Cellulitis, Erysipelas, and SSTIs

Skin and soft tissue infections (SSTIs) are common in hospitalized patients, ranging from mild cellulitis to life-threatening necrotizing infections. This pamphlet provides students with a detailed guide to diagnose, manage, and treat SSTIs, including when to consult specialists, with case scenarios to apply the knowledge.

Overview and Diagnosis

- **Definition:** SSTIs encompass infections of the skin, subcutaneous tissue, fascia, and muscle, ranging from superficial (e.g., erysipelas) to deep (e.g., necrotizing fasciitis).
    - **Cellulitis:**
        - **Clinical Features:** Diffuse erythema, warmth, swelling, tenderness; poorly demarcated borders; often unilateral (e.g., lower leg).
        - **Common Sites:** Lower extremities, face, arms.
        - **Systemic Signs:** Fever, chills, malaise (moderate-severe cases).
    - **Erysipelas:**
        - **Clinical Features:** Bright red, sharply demarcated, raised erythematous plaque; often on face or lower legs; peau d'orange appearance (lymphatic involvement).
        - **Systemic Signs:** High fever, chills, more pronounced than cellulitis.
    - **Other SSTIs:**
        - **Abscess:** Localized, fluctuant mass with erythema, warmth, pus; often painful.
        - **Necrotizing Fasciitis:** Rapidly progressive, severe pain disproportionate to exam, bullae, crepitus, skin necrosis; systemic toxicity (fever, hypotension).
        - **Pyomyositis:** Deep muscle infection, often with abscess; fever, localized swelling, pain on movement.
- **Diagnosis:**
    - **Primarily clinical:** Based on exam findings (erythema, warmth, tenderness, systemic signs).
- **Severity Classification (IDSA):**
    - **Mild:** Localized erythema, no systemic signs.
    - **Moderate:** Systemic signs (fever, chills), no hemodynamic instability.

- **Severe:** Sepsis (hypotension, lactate >2 mmol/L), necrotizing infection, or immunocompromised state.

SSTI Types and Clinical Features Table

Type	Clinical Features	Common Pathogens	Notes
Cellulitis	Diffuse erythema, warmth, swelling	Streptococcus pyogenes, S. aureus	Poorly demarcated; often unilateral.
Erysipelas	Sharp, raised, bright red plaque	S. pyogenes	Peau d'orange; often face/lower legs.
Abscess	Fluctuant mass, erythema, pus	S. aureus (MSSA/MRSA), anaerobes	Requires incision and drainage (I&D).
Necrotizing Fasciitis	Severe pain, bullae, crepitus	S. pyogenes, polymicrobial	Surgical emergency; high mortality (20-30%).

Differential Diagnosis

- **Deep Vein Thrombosis (DVT):**
  - **Features:** Unilateral leg swelling, pain, no fever, Homan's sign (calf pain on dorsiflexion).
  - **Clues:** Risk factors (immobility, surgery), ultrasound with non-compressible vein.
- **Contact Dermatitis:**
  - **Features:** Pruritic, erythematous rash, well-demarcated, no fever.
  - **Clues:** Exposure history (e.g., new soap), sparing of deeper tissues.
- **Gout:**
  - **Features:** Acute, localized redness/swelling (e.g., 1st MTP joint), severe pain, no systemic signs.
  - **Clues:** Hyperuricemia, joint aspiration (negatively birefringent crystals).
- **Stasis Dermatitis:**
  - **Features:** Chronic, bilateral leg erythema, edema, scaling, no fever.
  - **Clues:** History of venous insufficiency, hemosiderin staining.
- **Herpes Zoster:**
  - **Features:** Unilateral, dermatomal vesicular rash, burning pain, no systemic signs.
  - **Clues:** Vesicles in dermatomal pattern, history of varicella.
- **Key Tips:**
  - Fever/systemic signs favor infection (cellulitis/erysipelas).
  - Rapid progression, severe pain, crepitus → Suspect necrotizing fasciitis (surgical emergency).

