Skin abscesses in adults: Treatment

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INTRODUCTION

Patients with skin and soft tissue infections may present with cellulitis, skin abscess, and other forms of infection [1-3].

This topic will discuss treatment of skin abscesses, including large furuncles and carbuncles.

Clinical manifestations and diagnosis of skin abscesses, furuncles, and carbuncles are discussed separately. (See "Cellulitis and skin abscess: Epidemiology, microbiology, clinical manifestations, and diagnosis", section on 'Skin abscess' and "Cellulitis and skin abscess: Epidemiology, microbiology, clinical manifestations, and diagnosis", section on 'Diagnosis'.)

Management of other forms of purulent skin infection, such as folliculitis and purulent cellulitis (cellulitis with purulent drainage or exudate without abscess), is discussed elsewhere. (See "Infectious folliculitis", section on 'Management' and "Acute cellulitis and erysipelas in adults: Treatment".)

INCISION AND DRAINAGE

To optimize the likelihood of cure, we recommend that all patients with a fluctuant skin abscess undergo incision and drainage to evacuate pus and necrotic debris [4,5]. In patients with small abscesses (<2 cm) that are spontaneously draining, close observation is an acceptable

alternative. If incision and drainage is not performed, we suggest that patients apply warm compresses to the infected area several times per day to promote drainage.

Extensive description of the technique for incision and drainage is found elsewhere (see "Techniques for skin abscess drainage"). During the incision and drainage procedure, we recommend that samples of pus be obtained and sent for Gram stain and culture.

Although it is less invasive, needle aspiration of abscess contents is not recommended [2]. An unblinded randomized trial of 101 patients with uncomplicated skin abscesses found that 32 of 43 individuals who underwent ultrasound-guided needle aspiration (74 percent) experienced clinical or ultrasonographic failure versus 10 of 49 who underwent incision and drainage (20 percent; difference 54 percentage points; 95% CI 35-69 percent). Appropriate antibiotics were given to the majority of individuals in both groups (92 percent and 93 percent, respectively) [6].

ANTIMICROBIAL THERAPY

Indications for antimicrobial therapy — We suggest antibiotic treatment for all patients undergoing incision and drainage of a skin abscess.

However, many abscesses are treated successfully with incision and drainage alone and expert opinion varies. For patients with multiple antibiotic allergies or intolerances or who prefer to forego antibiotic therapy, it is reasonable to withhold antibiotic therapy if the patient is otherwise healthy and meets all of the following criteria [7-9]:

- Single abscess.
- Size of abscess <2 cm in diameter [10-12].
- No or minimal surrounding cellulitis.
- No systemic signs of toxicity (eg, fever >100.5°F/38°C, hypotension, or sustained tachycardia).
- No immunosuppression or other comorbidities.
- No prior clinical failure with incision and drainage alone.
- No indwelling medical device (such as prosthetic joint, vascular graft, or pacemaker).
- No risk factors for endocarditis – Risk factors for endocarditis are discussed below. (See 'Increased risk of endocarditis' below.)
- No exposure to situations that could increase transmission to others (eg, contact sports, military barracks).

Several trials have indicated a benefit to antibiotic therapy, even in patients with small abscesses [10-14]:

- Antibiotics decrease the likelihood of treatment failure. A meta-analysis of four randomized placebo-controlled trials involving more than 2400 patients with drained abscess found that the rate of treatment failure was 8 percent for patients who received antibiotics compared with 16 percent for those who received placebo (odds ratio [OR] for cure 2.3, 95% CI 1.8-3.1) [13]. Similar findings were found in another meta-analysis of 14 randomized trials involving more than 4000 patients who received either antibiotics or no antibiotics (OR for treatment failure with antibiotics 0.58, 95% CI 0.37-0.90) [14].

  Antibiotics appear to improve outcomes regardless of lesion size, causative organism, or presence of fever or comorbidities based on a randomized placebo-controlled trial of 1220 patients with drained abscess who received trimethoprim-sulfamethoxazole or placebo [10,12].

- In addition to decreasing treatment failures, antimicrobial therapy decreases the risk of recurrent skin abscesses. One meta-analysis found that the recurrence rate within one month was 7.6 percent with antibiotics versus 14.5 percent without antibiotics (OR 0.48, 95% CI 0.30-0.77) and was 17.4 percent versus 25 percent after one month (OR 0.64, 95% CI 0.48-0.85) [14]. Another meta-analysis found that the rate of new lesions at 30 days of follow-up was lower in the group that received antibiotics compared with the group that received placebo (OR 0.32, 95% CI 0.2-0.4) [13].

