

Skin and Soft Tissue Infections (SSTI)

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Objectives

- Identify the clinical presentations of common SSTIs
- Review microbiology associated with common SSTIs
- Identify SSTIs that necessitate URGENT surgical intervention
- Recognize imaging modalities that may be useful in diagnosis of SSTIs
- Identify an antibiotic plan for treatment of purulent vs. non-purulent SSTIs with particular focus on disease severity
- Describe indications for inpatient management of SSTI


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Background

SSTIs are responsible for:

- 14 million ambulatory visits per year
- 9.89 million ED visits per year
- 900,000 admissions per year
 - \$3.7B yearly total cost
- 10% of all cases of septic shock
- Incorrect antibiotic use in 49.8% of presentations
- Third highest level of variance in treatment
 - Mood disorders and nonspecific chest pain

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Pre-test

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Which of the following is the most likely diagnosis for this acute, warm, and tender skin condition?

- A) Cellulitis
- B) Contact dermatitis
- C) Ecthyma
- D) Impetigo
- E) Stasis dermatitis

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This patient is afebrile, with a heart rate of 70, BP 120/80, and RR 15. What is the most appropriate treatment?

- A) PO cephalixin
- B) PO doxycycline
- C) PO trimethoprim-sulfamethoxazole
- D) IV cefazolin
- E) IV vancomycin

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This patient has a temp of 38.4, with a heart rate of 110, BP 90/60, and RR 15. What is the most appropriate treatment?

- A) PO cephalexin
- B) PO doxycycline
- C) PO trimethoprim-sulfamethoxazole
- D) IV cefazolin
- E) IV vancomycin

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A 28-year-old man is evaluated for a 4-day history of a tender nodule on the left dorsal hand. The patient thought the lesion started as a "spider bite," and it continued to increase in size and tenderness. He has no fever or chills. No other lesions are present.


Medical history is unremarkable, and he takes no medications.

On physical examination, vital signs are normal. Skin findings are shown.


The remainder of the examination is normal. Laboratory values, including leukocyte count, are within normal range.

Which of the following is the most appropriate treatment?

- A) Antibiotic therapy based on culture result
- B) Incision and drainage
- C) Incision and drainage plus oral cephalexin
- D) Oral trimethoprim-sulfamethoxazole



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A 23-year-old man is evaluated for a furuncle on the neck that appeared 1 day ago. Medical history is notable only for anaphylaxis with administration of trimethoprim-sulfamethoxazole. He is otherwise well and takes no medications.


On physical examination, temperature is 38.3 °C (100.9 °F), blood pressure is 124/75 mm Hg, pulse rate is 95/min, and respiration rate is 15/min.

After incision and drainage of the abscess, a culture is obtained.

Which of the following is the most appropriate additional treatment?

- A) Oral cephalexin
- B) Oral clindamycin
- C) Oral doxycycline
- D) Oral penicillin
- E) Clinical follow-up

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Following 3 days of appropriate treatment, the man from the previous question re-presents with ongoing discomfort. Exam pertinent for the same vitals as previous: Temperature is 38.3 °C (100.9 °F), blood pressure is 124/75 mm Hg, pulse rate is 95/min, and respiration rate is 15/min.

Which of the following is the most appropriate additional treatment?

- A) Oral cephalexin
- B) Oral clindamycin
- C) Oral doxycycline
- D) IV cefazolin
- E) IV vancomycin

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A 57-year-old man cut his calf while working under his car in his garage. The next day he presents to the emergency department for redness which started at the calf and has rapidly spread to the ankle, thigh, and buttocks. Crepitus is noted on physical exam.

Which of the following imaging modalities would be the most appropriate for assisting in this patient's evaluation?

- A) Computed tomography (CT)
- B) Magnetic resonance imaging (MRI)
- C) X-ray
- D) All the above

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The man from the previous question undergoes imaging.

Which of the following is the proper treatment plan based on this patient's presentation and radiograph findings?

- A) IV vancomycin
- B) IV cefepime
- C) IV clindamycin
- D) Urgent surgical consultation
- E) All the above


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Erysipelas



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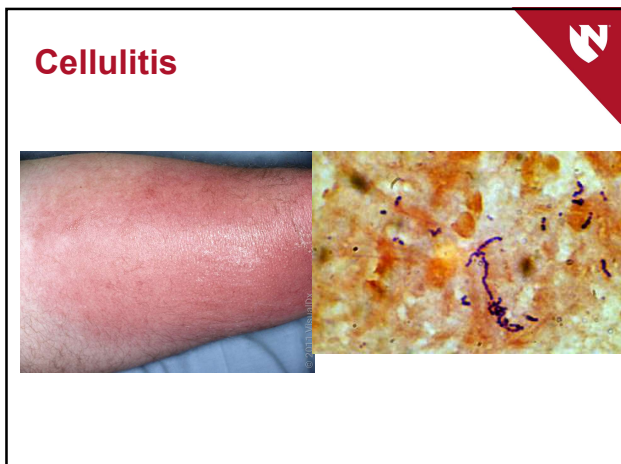
Erysipelas



