# Skin and Soft Tissue Infections (SSTI)

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PIDS PEDIATRIC INFECTIOUS DISEASES SOCIETY

# Disclosure Statement

No disclosures to report.

No active or potential conflict of interest in relation to this presentation.

# Learning Objectives

Learner will be able to:

- Identify the most common pathogens that cause skin and soft tissue infections
- Classify purulent and nonpurulent skin and soft tissue infection
- State the first-line antibiotic treatment for purulent and nonpurulent skin and soft tissue infections
- Define failure of initial outpatient antibiotic and next steps

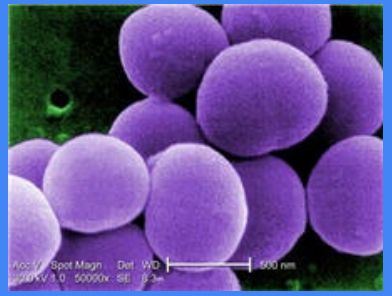
# SSTI Guidelines

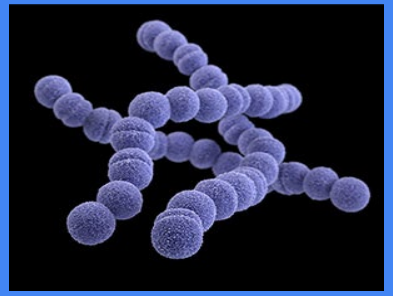
**No National Pediatric SSTI Guideline to date.**

**Examples of existing Guidelines / Clinical Pathways**

- **IDSA** - Practice Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections: 2014 Update by the Infectious Diseases Society of America
- **ED Pathway for SSTI** - Children's National Health System
- **Skin and Soft Tissue Infection** - Texas Children's Hospital
- **ED Pathway for the Evaluation/Treatment of the Child with Suspected Cellulitis/Abscess** - Children's Hospital of Philadelphia
- **Skin and Soft Tissue Infection Guideline** - Dell Children's Medical Center

# SSTI Primary Pathogens





## Staphylococcus aureus

Also known as:

- MSSA: Methicillin-resistant Staphylococcus aureus
- MRSA: Methicillin-resistant Staphylococcus aureus

Methicillin Resistance

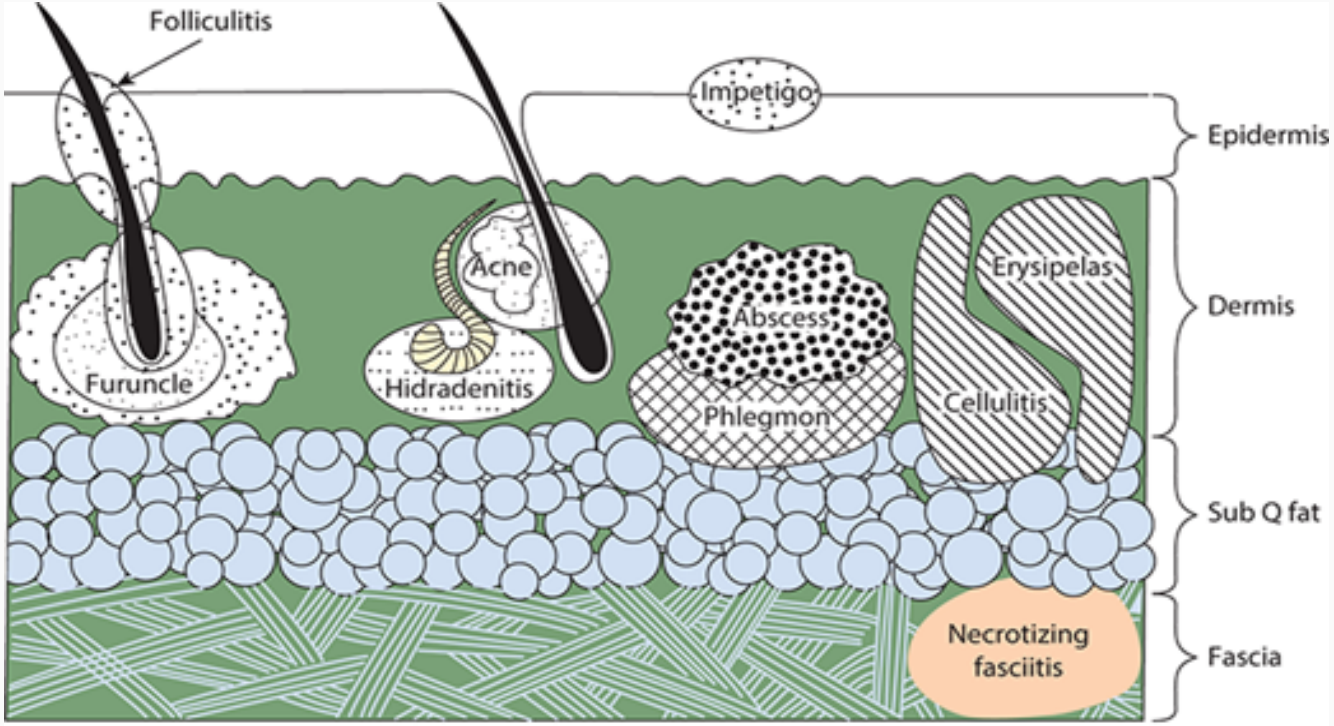
- MecA/C
- MREJ
- Penicillin-binding protein 2a (PBP2A)