Trials also indicate increased rates of adverse events in patients who receive antibiotics, but the large majority of adverse events in these trials were classified as mild, and the rate of adverse events was lower than the reported treatment benefits [13,14]. Gastrointestinal side effects are the most commonly reported adverse events in patients who receive antibiotics. In one meta-analysis, clindamycin was found to cause the highest rates of diarrhea when compared with no antibiotics (OR 2.71, 95% CI 1.50-4.89) [14].

Our recommendations differ from the 2014 Infectious Diseases Society of America guidelines on the management of skin and soft tissue infections, which do not recommend routine antibiotic therapy for patients with mild skin abscesses in the absence of systemic infection, immunocompromising conditions, extremes of age, or multiple abscesses [2]. The 2014 guidelines were published before the above trials and meta-analyses were published and were based on earlier smaller studies, some of which were performed before community-acquired methicillin-resistant *Staphylococcus aureus* (MRSA) became the primary cause of skin abscesses [9,15-18].

Timing of antimicrobial administration — For most patients, we suggest withholding antimicrobial therapy until after samples for culture have been obtained to optimize culture

results.

However, for certain patients, we suggest that antimicrobials be administered prior to incision and drainage:

- **Patients whose incision and drainage cannot be performed promptly**
- **Patients who have an indication for parenteral therapy** – These patients generally have more severe or rapidly progressive illness, and delaying antimicrobial therapy can be associated with worse outcomes, especially for patients with sepsis [19-23]. Indications for parenteral therapy are discussed below. (See 'Indications for parenteral therapy' below.)
- **Patients with risk factors for endocarditis** – We suggest preprocedural antibiotics for these patients given the potential risk of transient bacteremia during the procedure and consequent seeding of a heart valve. Risk factors that warrant preprocedural antibiotics include a history of infective endocarditis, presence of a prosthetic valve or prosthetic perivalvular material, an unrepaired congenital heart defect, or valvular dysfunction in a transplanted heart. (See "Prevention of endocarditis: Antibiotic prophylaxis and other measures".)

  The specific timing of antibiotic administration prior to incision varies by antibiotic and is discussed below. (See 'Increased risk of endocarditis' below.)

Antimicrobial selection — The choice of antibiotic is typically dependent on the suspected microorganisms, severity of illness, and patient comorbidities (algorithm 1).

Spectrum of empiric antimicrobial coverage — Patients with skin abscess should receive empiric therapy that covers *S. aureus*, including MRSA [1,2]. Empiric therapy for infection due to beta-hemolytic streptococci (or uncommon pathogens, such as gram-negative bacilli) is generally not necessary, except in certain situations as discussed elsewhere. (See 'Special populations' below.)

This approach is supported by findings of a study including 422 patients with purulent soft tissue infection, 81 percent of whom had abscesses. Of 384 patients who had positive culture results, 320 (83 percent) grew *S. aureus*, of which 249 (78 percent) were MRSA. Beta-hemolytic streptococci accounted for a much smaller proportion of overall infections (2.6 percent) [24].

Further discussion of the microbiology of skin abscesses is found elsewhere. (See "Cellulitis and skin abscess: Epidemiology, microbiology, clinical manifestations, and diagnosis", section on 'Skin abscess'.)

Indications for parenteral therapy — The decision to initiate parenteral therapy is typically based on the extent and severity of infection and patient comorbidities. Patients who meet criteria for parenteral therapy are usually admitted to the hospital to ensure prompt administration and close observation.

For individuals with skin abscess, we suggest initial treatment with parenteral antibiotics in the following circumstances:

- Systemic signs of toxicity (eg, fever >100.5°F/38°C, hypotension, sustained tachycardia)
- Rapid progression of erythema or abscess
- Extensive abscess or surrounding erythema
- Immunocompromising condition (eg, neutropenia, use of immunosuppressive drugs such as chemotherapy for malignancy)
- Inability to tolerate or absorb oral therapy

Preferred regimens

Oral regimens — Most individuals can be treated with oral antibiotics in the outpatient setting. For these patients, targeted empiric therapy that covers *S. aureus*, including MRSA, is appropriate. For most patients, we suggest one of the following empiric regimens (algorithm 1):

- Trimethoprim-sulfamethoxazole (one to two double-strength tablets orally twice daily; for patients who weigh more than 70 kg and have normal renal function, we favor two double-strength tablets twice daily)
- Doxycycline (100 mg orally twice daily)
- Minocycline (200 mg orally once, then 100 mg orally twice daily)

Clindamycin (450 mg orally every eight hours) is an acceptable alternative, but we generally avoid it due to risk for *Clostridioides difficile* infection and the possibility of staphylococcal resistance [25-27]. Local resistance rates should be reviewed before prescribing. Data from 2017 from the United States Centers for Disease Control and Prevention revealed that 47 percent of 471 invasive MRSA isolates were resistant to clindamycin [28].