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Abscess
(including furuncle and carbuncle)



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Abscess



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Necrotizing SSTI



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Types of necrotizing fasciitis

- Type I
 - polymicrobial
- Type II
 - Monomicrobial (GAS, *Staph aureus*, *Aeromonas*, *Vibrio*)
- Type III
 - Clostridial myonecrosis

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Specific necrotizing syndromes



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Call the surgeons NOW

Concern for necrotizing fasciitis
Concern for Fournier's gangrene
Concern for Ludwig's angina

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When and how to image

Concern for necrotizing infection

- XR (left), CT (middle), or MRI (right).




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When and how to image

Concern for large abscess

- Ultrasound (left), CT (middle), or MRI (right)



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Purulence or no purulence?



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Severity of infection

Mild

- No systemic signs of infection.

Moderate

- Some systemic signs of infection (fever, leukocytosis, tachycardia) but are well appearing, immunocompetent, and hemodynamically stable.

Severe

- Necrotizing infection.
- Multiple systemic signs of infection.
- Hypotensive.
- Immunocompromised.
- Failed appropriate antibiotic therapy.

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Purulent infections need to be drained

Mild

- I&D only

Moderate

- I&D plus PO antibiotics

Severe

- I&D plus IV antibiotics
- If necrotizing infection, additional surgical debridement required

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Inpatient or outpatient?

Outpatient

- Infections which can be managed with oral antibiotics
 - Mild purulent and non-purulent infections
 - Many moderate purulent infections (well-appearing, can tolerate PO)

Inpatient

- Infections which require IV antibiotics
 - All severe purulent and non-purulent infections
 - Some moderate purulent infections (cannot tolerate PO, worsening clinical status, etc.)

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Which antibiotics?

Purulent infections need antibiotics targeting MRSA

- PO
 - Trimethoprim-sulfamethoxazole, doxycycline
 - clindamycin provides MRSA coverage but should not be chosen over TMP-SMX or doxycycline due to increasing MRSA resistance and high C diff risk
- IV
 - Vancomycin is first line
 - Other antibiotics such as linezolid, daptomycin, and ceftaroline should usually only be given with assistance of Infectious Disease consultation

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Which antibiotics?

Non-purulent infections need antibiotics targeting *Strep* (penicillins or cephalosporins preferred)

- PO
 - Cephalexin, dicloxacillin
- IV
 - Cefazolin, oxacillin; penicillin G or ampicillin may be used if *Streptococcus* confirmed on culture

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Which antibiotics?

Necrotizing infections

- Inpatient only
 - STAT surgical consultation
 - Infectious Disease consultation recommended
 - Empiric broad spectrum antibiotics
 - Vancomycin PLUS ceftriaxone/cefepime PLUS metronidazole/clindamycin
 - Vancomycin PLUS levofloxacin PLUS metronidazole/clindamycin for patients with severe penicillin allergy
 - Pathogen specific
 - Pending culture data

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Treatment summarized

- Mild purulent
 - I&D alone
- Mild non-purulent
 - cephalexin
- Moderate purulent
 - Trimethoprim-sulfamethoxazole or doxycycline
- Moderate and severe non-purulent
 - cefazolin
- Severe purulent
 - vancomycin
- Necrotizing infection
 - Vancomycin PLUS cefepime PLUS clindamycin

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MANAGEMENT OF SSTIs

NONPURULENT (Necrotizing Infection, Cellulitis, Erysipelas)

- Severe:** EMERGENT SURGICAL INTERVENTION (DEBRIDEMENT) + Rule out necrotizing process. **EMPIRIC Rx:** Vancomycin PLUS Piperacillin/Tazobactam. **C.S. & S:** DEFINED Rx (Necrotizing Infection) Monomicrobial: Streptococcus pyogenes: Cefazolin PLUS Clindamycin; Clostridial spp.: Penicillin PLUS Clindamycin; Vibrio vulnificans: Doxycycline PLUS Ceftriaxone; Aeromonas hydrophila: Doxycycline PLUS Ciprofloxacin. Polymicrobial: Vancomycin PLUS Piperacillin/Tazobactam.
- Moderate:** INTRAVENOUS Rx: Penicillin or Ceftriaxone or Cefazolin or Clindamycin.
- Mild:** ORAL Rx: Penicillin VK or Cephalexin or Dicloxacillin or Clindamycin.

