involving the superficial fascia
  - Severe form of cellulitis
  - Popularized in the media as “flesh-eating disease”
  - Several cases received media attention throughout 2019
- Associated with a high mortality rate and considered a medical emergency
- Usually involves the limbs and initially appears as rapidly progressing cellulitis

In early stages, difficulty exists distinguishing necrotizing fasciitis from cellulitis

Deep tissue involvement suggested by:
- Severe pain/edema
- Minimal or no response to antimicrobial therapy
- Wooden or hard feeling subcutaneous tissue
- Crepitus
- Skin necrosis or ecchymosis
- Bullous lesions
Necrotizing Fasciitis Pathogens

• Causative organisms:
  • *Streptococcus pyogenes*
    • Most common monomicrobial cause
    • Toxin production causes rapid spreading
  • MSSA/MRSA
    • Uncommon, but incidence is increasing
  • *Vibrio vulnificus*
    • Associated with saltwater environments
  • *Aeromonas hydrophilia*
    • Associated with freshwater environments

Risk Factors for Necrotizing Fasciitis

• Anyone can be affected, including otherwise healthy patients, but there are predisposing factors
• Risk factors
  • Diabetes
  • Immunocompromised state
  • Venous insufficiency with edema/venous stasis
  • Ulcerations
Treatment of Necrotizing fasciitis

• Primary treatment is immediate surgical excision
  • Infected flesh must be excised due to rapid spreading
  • Most patients will require multiple surgeries
• Adequate fluid resuscitation must be provided due to loss through wounds
• Empiric antimicrobials
  • Vancomycin, daptomycin, or linezolid **plus**
  • Piperacillin/tazobactam, a carbapenem, ceftriaxone/metronidazole, fluoroquinolone/metronidazole

Clindamycin should be added **empirically** due to its ability to suppress toxin production of *Streptococcus*
  • Continue only if *Streptococcus pyogenes* is confirmed

• Length of therapy is highly variable, but is usually extended
• Antimicrobial therapy should continue until:
  • Surgical debridement is no longer needed
  • No documented fever for 48-72 hours
  • Clinical improvement is documented

2019 ASCP Annual Meeting & Exhibition
Aged to Perfection
#ASCP50
Treatment of Necrotizing fasciitis

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Streptococcus pyogenes</em></td>
<td>• Penicillin plus clindamycin</td>
</tr>
<tr>
<td><em>Vibrio vulnificus</em></td>
<td>• Doxycycline plus 3rd generation cephalosporin</td>
</tr>
<tr>
<td></td>
<td>- Ceftriaxone</td>
</tr>
<tr>
<td></td>
<td>- Cefotaxime</td>
</tr>
<tr>
<td></td>
<td>- Ceftazidime</td>
</tr>
<tr>
<td><em>Aeromonas hydrophilia</em></td>
<td>• Doxycycline plus ciprofloxacin or ceftriaxone</td>
</tr>
</tbody>
</table>

Diabetic Foot Infections

- Diabetic foot infections (DFIs)
  - Common consequence of diabetes
  - Occurs more frequently in cases of uncontrolled diabetes

- Complications:
  - Hospitalization
  - Amputation
  - Osteomyelitis

- DFIs can escalate in severity when patients are not aware in the early stages due to peripheral neuropathy
DFI Pathogens

• While gram-positive organisms are often implicated, gram-negative organisms and obligate anaerobes are also frequently isolated
• Many infections are also polymicrobial
• Pathogenic causes:
  • *Staphylococcus aureus* (MSSA/MRSA)
  • Other gram-positives: *Streptococcus* spp., *Enterococcus*
  • Gram-negatives: *Escherichia coli*, *Klebsiella* spp., *Proteus mirabilis*, *Pseudomonas aeruginosa*
  • Obligate anaerobes: *Bacteroides fragilis*, *Peptostreptococcus* spp.

Diabetic Foot Infections - Severity

<table>
<thead>
<tr>
<th>PEDIS Grade</th>
<th>IDSA</th>
<th>Clinical Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not infected</td>
<td>• No classic signs/symptoms of infection or purulent discharge</td>
</tr>
</tbody>
</table>
| 2           | Mild | • Local infection of only the skin and subcutaneous tissue  
• Erythema around the ulcer must be >0.5 cm to ≤2 cm |
| 3           | Moderate | • Local infection with erythema >2 cm, or with deeper involvement than skin and subcutaneous tissues, and 
• No SIRS criteria |
| 4           | Severe | • Local infection with ≥2 of the following SIRS criteria:  
- Temperature >38°C or <36°C  
- HR >90 bpm  
- RR >20 breaths/min or PaCO₂ <32 mmHg  
- White blood cell count >12,000 or <4000 cells/µL or ≥10% bands |
Treatment of DFIs