In certain patient populations, we broaden coverage as described elsewhere. (See 'Special populations' below.)

Additional agents that should be reserved for when a preferred agent cannot be used are listed in the table (table 1), and their efficacy is discussed elsewhere. (See "Methicillin-resistant Staphylococcus aureus (MRSA) in adults: Treatment of skin and soft tissue infections".)

Parenteral regimens — Parenteral antibiotic regimens are recommended for higher risk patients and are typically started prior to incision and drainage. (See 'Indications for parenteral therapy' above and 'Timing of antimicrobial administration' above.)

For most patients who warrant parenteral therapy, we suggest one of the following regimens (algorithm 1):

- Intravenous vancomycin (refer to the table for dosing (table 2))
- Daptomycin 4 to 6 mg/kg intravenously every 24 hours (alternative)

In certain patient populations, we broaden coverage as described elsewhere. (See 'Special populations' below.)

Vancomycin is the preferred option because of extensive experience with this agent. When daptomycin is used, we usually favor the higher dose (ie, 6 mg/kg). Additional agents that should be reserved for when a preferred agent cannot be used are listed in the table (table 3), and their efficacy is discussed elsewhere. (See "Methicillin-resistant Staphylococcus aureus (MRSA) in adults: Treatment of skin and soft tissue infections".)

Once there is evidence of clinical improvement, parenteral antibiotics should be switched to one of the oral agents listed above.

Special populations — Patients with severe illness, certain comorbidities, or atypical locations of infection warrant altered management.

Severe sepsis or an immunocompromising condition — Patients with these conditions are at increased risk for mortality, so rapid institution of empiric parenteral broad-spectrum antibiotic coverage is indicated. Due to the urgency of antibiotic administration, we suggest administering antibiotics prior to incision and drainage as discussed above. (See 'Timing of antimicrobial administration' above.)

For empiric therapy for these patients, we use one of the regimens suggested for cellulitis in this patient-population (algorithm 1) (see "Acute cellulitis and erysipelas in adults: Treatment", section on 'Patients with severe sepsis'). If an organism is identified from culture, antibiotics should be narrowed to target the causative organism.

There is a spectrum of immunocompromising conditions such that it is difficult to describe a single unifying definition. Ultimately, the decision to use a broader spectrum regimen rather than a standard one requires clinical judgement and depends on the depth and type of immunosuppression.

Atypical abscess site (eg, perianal, breast, vulvar) — Most skin abscesses occur on the extremities, back, or trunk. Skin abscesses in other anatomical sites (eg, perianal, breast, vulvar) often require an alteration of antibiotic selection or management. Management of these infections is discussed in detail elsewhere:

- (See "Perianal and perirectal abscess", section on 'Management'.)
- (See "Primary breast abscess", section on 'Treatment'.)
- (See "Vulvar abscess", section on 'Management'.)
- (See "Peritonsillar cellulitis and abscess".)

Wound, injury, or medical device — Management of abscesses associated with wounds or injury (eg, bites, pressure ulcers, diabetic wounds) or with underlying medical devices (eg, mesh, prosthetic joint, vascular graft) requires specific approaches, which are discussed elsewhere:

- (See "Animal bites (dogs, cats, and other mammals): Evaluation and management", section on 'Management'.)
- (See "Infectious complications of pressure-induced skin and soft tissue injury", section on 'Management of soft tissue infection'.)
- (See "Clinical manifestations, diagnosis, and management of diabetic infections of the lower extremities", section on 'Management'.)
- (See "Wound infection following repair of abdominal wall hernia", section on 'Deep incisional surgical site/mesh infection'.)
- (See "Prosthetic joint infection: Treatment".)
- (See "Overview of the evaluation and management of surgical site infection", section on 'Deep infection associated with implanted materials'.)

Increased risk of endocarditis — We suggest preprocedural antibiotics for patients with risk factors for endocarditis. The specific risk factors that warrant preprocedural antibiotics are discussed above. (See 'Timing of antimicrobial administration' above.)