PURULENT (Furuncle, Carbuncle, Abscess)

- Severe:** I&D C&S. **EMPIRIC Rx¹:** Clindamycin or Doxycycline or Linezolid or Telavancin or Cefazolin. **DEFINED Rx:** MRSA: Vancomycin or Linezolid or Telavancin or Cefazolin or Clindamycin; MSSA: Clindamycin or Doxycycline.
- Moderate:** I&D C&S. **EMPIRIC Rx:** TMP/SMX or Doxycycline. **DEFINED Rx:** MRSA: TMP/SMX or Clindamycin or Cephalexin; MSSA: Doxycycline or Cephalexin.
- Mild:** I&D.

¹Since doxycycline and telavancin are not approved for use in children, vancomycin is recommended; clindamycin may be used if clindamycin resistance is <10-15% at the institution.

2014 IDSA guidelines for management of SSTIs. Grenthel, Stevens, Allan L, Basso, Henry G, Chambers, E, Patches Dellinger, Ellie J, C, Goldstein, Sherwood L, Gorbach, Jan V, Hirschmann, Sheldon L, Kaplan, Jose G, Montoya, James C, Wade, Executive Summary: Practice Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections: 2014 Update by the Infectious Diseases Society of America, Clinical Infectious Diseases, Volume 59, Issue 2, 15 July 2014, Pages 147-159, <https://doi.org/10.1093/cid/ciu444>

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UNMC Antimicrobial Stewardship website

Type of Infection	Suspected Organisms	Recommended Treatment
Non-purulent cellulitis (no purulent material or wound present)	Most commonly beta-hemolytic Streptococcus (Strep pyogenes (group A strep), Strep agalactiae (group B strep or GBS)), Strep dysgalactiae (group C strep), Group G strep, Rarely Staphylococcus aureus (normally MSSA)	Mild
		<ul style="list-style-type: none"> • Cephalexin 500mg PO q6h OR • Dicloxacillin 500mg PO q6h Severe Penicillin Allergy: Clindamycin 300 mg PO q6h
		Moderate-severe
		<ul style="list-style-type: none"> • Cefazolin 2g IV q8h OR • Oxacillin 2g IV q6h Severe Penicillin Allergy: Clindamycin 600 mg IV q8h
		Severe systemic illness or no response/worsening at 48 hours
		<ul style="list-style-type: none"> • Consider vancomycin 10-15 mg/kg IV q12h¹ If streptococcal infection confirmed on culture (no PCN allergy): • PO: Penicillin VK 500 mg PO q6h OR • Amoxicillin 875mg PO BID • IV: Aqueous Penicillin G 2 MU q4h OR • Ampicillin 2g q4-6h

https://www.unmc.edu/intmed/_documents/id/clinicpath-ssti-guidelines-2018.pdf

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UNMC Antimicrobial Stewardship website

<p>Erysipelas (superficial SSTI limited to dermal lymphatics with clear demarcation)</p>	<p><i>S. pyogenes</i>, rarely <i>S. aureus</i>, including CA-MRSA, or <i>S. agalactiae</i></p>	<p>Mild Penicillin VK 500 mg PO q6h OR Amoxicillin 875mg PO BID OR Cephalexin 500 PO q6h Severe Penicillin allergy: Clindamycin 300mg PO q6h</p> <p>Moderate-Severe Aqueous PCN G 2 MU IV q6h OR Ampicillin 2g IV q6h OR Cefazolin 2g IV q6h Severe Penicillin allergy: Clindamycin 600 mg IV q6h</p> <p>- If concern for MRSA consider TMP/SMX DS 1tab PO q12h or vancomycin 10-15 mg/kg IV q12h (Consult pharmacy for patient-specific dosing)</p> <p>Facial erysipelas should generally be treated with IV therapy including MRSA coverage</p>
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UNMC Antimicrobial Stewardship website

Type of Infection	Suspected Organisms	Recommended Treatment
<p>Peristent Skin/Soft Tissue Infections (including abscess, furuncles, carbuncles or other SSTI with purulence present)</p>	<p><i>S. aureus</i>, including CA-MRSA and β-hemolytic Streptococci</p>	<p>Incision/Drainage is essential for clinical cure</p> <p>Adjunctive antibiotics are recommended for all abscesses >2cm³ or in the following clinical situations:</p> <ul style="list-style-type: none"> • Severe or extensive disease (multiple sites) • Rapid progression of soft tissue infection • Signs/symptoms of systemic illness • Immunosuppression or comorbidities (diabetes, HIV, active neoplasm) • Extremes of age • Associated septic phlebitis • Sensitive area (face, hand, genitals) • Lack of response to incision/drainage <p>Mild SSTI</p> <ul style="list-style-type: none"> • TMP/SMX DS 1 tab PO q12h OR • Doxycycline/Minocycline¹ 100 mg PO q12h <p>Moderate-severe SSTI</p> <ul style="list-style-type: none"> • Vancomycin 10-15 mg/kg IV q12h (Consult pharmacy for patient-specific dosing) <p>- If gangrene, immunocompromised and/or severe systemic symptoms treat as per necrotizing SSTI guidance below</p>