## Beta-hemolytic Streptococcus

Also known as:

- Group A streptococcus
- GAS
- Streptococcus pyogenes

# Location of skin infections




Source: Frederick S. Southwick: *Infectious Diseases: A Clinical Short Course*, 4e

# Definitions

**Abscess:** localized collection of pus with inflamed tissue within tissues, organs or confined spaces

**Bullae:** large fluid-filled blisters

**Cellulitis:** Common skin bacterial infection of underlying soft tissue characterized by inflammation, erythema, edema, and warmth
-typically painful with relatively sudden onset
-not well-demarcated

**Erysipelas:** shiny, raised, indurated, and tender plaques with distinct margins, well-demarcated.

**Folliculitis:** superficial bacterial infection of hair follicles with purulent material in epidermis

**Furuncle:** well-circumscribed, painful suppurative inflammatory nodule involving hair follicles

**Phlegmon**: inflammation of soft tissue that spreads under the skin or inside the body

**Pitting:** Excess fluid build up causing a “pit” when compressed

**Vesicle:** small fluid-filled blister

## Abcess with surrounding inflamation

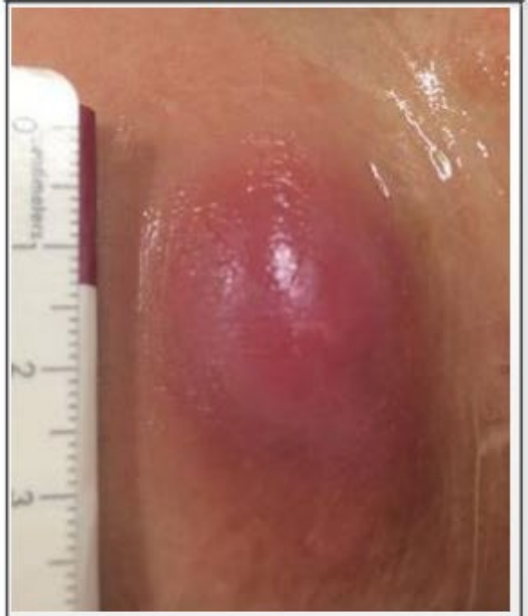


Photo courtesy of Mayo Foundation for Medical Education and Research

## Cellulitis (Non-purulent)

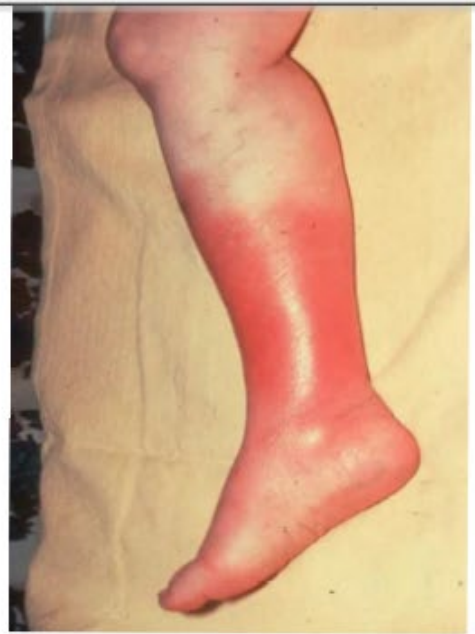


Photo courtesy of Coreem.net/skinand soft tissue infection

## Abscess with Papule w/ surrounding Inflammation

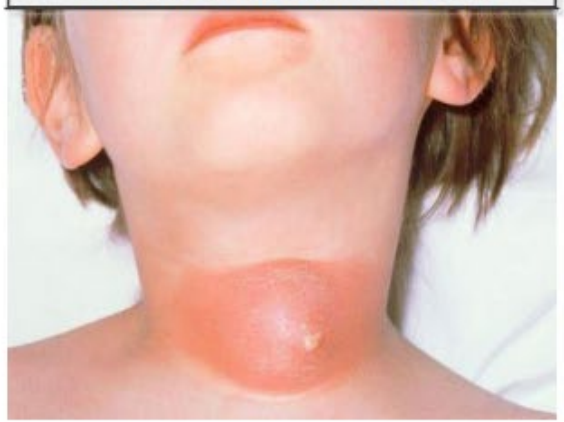
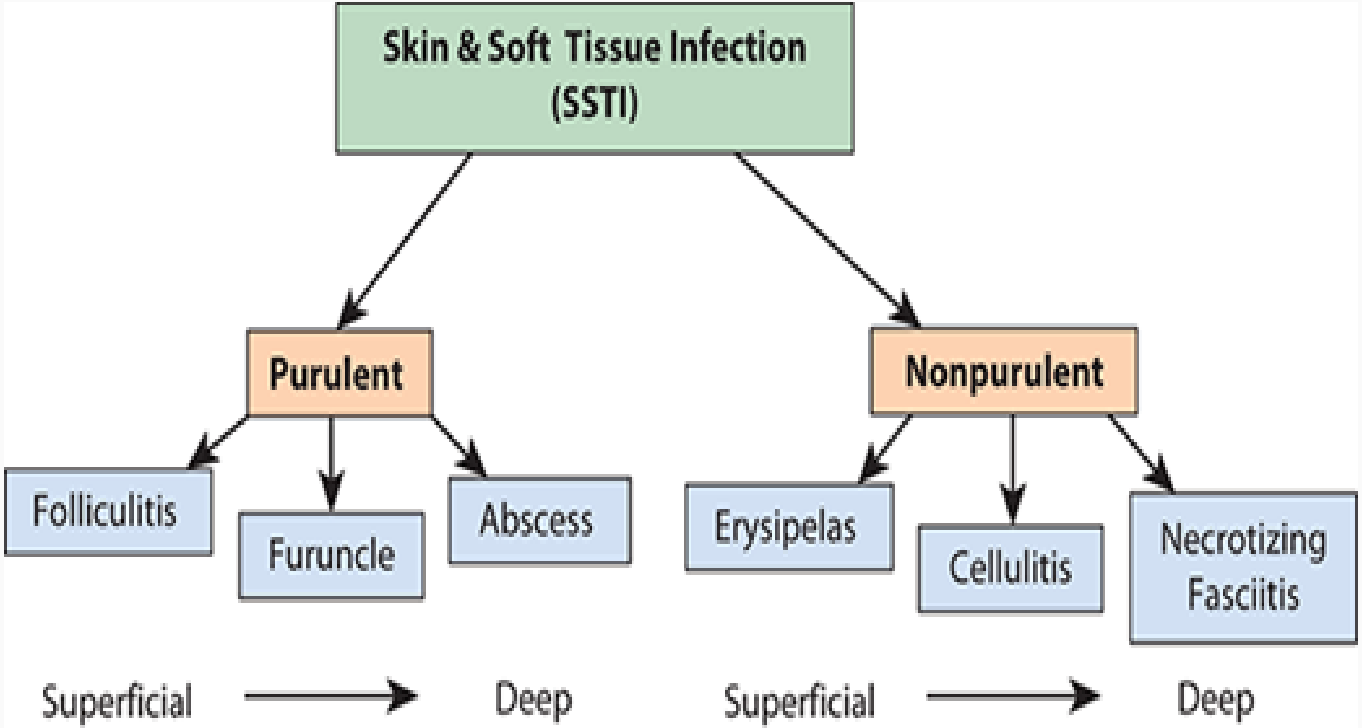