For such patients, we favor empirically covering beta-hemolytic *Streptococcus* in addition to MRSA because of the possibility (albeit small) of streptococcal involvement. All the oral and intravenous agents discussed above have been shown to be effective against streptococcal skin infections, except for the tetracyclines (eg, doxycycline, minocycline). When a tetracycline is

used for these patients, we add amoxicillin (875 mg orally twice daily) due to its reliable coverage of streptococci. (See 'Oral regimens' above and 'Parenteral regimens' above.)

The antibiotic regimen should be started 30 to 60 minutes prior to incision (administration of vancomycin should begin 120 minutes before incision) [29,30]. (See "Prevention of endocarditis: Antibiotic prophylaxis and other measures".)

Duration of antimicrobial therapy — The duration of therapy should be individualized based on clinical response. Patients are typically treated for five days; extension of the duration (up to 14 days) may be warranted in the setting of severe infection, slow response to therapy, or immunosuppression. Patients whose infection was complicated by staphylococcal bacteremia typically require more intensive and longer durations, as discussed elsewhere. (See "Clinical approach to Staphylococcus aureus bacteremia in adults", section on 'Management'.)

MONITORING RESPONSE

Patients receiving outpatient therapy should have repeat evaluation 24 to 48 hours after treatment initiation to verify clinical response [2].

The goal of therapy is to achieve resolution of the abscess and surrounding cellulitis. Patients who undergo adequate incision and drainage typically have improvement in pain and size of the abscess shortly after the procedure. However, any surrounding cellulitis typically responds gradually; the natural evolution of resolving cellulitis is discussed in detail elsewhere. (See "Acute cellulitis and erysipelas in adults: Treatment", section on 'Monitoring response to therapy'.)

It is useful to document the baseline appearance of the physical findings at the start of antibiotic therapy. We obtain a baseline digital photograph to help monitor progress. Some experts outline the area of infection with an indelible marker at the time of treatment initiation to allow objective monitoring of progress. Others do not outline the infection because patients sometimes experience unnecessary anxiety if the infection appears to extend beyond the line as the infection dissipates.

REFRACTORY INFECTION

Despite incision and drainage and a complete course of antibiotics, abscesses fail to resolve in about 10 percent of patients [10,11].

Failure to improve after incision and drainage and 24 to 48 hours of appropriate antibiotic therapy should prompt assessment for possible reasons for nonresponse.

- **Inadequate drainage** – This is one of the most common causes of treatment failure [10,11]. Evaluation should include imaging (eg, ultrasound) or re-exploration of the wound. In some cases, imaging may reveal the presence of a deeper, more serious infection than previously realized.

If residual abscess is not detected, other causes to be considered include the following:

- **Infection with resistant organism** – For patients in whom an initial culture was not obtained or was negative, sending a sample from the abscess cavity for Gram stain and culture should be performed.

- **Inadequate dosing or tissue penetration of antibiotics** – Certain conditions, such as obesity, limit penetration of antibiotics into sites of infection and may require higher dosages of antibiotics. Switching from oral to intravenous antibiotics can help in some cases as well. Further information regarding these issues can be found elsewhere. (See "Acute cellulitis and erysipelas in adults: Treatment", section on 'Refractory infection'.)

- **Diagnosis other than skin abscess** – Occasionally, skin abscess is confused with other infectious and noninfectious etiologies. The differential diagnosis of skin abscess is discussed in detail elsewhere. (See "Cellulitis and skin abscess: Epidemiology, microbiology, clinical manifestations, and diagnosis", section on 'Skin abscess'.)

- **Inadequate adherence** – A repeat course of antimicrobial therapy and wound care may be appropriate for patients with inadequate adherence to the treatment regimen.

RECURRENT INFECTION

Recurrences of skin abscesses are not uncommon, occurring in 7 to 14 percent of individuals within two months of completing therapy [10,11]. Although recurrences can occur at the original site of infection, they usually occur at locations other than the site of the initial abscess.

Management of recurrent infections — During the active stage of infection, management of recurrent skin abscess is the same as initial episodes. (See 'Incision and drainage' above and 'Antimicrobial therapy' above.)

If antibiotics were not used for the first episode, they should be used for subsequent episodes. Studies suggest that antimicrobial therapy decreases the risk of recurrent skin abscess, as

described above. (See 'Indications for antimicrobial therapy' above.)