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UNMC Antimicrobial Stewardship website

<p>Necrotizing Soft Tissue Infections Necrotizing fasciitis, Fournier's gangrene, Ludwig's angina, Clostridial myonecrosis (gas gangrene)</p>	<p>Empiric Therapy (pathogen unknown)</p>	<p>Immediate surgical debridement and culture</p> <ul style="list-style-type: none"> - Infectious Diseases consult Recommended - De-escalate antibiotics after 72 hrs, or when specific culture data become available <ul style="list-style-type: none"> • Vancomycin 10-15 mg/kg IV q12h (Consult pharmacy for patient-specific dosing) PLUS • Cefazolin 1g Q2H IV q2h OR Cefepime 1g IV q6h PLUS • Meropenem 500mg IV q6h OR Clindamycin 600mg IV q6h <p>OR</p> <ul style="list-style-type: none"> • Vancomycin PLUS Piperacillin/tazobactam 4.5g IV q6h <p>Severe Penicillin Allergy: Reclade Cefepime or Cefazone with Levofloxacin¹ 750mg IV q6h OR Aztreonam 2g IV q6h</p> <p>Type I - mixed aerobic and anaerobic flora - De-escalate therapy based on culture data</p> <p>Type II - monomicrobial - <i>S. pyogenes</i>: Aqueous Penicillin G 2-4 MU IV q4 PLUS Clindamycin 900 mg IV q6h - <i>S. aureus</i>: Antistaphylococcal penicillin/cephalosporin for MSSA or Vancomycin for MRSA</p> <p>Type III - Clostridial (<i>C. perfringens</i>, rarely <i>C. septicum</i>) - Aqueous Penicillin G 2-4 MU IV q4 PLUS Clindamycin 900 mg IV q6h</p>
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Post test

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Which of the following is the most likely diagnosis for this acute, warm, and tender skin condition?

- A) Cellulitis
- B) Contact dermatitis
- C) Ecthyma
- D) Impetigo
- E) Stasis dermatitis

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This patient is afebrile, with a heart rate of 70, BP 120/80, and RR 15. What is the most appropriate treatment?

- A) PO cephalexin
- B) PO doxycycline
- C) PO trimethoprim-sulfamethoxazole
- D) IV cefazolin
- E) IV vancomycin

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This patient has a temp of 38.4, with a heart rate of 110, BP 90/60, and RR 15. What is the most appropriate treatment?

- A) PO cephalexin
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A 28-year-old man is evaluated for a 4-day history of a tender nodule on the left dorsal hand. The patient thought the lesion started as a "spider bite," and it continued to increase in size and tenderness. He has no fever or chills. No other lesions are present.

Medical history is unremarkable, and he takes no medications.

On physical examination, vital signs are normal. Skin findings are shown.


The remainder of the examination is normal. Laboratory values, including leukocyte count, are within normal range.

Which of the following is the most appropriate treatment?

- A) Antibiotic therapy based on culture result
- B) Incision and drainage
- C) Incision and drainage plus oral cephalexin
- D) Oral trimethoprim-sulfamethoxazole



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On physical examination, temperature is 38.3 °C (100.9 °F), blood pressure is 124/75 mm Hg, pulse rate is 95/min, and respiration rate is 15/min.

After incision and drainage of the abscess, a culture is obtained.

Which of the following is the most appropriate additional treatment?

- A) Oral cephalexin
- B) Oral clindamycin
- C) Oral doxycycline
- D) Oral penicillin
- E) Clinical follow-up

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Following 3 days of appropriate treatment, the man from the previous question re-presents with ongoing discomfort. Exam pertinent for the same vitals as previous: temperature is 38.3 °C (100.9 °F), blood pressure is 124/75 mm Hg, pulse rate is 95/min, and respiration rate is 15/min.

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49

A 57-year-old man cut his calf while working under his car in his garage. The next day he presents to the emergency department for redness which started at the calf and has rapidly spread to the ankle, thigh, and buttocks. Crepitus is noted on physical exam.

Which of the following imaging modalities would be the most appropriate for assisting in this patient's evaluation?

- A) Computed tomography (CT)
- B) Magnetic resonance imaging (MRI)
- C) X-ray
- D) All the above

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The man from the previous question undergoes imaging.

Which of the following is the proper treatment plan based on this patient's presentation and radiograph findings?

- A) IV vancomycin
- B) IV ceftazidime
- C) IV clindamycin
- D) Urgent surgical consultation
- E) All the above

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