Photo courtesy of Texas https://www.dryogoda.com/ent-medicine/ent-head-neck/neck-abscesses/. of Public Health

# Classification of SSTI Infections




Source: Frederick S. Southwick: *Infectious Diseases: A Clinical Short Course*, 4e

# Depth of infection - Superficial vs Deep

**Superficial Infections**

- Impetigo
- Erysipelas
- Folliculitis

**Deep infections:**

- Cellulitis
- Furunculosis - associated with hair follicles
- Hidradenitis - associated with sweat glands
- Skin Abscess
- Necrotizing Fasciitis

# Purulent vs. Nonpurulent

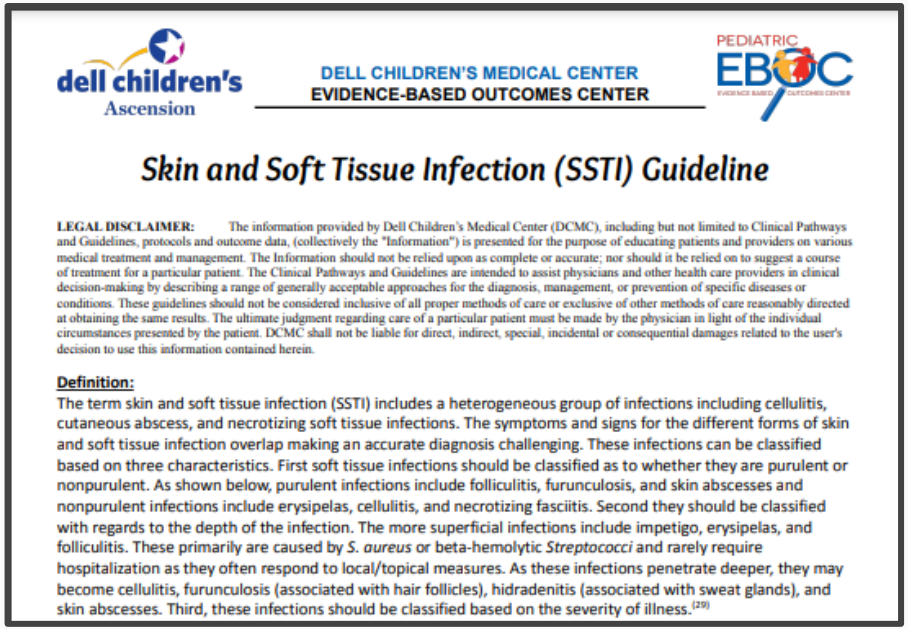
| Type of SSTI: | Definition | Examples |
|---|---|---|
| **Purulent** | - Active drainage of purulent fluid<br>- Fluid collection<br>- Erythematous<br>- Fluctuant<br>- Phlegmon<br>- Red nodule<br>- Swelling<br>- Tenderness | - Abscess<br>- Furuncle<br>- Folliculitis |
| **Non-Purulent** | - Absence of purulence or abscess<br>- Erythema<br>- Swelling<br>- Tenderness<br>- Warmth | - Cellulitis<br>- Erysipelas<br>- Necrotizing Fasciitis |