Causes

- **Cellulitis:**
  - **Pathogens:** Streptococcus pyogenes (group A strep), S. aureus (MSSA/MRSA); less common: gram-negatives (e.g., E. coli in diabetics).
  - **Risk Factors:** Skin breaks (e.g., trauma, ulcers), lymphedema, venous insufficiency, obesity, diabetes.
- **Erysipelas:**
  - **Pathogens:** S. pyogenes (most common); rarely S. aureus.
  - **Risk Factors:** Lymphedema, prior erysipelas, nasal carriage of S. pyogenes.
- **Abscess:**
  - **Pathogens:** S. aureus (MSSA/MRSA predominant), anaerobes (oral flora in bite wounds), polymicrobial (diabetic foot).
  - **Risk Factors:** IV drug use, diabetes, trauma, poor hygiene.
- **Necrotizing Fasciitis:**
  - **Type I (Polymicrobial):** E. coli, Bacteroides, Clostridium; often in diabetics, post-surgical.
  - **Type II (Monomicrobial):** S. pyogenes, Vibrio vulnificus (saltwater exposure).
  - **Risk Factors:** Diabetes, immunocompromise, trauma, recent surgery, marine exposure.
- **Pyomyositis:**
  - **Pathogens:** S. aureus (90%), S. pyogenes; rare: gram-negatives (immunocompromised).
  - **Risk Factors:** Tropical regions, HIV, trauma, IV drug use.
- **Other Causes:**
  - **Bite Wounds:** Pasteurella multocida (cat/dog bites), Eikenella corrodens (human bites), anaerobes.
  - **Diabetic Foot Infections:** Polymicrobial (S. aureus, gram-negatives, anaerobes), often with osteomyelitis.
  - **Immunocompromised:** Fungal (Candida, Aspergillus), atypical (Pseudomonas, Nocardia).

Labs

- **Initial Labs:**
  - **CBC:** Leukocytosis (WBC >12,000/µL), left shift (infection); leukopenia in severe sepsis.
  - **Inflammatory Markers:** CRP, ESR (elevated in cellulitis, necrotizing infections); procalcitonin (if sepsis suspected).

- **Blood Cultures:** ≥2 sets (aerobic/anaerobic) if systemic signs (fever, sepsis); positive in 5-10% of cellulitis.
- **Wound Culture:** Swab (if open wound, abscess drainage); tissue biopsy (necrotizing fasciitis).
- **Metabolic Panel:** Creatinine, glucose (diabetes control), lactate (>2 mmol/L in sepsis).

- **Other Tests:**
  - **Blood Glucose/HbA1c:** Uncontrolled diabetes (risk factor for severe SSTIs).
  - **HIV Test:** If risk factors (e.g., recurrent infections, atypical pathogens).
  - **Creatine Kinase (CK):** Elevated in necrotizing fasciitis, pyomyositis (muscle destruction).

Imaging

- **Ultrasound:**
  - **Indications:** Suspected abscess (fluctuance unclear), guide drainage.
  - **Findings:** Hypoechoic fluid collection (abscess), cobblestoning (cellulitis).
- **CT/MRI:**
  - **Indications:** Suspected necrotizing fasciitis, pyomyositis, osteomyelitis (diabetic foot).
  - **Findings:** Gas in soft tissues (necrotizing fasciitis), muscle edema/abscess (pyomyositis), bone erosion (osteomyelitis).
- **X-ray:**
  - **Indications:** Diabetic foot infection, suspected osteomyelitis.
  - **Findings:** Soft tissue gas (necrotizing infection), cortical destruction (osteomyelitis, >2 weeks).
- **Key Tips:**
  - **CT/MRI:** Urgent if necrotizing fasciitis suspected (gas, fascial involvement).
  - **Ultrasound:** First-line for abscess; bedside, non-invasive.

Treatment

- **General Principles:**
  - **Antibiotics:** Start empiric therapy based on severity, tailor to cultures/susceptibility.
  - **Source Control:** Incision and drainage (I&D) for abscess, surgical debridement for necrotizing fasciitis.
  - **Elevation:** Affected limb (cellulitis, erysipelas) to reduce swelling.