A recurrent abscess at a site of previous infection should prompt consideration of alternative etiologies such as pilonidal cyst, hidradenitis suppurativa, or presence of foreign material [2]. Surgical exploration and debridement may be warranted. (See "Cellulitis and skin abscess: Epidemiology, microbiology, clinical manifestations, and diagnosis", section on 'Skin abscess'.)

In adult patients whose abscesses began in early childhood, evaluation for neutrophil disorders should be performed. (See "Primary disorders of phagocyte number and/or function: An overview".)

Prevention of recurrences — The mainstay of prevention includes attention to personal hygiene, decolonization, and consideration of the possibility of household or interpersonal transmission. These issues, including decolonization strategies, are discussed in detail elsewhere. (See "Methicillin-resistant Staphylococcus aureus (MRSA) in adults: Prevention and control", section on 'Decolonization' and "Methicillin-resistant *Staphylococcus aureus* (MRSA) in children: Prevention and control".)

There are little to no data to support the use of suppressive antibiotics to prevent recurrent skin abscesses [1].

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Skin and soft tissue infections".)

SUMMARY AND RECOMMENDATIONS

- **Overview** – This topic discusses treatment of skin abscesses, including large furuncles and carbuncles. Management of other forms of purulent skin infection, such as folliculitis and purulent cellulitis (cellulitis with purulent drainage or exudate without abscess), is discussed elsewhere. (See "Infectious folliculitis", section on 'Management' and "Acute cellulitis and erysipelas in adults: Treatment".)

- **Incision and drainage** – Fluctuant skin abscesses generally require incision and drainage to evacuate pus and necrotic debris (algorithm 1). Extensive description of the

technique for incision and drainage is found elsewhere. (See 'Incision and drainage' above and "Techniques for skin abscess drainage".)

In patients with small abscesses (<2 cm) that are spontaneously draining, close observation is an acceptable alternative.

- **Indications for antimicrobial therapy** – For all patients undergoing incision and drainage of a skin abscess, we suggest antibiotic therapy because it reduces the rate of treatment failure and recurrence (**Grade 2B**). We feel most strongly about using antibiotics for those at highest risk (eg, multiple abscesses, abscess >2 cm, extensive surrounding cellulitis, comorbidities or immunosuppression, signs of systemic infection, or inadequate clinical response to incision and drainage alone). However, because many abscesses can be treated successfully with incision and drainage alone, expert opinion varies, and it is reasonable to forgo antibiotic therapy in otherwise-healthy patients who have small (eg, <2 cm) abscesses and no other comorbidities. (See 'Indications for antimicrobial therapy' above.)

  Antimicrobial selection – Empiric therapy should cover *Staphylococcus aureus*, including methicillin-resistant *S. aureus* (MRSA), which causes the vast majority of skin abscesses (algorithm 1). (See 'Spectrum of empiric antimicrobial coverage' above.)

  - **Oral regimens** – For most patients with skin abscess, oral antibiotic therapy is sufficient. We suggest trimethoprim-sulfamethoxazole, doxycycline, or minocycline (**Grade 2C**). We reserve clindamycin and other agents for patients who cannot take our preferred antibiotics. (See 'Oral regimens' above.)

  - **Parenteral regimens** – Intravenous therapy is warranted for patients with signs of systemic toxicity, rapidly progressive or extensive erythema, or an inability to absorb oral therapy. We also suggest parenteral therapy in those who are immunosuppressed (**Grade 2C**).

    For these patients, we suggest vancomycin (**Grade 2C**). For patients with sepsis or an immunocompromising condition, we combine vancomycin with cefepime to provide a broader spectrum of coverage. (See 'Parenteral regimens' above.)

  - **Timing of antimicrobial administration** – To optimize culture results, antibiotics are generally withheld prior to incision and drainage. However, for patients who have an indication for parenteral therapy or who have risk factors for endocarditis, administration prior to the procedure is appropriate. (See 'Timing of antimicrobial administration' above.)

- **Duration of therapy** – We suggest five to six days of therapy rather than longer (**Grade 2C**). Extended regimens (ie, up to 14 days) may be indicated for severe or slowly responding infections. Patients whose infection is complicated by *S. aureus* bacteremia typically require more intensive and longer durations, as discussed elsewhere. (See 'Duration of antimicrobial therapy' above and "Clinical approach to Staphylococcus aureus bacteremia in adults", section on 'Management'.)

- **Special populations** – Specific management considerations are warranted for patients with certain features including those with septic shock, immunosuppression, atypical sites of infection, infected wounds, or risk for endocarditis. (See 'Special populations' above.)