- Mild infections can usually be treated with oral antimicrobials on an outpatient basis
  - Generally only requires coverage against *Staphylococcus aureus* and gram-positive organisms
  - Provide coverage against MRSA if risk factors are present
    - Prior history of infection, high prevalence
    - Most patients will require coverage
- Moderate infections may require initial IV therapy and hospitalization, with a change to oral therapy for completion
- Severe infections require hospitalization and initial IV therapy, with possible change to oral after patient improvement

Diabetic foot infections - Treatment

- Appropriate wound care should always be used in conjunction with antimicrobials
- *Pseudomonas* often colonizes wounds, but is an uncommon cause of true DFIs
  - Provide coverage only in severe infections and when risk factors are present (high local prevalence, warm climate, frequent foot exposure to water, severe infection)
- Antimicrobials should not be continued until the wound totally heals
- Length of therapy can range from 1-4 weeks
### Treatment of Mild DFIs

<table>
<thead>
<tr>
<th>Antimicrobial Agent</th>
<th>Route of Administration</th>
<th>Length of Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For suspected MSSA or Streptococcus</strong></td>
<td>Oral, but can consider topical for some patients</td>
<td>1-2 weeks, but can extend up to 4 weeks if the infection is slow to resolve</td>
</tr>
<tr>
<td>• Amoxicillin/clavulanate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cephalexin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Dicloxacillin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Clindamycin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Levofloxacin</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>For suspected MRSA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• TMP-SMX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Doxycycline</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Treatment of Moderate DFIs

<table>
<thead>
<tr>
<th>Antimicrobial Agent</th>
<th>Therapy Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Empiric therapy</strong></td>
<td></td>
</tr>
<tr>
<td>• Ampicillin/sulbactam</td>
<td>• Initial treatment may often require hospitalization</td>
</tr>
<tr>
<td>• Cefoxitin/Ceftriaxone</td>
<td></td>
</tr>
<tr>
<td>• Ertapenem</td>
<td>• Antimicrobials may be changed to oral if infecting pathogens can be identified</td>
</tr>
<tr>
<td>• Imipenem/cilastatin</td>
<td>• Length of therapy varies between 1-3 weeks</td>
</tr>
<tr>
<td>• Moxifloxacin</td>
<td></td>
</tr>
<tr>
<td>• Tigecycline</td>
<td></td>
</tr>
<tr>
<td><strong>If MRSA is suspected, add:</strong></td>
<td></td>
</tr>
<tr>
<td>• Vancomycin, daptomycin, or linezolid</td>
<td></td>
</tr>
<tr>
<td><strong>Suspected Pseudomonas aeruginosa:</strong></td>
<td></td>
</tr>
<tr>
<td>Piperacillin/tazobactam</td>
<td></td>
</tr>
</tbody>
</table>
Treatment of Severe DFIs

**Antimicrobial Agent** | **Therapy Considerations**
---|---
Empiric therapy against MRSA, *Pseudomonas*, Enterobacteriaceae, and obligate anaerobes:  
• Piperacillin/tazobactam  
• Imipenem/cilastatin  
• Ceftazidime  
• Cefepime  
• Aztreonam  
**PLUS**  
• Vancomycin  
• Daptomycin  
• Linezolid  

• Treatment may require a prolonged hospitalization depending on the clinical status of the patient  
• Antimicrobials may be changed to oral if infecting pathogens can be identified and the patient is clinically stable  
• Length of therapy varies between 2-4 weeks

To access the polling questions, go to this link: [ascp.com/qa](http://ascp.com/qa) and select the "Skin/Soft Tissue Infections in the Older Adult" activity, as seen below.
Self-Assessment Question #5

Which of the following would be the most likely cause of a diabetic foot infection in a patient with a mild (PEDIS grade 1) infection?

A. *Escherichia coli*  
B. *Enterococcus faecium*  
C. *Pseudomonas aeruginosa*  
D. *Staphylococcus aureus*

Summary and Practice Points

• SSTIs are a common problem in the older adult population due to decreased skin integrity, comorbidities, and immunosenescence  
• Infection severity is generally characterized by the presence or absence and extent of systemic signs and symptoms  
• *Staphylococcus aureus* is the primary cause of purulent infections and empiric therapy should provide coverage against MRSA  
• *Streptococcus pyogenes* is the primary cause of non-purulent infections  
• I&D should always be performed for purulent infections
References


Social Q&A
To access Q&A, go to this link: ascp.cnf.io and select the "Skin/Soft Tissue Infections in the Older Adult" activity, as seen below.