- **Empiric Therapy:**
  - **Mild Cellulitis/Erysipelas:**
    - Cephalexin 500 mg PO QID OR dicloxacillin 500 mg PO QID (covers S. pyogenes, MSSA).
    - **Duration:** 5-7 days.
  - **Moderate Cellulitis (Systemic Signs):**
    - Ceftriaxone 1 g IV q24h OR cefazolin 1 g IV q8h.
    - **If MRSA suspected:** Add vancomycin 15 mg/kg IV q12h (trough 10-15 µg/mL) OR linezolid 600 mg IV/PO q12h (alternative if vancomycin intolerance or renal dysfunction).
    - **Duration:** 7-10 days.
  - **Severe Cellulitis/Necrotizing Fasciitis (Sepsis, Systemic Toxicity):**
    - Vancomycin 15 mg/kg IV q12h OR linezolid 600 mg IV q12h + piperacillin-tazobactam 4.5 g IV q6h OR meropenem 1 g IV q8h.
    - **If necrotizing fasciitis (S. pyogenes suspected):** Add clindamycin 600-900 mg IV q8h (inhibits toxin production).
    - **Duration:** 10-14 days (cellulitis); 14-21 days post-debridement (necrotizing fasciitis).
  - **Abscess:**
    - I&D (primary treatment); antibiotics if systemic signs or immunocompromised.
    - Vancomycin 15 mg/kg IV q12h OR linezolid 600 mg IV/PO q12h (if MRSA).
    - **Duration:** 5-7 days (if antibiotics needed).
  - **Pyomyositis:**
    - Vancomycin 15 mg/kg IV q12h OR linezolid 600 mg IV q12h + ceftriaxone 2 g IV q24h.
    - Surgical drainage if abscess present.
    - **Duration:** 14-21 days.
- **Directed Therapy (Based on Culture/Susceptibility):**
  - **S. pyogenes:** Penicillin G 4 million units IV q4h OR ceftriaxone 1 g IV q24h.
  - **S. aureus (MSSA):** Cefazolin 1 g IV q8h.
  - **S. aureus (MRSA):** Vancomycin 15 mg/kg IV q12h OR linezolid 600 mg IV/PO q12h.
  - **Polymicrobial (Diabetic Foot):** Piperacillin-tazobactam 4.5 g IV q6h + metronidazole 500 mg IV q8h.

- **Supportive Care:**
  - **Sepsis:** Fluids (NS 30 mL/kg IV within 3h), vasopressors (norepinephrine 5-20 mcg/min IV) if hypotensive.
  - **Pain Control:** Acetaminophen 1 g PO/IV q6h, avoid NSAIDs (risk of bleeding in necrotizing infections).
- **Key Tips:**
  - **Necrotizing Fasciitis:** Surgical debridement within 6-12h (delays increase mortality).
  - **Abscess:** I&D is primary treatment; antibiotics only if systemic signs.
  - **Linezolid:** Alternative to vancomycin for MRSA; monitor for thrombocytopenia, neuropathy with prolonged use (>2 weeks).

Treatment Guidelines Table

Condition	Treatment Agent/Dose	Duration
Mild Cellulitis	Cephalexin 500 mg PO QID	5-7 days
Severe Cellulitis	Vancomycin 15 mg/kg IV q12h OR linezolid 600 mg IV q12h + piperacillin-tazobactam OR meropenem 1 g IV q8h	10-14 days
Necrotizing Fasciitis	Broad-spectrum + clindamycin	14-21 days post-debridement
Abscess	I&D + antibiotics (if systemic) Vancomycin 15 mg/kg IV q12h OR linezolid 600 mg IV/PO q12h	5-7 days (if antibiotics needed)

Complications

- **Acute:**
  - **Sepsis/Septic Shock:** 10-20% mortality in severe SSTIs; multi-organ failure (AKI, ARDS).
  - **Necrotizing Fasciitis:** 20-30% mortality; amputation (15-20%), extensive tissue loss.
  - **Bacteremia:** Hematogenous spread (e.g., endocarditis, osteomyelitis), especially S. aureus.
- **Chronic:**
  - **Lymphedema:** Recurrent cellulitis/erysipelas (chronic lymphatic damage).
  - **Osteomyelitis:** Diabetic foot infections, necrotizing fasciitis (bone involvement).
  - **Scarring:** Extensive tissue destruction (necrotizing fasciitis, pyomyositis).

- **Other:**
  - **Antibiotic Toxicity:** AKI (vancomycin), C. difficile infection (broad-spectrum antibiotics), thrombocytopenia/neuropathy (linezolid with prolonged use).
  - **Recurrence:** 10-20% of cellulitis cases (underlying risk factors, e.g., lymphedema).

Consultations Needed

- **Infectious Disease (ID):**
  - Severe SSTI (sepsis, necrotizing fasciitis, pyomyositis).
  - Polymicrobial infections (e.g., diabetic foot, intra-abdominal source).
  - Bacteremia (e.g., S. aureus, gram-negatives), especially persistent (>72h).
  - Antibiotic resistance (e.g., MRSA, ESBL gram-negatives).
  - Immunocompromised patients (e.g., HIV, neutropenia, fungal SSTI).
- **Surgery:**
  - Necrotizing fasciitis (urgent debridement within 6-12h).
  - Abscess (I&D required for drainage).
  - Pyomyositis (surgical drainage of muscle abscess).
  - Diabetic foot infections (debridement, amputation if osteomyelitis severe).
- **Other:**
  - **oVascular Surgery:** If arterial insufficiency (e.g., diabetic foot, non-healing ulcer).
  - **Dermatology:** If unclear diagnosis (e.g., contact dermatitis vs. erysipelas), atypical presentation (e.g., fungal SSTI).