- **Monitoring response** – The goal of therapy is to achieve resolution of the abscess and surrounding cellulitis. Patients who undergo adequate incision and drainage typically have improvement in pain and size of the abscess shortly after the procedure. Surrounding erythema typically improves within 24 to 48 hours. (See 'Monitoring response' above.)

- **Refractory infection** – Imaging or re-exploration of the wound is indicated for refractory infections to ensure that further drainage is not necessary. Other less common causes of refractory infection include resistant organisms, inadequate tissue penetration of antibiotics, and incorrect diagnosis. (See 'Refractory infection' above.)

- **Recurrent infection** – Causes of recurrences include suboptimal personal hygiene and interpersonal transmission. For patients with recurrent MRSA infection despite hygiene optimization or with ongoing transmission among close contacts, we suggest *S. aureus* decolonization (**Grade 2C**). Details regarding decolonization are found separately. (See 'Recurrent infection' above and "Methicillin-resistant Staphylococcus aureus (MRSA) in adults: Prevention and control", section on 'Decolonization'.)

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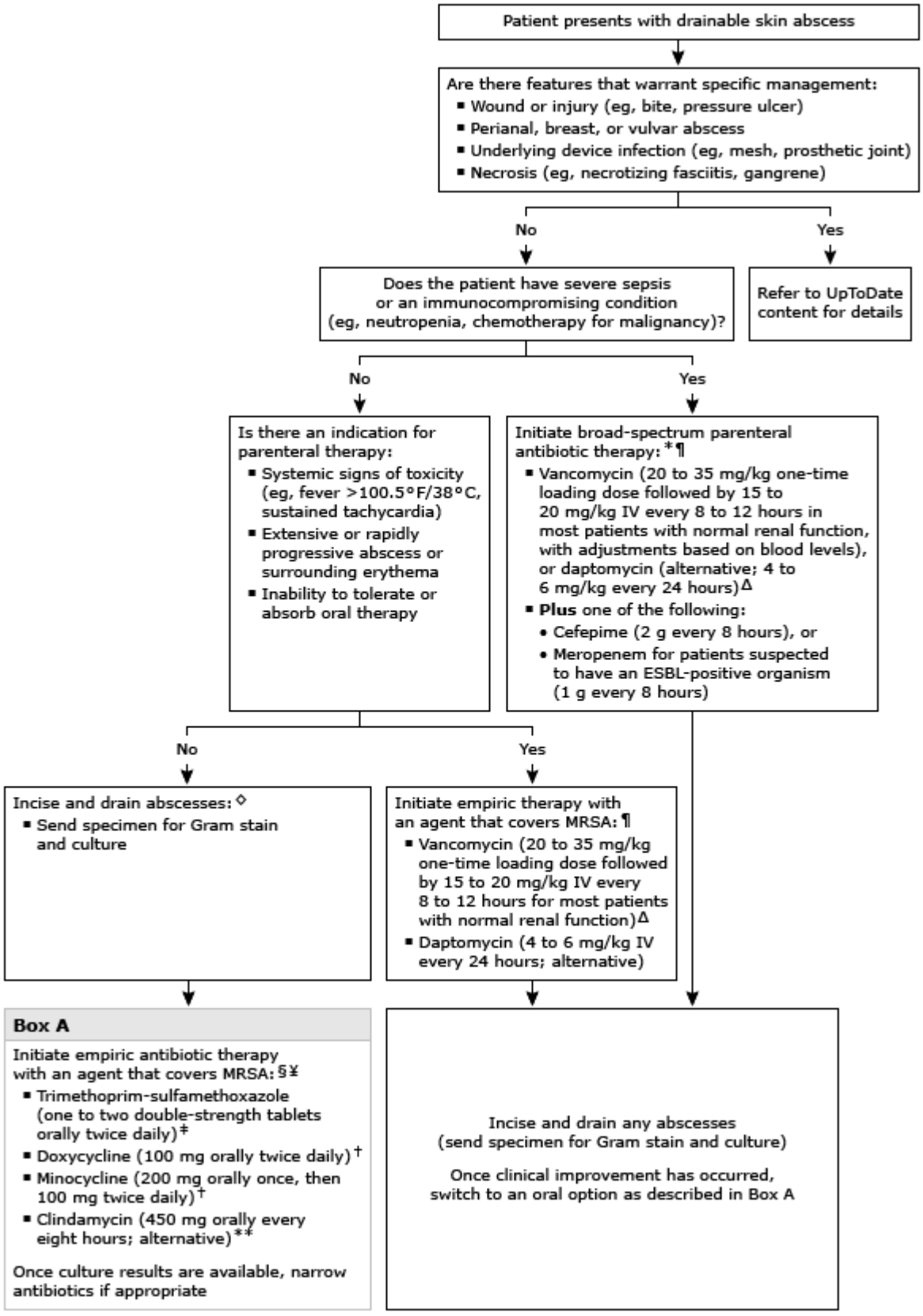
GRAPHICS