Likelihood of developing skin and soft tissue infections can be reduced with the identification and treatment of predisposing conditions

# Predisposing Factors for Skin Infections

- Skin barrier disruption due to trauma
- Skin inflammation
- Edema related to impaired lymphatic drainage
- Edema related to venous insufficiency
- Obesity
- Immunosuppression
- Skin breaks between the toes (Toe-Web Intertrigo)
- Pre-existing skin infection

# Dell Children's Medical Center SSTI Guideline



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## *Skin and Soft Tissue Infection (SSTI) Guideline*

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**Definition:**

The term skin and soft tissue infection (SSTI) includes a heterogeneous group of infections including cellulitis, cutaneous abscess, and necrotizing soft tissue infections. The symptoms and signs for the different forms of skin and soft tissue infection overlap making an accurate diagnosis challenging. These infections can be classified based on three characteristics. First soft tissue infections should be classified as to whether they are purulent or nonpurulent. As shown below, purulent infections include folliculitis, furunculosis, and skin abscesses and nonpurulent infections include erysipelas, cellulitis, and necrotizing fasciitis. Second they should be classified with regards to the depth of the infection. The more superficial infections include impetigo, erysipelas, and folliculitis. These primarily are caused by *S. aureus* or beta-hemolytic *Streptococci* and rarely require hospitalization as they often respond to local/topical measures. As these infections penetrate deeper, they may become cellulitis, furunculosis (associated with hair follicles), hidradenitis (associated with sweat glands), and skin abscesses. Third, these infections should be classified based on the severity of illness.[29]

# Inclusion and Exclusion Criteria

**Inclusion:**
All immunocompetent children > 59 days of age with suspected skin and soft tissue infection.

**Exclusion:**
Immunocompromised host, post op wound infection, cervical lymphadenitis, chronic or recurrent cellulitis/abscess

# Evaluation

**Physical Examination**
Vital signs, pain, size of lesion, induration, swelling, fluctuance, erythema, regional adenopathy

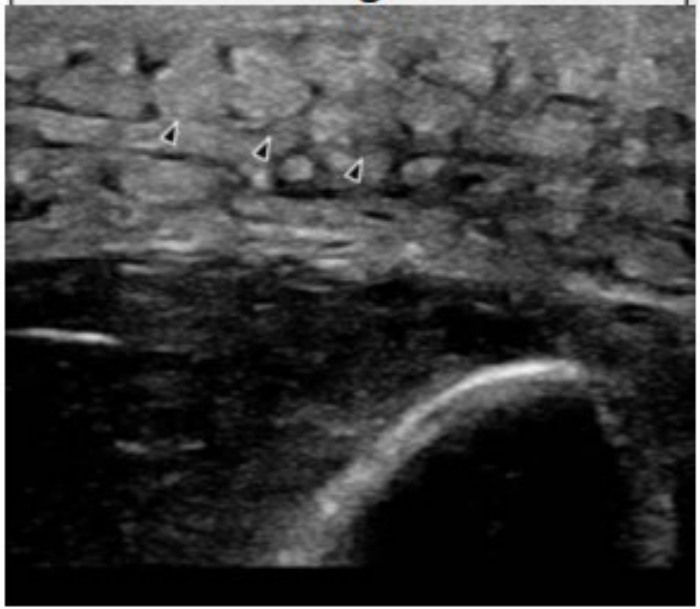
**Lab**
In most cases, blood work and cultures are not indicated
Laboratory testing not required for uncomplicated infection in absence of comorbidities or complications.

**Imaging**
In most cases imaging is not indicated
Ultrasound can help in cases of indeterminate clinical assessment

- May confirm fluid collection, determine its size and nature and locate any possible surrounding vascular structures or foreign body.