Key Pearls

- **Cellulitis:** Diffuse erythema, poorly demarcated; S. pyogenes, S. aureus.
- **Erysipelas:** Sharp, raised, bright red; S. pyogenes, often face/legs.
- **Necrotizing Fasciitis:** Severe pain, bullae, crepitus—surgical emergency (debridement within 6-12h).
- **Abscess:** I&D primary treatment; antibiotics if systemic signs.
- **Differential:** DVT (unilateral swelling, no fever), gout (joint involvement), stasis dermatitis (chronic, bilateral).
- **Labs:** Blood cultures if systemic signs; CK for necrotizing fasciitis.
- **Imaging:** Ultrasound (abscess), CT/MRI (necrotizing fasciitis, pyomyositis).

- **Linezolid:** Alternative to vancomycin for MRSA; monitor for thrombocytopenia with prolonged use.

References

- **UpToDate:** “Cellulitis and Erysipelas: Diagnosis and Management” (2025).
- **IDSA:** “Guidelines for the Management of SSTIs” (2024).
- **NEJM:** “Necrotizing Fasciitis: Clinical Features and Treatment” (2023).
- **Clin Infect Dis:** “Diabetic Foot Infections: Management Strategies” (2024).

Case Scenarios

Case 1: A 50-Year-Old Male with Leg Redness

- **Presentation:** A 50-year-old male with a history of diabetes presents with a 3-day history of right leg redness, warmth, and tenderness. Exam shows diffuse erythema with poorly demarcated borders, fever (38.5°C), no fluctuance, no crepitus.
- **Labs/Imaging:** WBC 14,000/µL, CRP 80 mg/L, blood cultures negative. Ultrasound: No abscess, cobblestoning (cellulitis).
- **Diagnosis:** Moderate Cellulitis → Diffuse erythema, systemic signs, no sepsis.
- **Management:** Start ceftriaxone 1 g IV q24h + linezolid 600 mg IV q12h (MRSA coverage, chosen due to vancomycin allergy) x 10 days. Elevate leg, monitor for improvement (erythema, fever). No ID consult (uncomplicated, improving). Transition to oral cephalexin 500 mg PO QID to complete 10 days. Patient discharged on day 5, erythema resolving.

Case 2: A 35-Year-Old Female with Rapidly Progressing Pain

- **Presentation:** A 35-year-old female presents with a 24-hour history of severe left thigh pain, erythema, and fever (39°C). Exam shows bullae, crepitus, and skin necrosis; BP 90/60 mmHg, HR 110 bpm.
- **Labs/Imaging:** WBC 20,000/µL, lactate 3.5 mmol/L, CK 5,000 U/L. CT thigh: Gas in soft tissues, fascial edema. Blood cultures: S. pyogenes.
- **Diagnosis:** Necrotizing Fasciitis (Type II) → Rapid progression, bullae, crepitus, gas on CT.
- **Management:** Surgical consult—urgent debridement within 6h. Start meropenem 1 g IV q8h + clindamycin 900 mg IV q8h + linezolid 600 mg IV q12h (MRSA coverage, chosen due to vancomycin intolerance). ID consult for

polymicrobial coverage. ICU transfer (sepsis). Debridement reveals extensive necrosis; antibiotics continued x 21 days post-debridement. Patient survives, requires skin grafting.

Case 3: A 60-Year-Old Male with Diabetic Foot Infection

- **Presentation:** A 60-year-old male with uncontrolled diabetes (HbA1c 9%) presents with a 5-day history of right foot swelling, erythema, and purulent discharge. Exam shows a 3 cm plantar ulcer with fluctuance, fever (38.2°C), no crepitus.
- **Labs/Imaging:** WBC 16,000/µL, glucose 300 mg/dL, blood cultures negative. Wound culture: S. aureus (MRSA) + E. coli. X-ray: No osteomyelitis. Ultrasound: Abscess.
- **Diagnosis:** Abscess with Cellulitis (Diabetic Foot) → Fluctuant mass, purulent discharge, polymicrobial.
- **Management:** Surgical consult—I&D performed, 20 mL pus drained. Start linezolid 600 mg IV q12h (MRSA coverage, vancomycin avoided due to renal dysfunction) + piperacillin-tazobactam 4.5 g IV q6h x 14 days. ID consult (polymicrobial, diabetic foot). Glucose control (insulin sliding scale). Monitor for osteomyelitis (repeat X-ray in 2 weeks). Transition to oral doxycycline 100 mg PO BID to complete 14 days. Patient discharged with wound care follow-up.