Treatment of skin abscess in adults



Dosing in this table is for adult patients with normal organ (eg, kidney, liver) function. Refer to Lexicomp drug monographs for dose adjustments and additional information.

ESBL: extended-spectrum beta-lactamase; IV: intravenous; MRSA: methicillin-resistant Staphylococcus aureus.

* For patients with septic shock or an immunocompromising condition who cannot take any beta-lactam agents, we suggest IV vancomycin plus either levofloxacin (750 mg IV once daily) or aztreonam (2 g IV every 6 to 8 hours). The majority of patients with reported beta-lactam allergies can take a cephalosporin (refer to UpToDate content for details).

¶ Once culture and susceptibility data are available, narrow antibiotics to target the pathogen as appropriate.

Δ For further details about vancomycin dosing, refer to UpToDate content for details.

◇ Close observation without incision and drainage is acceptable for stable patients with small abscesses (<2 cm) that are spontaneously draining.

§ Some experts would forego antibiotic therapy in select patients (eg, healthy patients with a single abscess <2 cm in diameter, minimal surrounding cellulitis, and no significant comorbidities).

¥ Five days of antibiotic therapy is generally adequate; extension up to 14 days may be warranted for slow clinical response.

‡ For patients who weigh more than 70 kg and have normal renal function, we favor two double-strength tablets twice daily.

† For patients with risk factors for endocarditis, we add amoxicillin (875 mg orally twice daily) to doxycycline or minocycline for beta-hemolytic streptococcal coverage.

** We generally avoid clindamycin due to risk for C. difficile infection and staphylococcal resistance rates. Local resistance rates should be reviewed before prescribing.

Graphic 139108 Version 6.0

Oral antimicrobial therapy for treatment of skin and soft tissue infections due to methicillin-resistant *Staphylococcus aureus* (MRSA) in adults

Treatment	Adult dose
Preferred agents*	
Trimethoprim-sulfamethoxazole (cotrimoxazole)	1 or 2 DS tablets twice daily¶
Clindamycin	450 mg orally 3 times daily
Doxycycline	100 mg orally twice daily
Minocycline	200 mg orally once, then 100 mg orally twice daily
Alternative agentsΔ	
Linezolid	600 mg orally twice daily
Tedizolid	200 mg orally once daily
Delafloxacin	450 mg orally twice daily
Omadacycline	300 mg orally once daily

The doses recommended above are intended for patients with normal renal function; the doses of some of these agents must be adjusted in patients with renal insufficiency.

DS: double strength (ie, 160 mg trimethoprim with 800 mg sulfamethoxazole per tablet).

* In general, the choice between the preferred oral antibiotic agents is guided by individual clinical circumstances including local antibiotic resistance patterns, allergy history, and concomitant medications.

¶ For patients who weigh more than 70 kg and have normal renal function, the typical dose is two double-strength tablets twice daily.

Δ Use of alternative oral antibiotic agents is limited by cost, clinical experience, and adverse drug effects. They should be reserved for patients who do not respond to or cannot tolerate the preferred agents.

Data from:

1. *Stevens DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. Clin Infect Dis 2014; 59:e10.*
2. *Liu C, Bayer A, Cosgrove SE, et al. Clinical Practice Guidelines by the Infectious Diseases Society of America for the Treatment of Methicillin-Resistant Staphylococcus Aureus Infections in Adults and Children. Clin Infect Dis 2011; 52:e18 (note: for TMP-SMX dose in osteomyelitis, refer to p e38).*

Graphic 64178 Version 28.0

Approach to vancomycin dosing for adults with normal kidney function*

Loading dose (for patients with known or suspected severe *Staphylococcus aureus* infection)¶	Load 20 to 35 mg/kg (based on actual body weight, rounded to the nearest 250 mg increment; not to exceed 3000 mg). Within this range, we use a highe dose for critically ill patients; we use a lower dose for patients who are obese and/or are receiving vancomycin via continuous infusion.
Initial maintenance dose and interval	Typically 15 to 20 mg/kg every 8 to 12 hours for most patients (based on actual body weight, rounded to the nearest 250 mg increment). In general, the approach to establishing the vancomycin dose/interval is guided by a nomogram.Δ
Subsequent dose and interval adjustments	Based on AUC-guided (preferred for severe infection)[1] or trough-guided serum concentration monitoring.◇

AUC: area under the 24-hour time-concentration curve.