Radiographs may be helpful to distinguish cellulitis versus osteomyelitis

**Ultrasound abscess with surrounding Cellulitis**

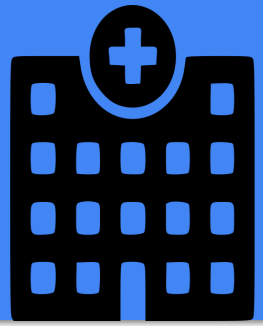


https://www.coreem.net/core/cellulitis

Ultrasound

- Findings consistent with cellulitis
  - Tissue edema
  - "Cobblestoning"
- Helpful in differentiating cellulitis from abscess

# Reasons to Consider Hospital Admission



- Systemic symptoms or severe disease
- Immunocompromised
- Concern for necrotizing infection
- Rapidly expanding or large lesion (>3cm; significant cellulitis despite abscess drainage)
- Age <2 months
- Concern for inadequate drainage of large abscess
- Unable to tolerate oral antibiotics
- Poor compliance or previous failure of outpatient treatment
- Significant pain
- Failed OP treatment with 48 hours of appropriate antibiotics, no improvement

# Non-Purulent Cellulitis Treatment

First-generation cephalosporins (**cefazolin or cephalexin**) should be used as first-line treatment empiric and definitive in patients with non-purulent cellulitis.

The addition of an MRSA-active agent to cephalexin does not improve clinical outcomes and is not recommended.

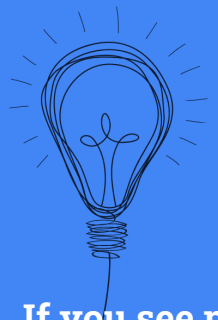
Sulfamethoxazole-trimethoprim should not be used if streptococcal infection is suspected due to inadequate coverage.

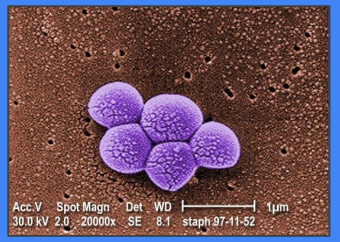
**Recommended duration of antimicrobial therapy for non-purulent cellulitis is 5 days**

# Non-Purulent Cellulitis Treatment

| Disposition | Medication | Dosing Regimen |
|---|---|---|
| **Non-Purulent Cellulitis: First-Line^** | | |
| **Sepsis/SIRS** | Refer to Sepsis ED/Inpatient guideline for antimicrobial recommendations | |
| **Inpatient** | Cefazolin (IV) | 33 mg/kg/dose IV q8h (max 1000 mg/dose) |
| **Outpatient** | Cephalexin (PO) | 25 mg/kg/dose PO q8h (max 1000 mg/dose) |
| **Non-Purulent Cellulitis: History of Type I reaction or SEVERE adverse reaction to Cefazolin** | | |
| **Inpatient** | Vancomycin (IV) | See Vancomycin Dosing Guideline |
| **Outpatient** | Clindamycin (PO) | 10 mg/kg/dose PO q8h (max 450 mg/dose PO) |

# Purulent Cellulitis Treatment






**If you see pus... think Staph aureus!**

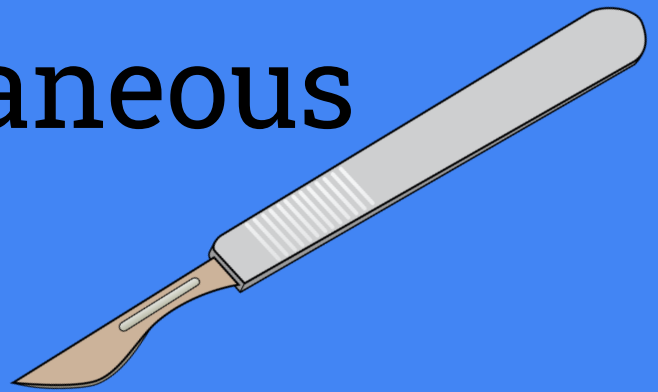
For well drained abscesses without overlying cellulitis or systemic symptoms present, antibiotics are **not recommended**.

For purulent cellulitis that has been successfully drained with overlying cellulitis or systemic symptoms, **sulfamethoxazole-trimethoprim** should be used as **first-line treatment** </=5-7 days status post incision and drainage

If treating MSSA, oral **cephalexin** should be used as first-line treatment.

| Purulent Cellulitis: First-Line | | |
|---|---|---|
| **Sepsis/SIRS** | Refer to Sepsis ED/Inpatient guideline for antimicrobial recommendations | |
| **Inpatient without systemic signs of infection** | Clindamycin (IV) | 13 mg/kg/dose IV q8h (max 600 mg/dose) |
| | SMX/TMP* (PO) | 5 mg/kg/dose of TMP* PO q12h (max 320 mg of TMP/dose) |
| **Outpatient** | SMX/TMP* (PO) | 5 mg/kg/dose of TMP* PO q12h (max 320 mg of TMP/dose) |
| **Outpatient (If MSSA)** | Cephalexin (PO) | 25 mg/kg/dose PO q8h (max 1000 mg/dose) |
| **Purulent Cellulitis: History of Type I reaction or SEVERE adverse reaction to Sulfa** | | |
| **Inpatient (If MRSA susceptible to clindamycin)** | Clindamycin (IV) | 13 mg/kg/dose IV q8h (max 600 mg/dose) |
| **Inpatient** | Vancomycin (IV) | See Vancomycin Dosing Guideline |
| **Outpatient** | Doxycycline (PO) *≥8 years only* | 2 mg/kg/dose PO q12h(max 100 mg/dose) |
| **Outpatient (If MRSA susceptible to clindamycin)** | Clindamycin (PO) | 10 mg/kg/dose PO q8h (max 450 mg/dose PO) |
| **Outpatient (If MSSA)** | Cephalexin (PO) | 25 mg/kg/dose PO q8h (max 1000 mg/dose) |

Incision and drainage alone is highly effective for the treatment of most uncomplicated cutaneous abscesses.



# Check culture results!

If cultures obtained the results should be used to guide antibiotic therapy


# Follow Up After Discharge

Patient should follow up with PCP 3-4 days after starting PO antibiotics to evaluate for treatment failure.

16.6% of acute cellulitis cases are unresponsive to initial treatment

- Due to inappropriate antibiotic selection
- Dosing

If cultures were obtained, review the speciation and susceptibilities

# Wound Care

- ❏ Wound care instructions will depend on type of drainage
- ❏ Warm soapy water soaks twice daily
- ❏ Wash with mild soap and water to allow drainage at vessel loop
- ❏ Keep the wound clean, dry and covered except during soaks or daily washing
- ❏ Enhanced hygiene practices
  - ○ Regular bathing
  - ○ Frequent hand washing with soap and water or alcohol-based hand sanitizers.
  - ○ Avoid sharing personal hygiene items (i.e towels, items in contact with skin).

# Prevention

- Limited data proving efficacy of preventing future SSTI's when attempting decolonization with nasal mupirocin or chlorhexidine/diluted bleach baths.

- We can educate families on the transmissibility of S. aureus, particularly through contact with open wounds and contaminated surfaces.

- Hygiene practices should include regular bathing and frequent hand washing with soap and water or alcohol-based hand sanitizer.

- Avoid sharing personal hygiene items such as towels or other items that come into contact with the skin

# Identifying Treatment Failure

- ❏ Defined as a lack of improvement after 48 hours of appropriate antibiotics
- ❏ New fluctuance
- ❏ Fever at any time

# Questions

# References

Slides compromised from Dell Children's Medical Center EBOC SSTI Guideline. References listed on page 12, 13, 14, 15.

Link: Skin and Soft Tissue Infection (SSTI) Guideline