* Refer to the UpToDate topic on vancomycin dosing for management of patients with abnormal kidney function.

¶ For patients with known or suspected severe *S. aureus* infection, we suggest administration of a loading dose to reduce the likelihood of suboptimal initial vancomycin exposure. Severe *S. aureus* infections include (but are not limited to) bacteremia, endocarditis, osteomyelitis, prosthetic joint infection, pneumonia warranting hospitalization, infection involving the central nervous system, or infection causing critical illness.

Δ If possible, the nomogram should be developed and validated at the institution where it is used to best reflect the regional patient population. Refer to the UpToDate topic on vancomycin dosing for sample nomogram.

◇ Refer to the UpToDate topic on vancomycin dosing for discussion of AUC-guided and trough-guided vancomycin dosing. For patients with nonsevere infection who receive vancomycin for <3 days (in the setting of stable kidney function and absence of other risk factors for altered vancomycin kinetics), vancomycin concentration monitoring is often omitted; the value of such monitoring prior to achieving steady state (usually around treatment day 2 to 3) is uncertain.

Reference:

1. *Rybak MJ, Le J, Lodise TP, et al. Therapeutic Monitoring of Vancomycin for Serious Methicillin-Resistant Staphylococcus Aureus Infections: A Revised Consensus Guideline and Review by the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, the Pediatric Infectious Diseases Society, and the Society of Infectious Diseases Pharmacists. Am J Health Syst Pharm 2020; 77:835.*

Graphic 128911 Version 5.0

Parenteral antimicrobial therapy for treatment of skin and soft tissue infections due to methicillin-resistant *Staphylococcus aureus* (MRSA) in adults

Drug	Adult dose
Antibiotics of choice*	
Vancomycin¶	15 to 20 mg/kg/dose every 8 to 12 hours
Daptomycin△	4 to 6 mg/kg IV once daily
Alternative agents	
Short-acting agents with parenteral or oral dosing	
Linezolid	600 mg IV (or orally) twice daily
Tedizolid	200 mg IV (or orally) once daily
Delafloxacin	300 mg IV twice daily (or 450 mg orally twice daily)
Omadacycline◇	100 mg IV once daily (or 300 mg orally once daily)
Short-acting agent with parenteral dosing§	
Ceftaroline	600 mg IV every 12 hours
Telavancin	10 mg/kg once daily
Long-acting agents with parenteral dosing	
Dalbavancin	Single-dose regimen: 1500 mg once Two-dose regimen: Initial dose 1000 mg, followed by 500 mg dose one week later
Oritavancin	1200 mg IV as a single dose

MRSA: methicillin-resistant *S. aureus*; IV: intravenously; AUC: area under the 24-hour time-concentration curve.

* In areas outside the United States where teicoplanin is available, some use it as the drug of choice for initial therapy of gram-positive pathogens, while others favor its use for patients with intolerance to vancomycin.

¶ For severely ill patients, a vancomycin loading dose (20 to 35 mg/kg) is appropriate[1]; within this range, we use a higher dose for critically ill patients. The loading dose is based on actual body weight, rounded to the nearest 250 mg increment and not exceeding 3000 mg. The initial maintenance dose and interval are determined by nomogram (typically 15 to 20 mg/kg every 8 to 12 hours for most patients with normal renal function). Subsequent dose and interval adjustments are based on AUC-guided or trough-guided serum concentration monitoring. Refer to the UpToDate topic on vancomycin dosing for sample nomogram and discussion of vancomycin monitoring.

Δ Dosing of daptomycin for treatment of skin and soft tissue infection is 4 to 6 mg/kg IV once daily; dosing for treatment of bacteremia is at least 6 mg/kg IV once daily. (Refer to the UpToDate topic on treatment of MRSA bacteremia for further discussion.)

◇ A loading dose may be used: 200 mg IV over 60 minutes OR 100 mg IV over 30 minutes twice.

§ Ceftobiprole has broad-spectrum activity against gram-positive and gram-negative organisms and is available in some countries outside the United States.

Data from: Lui C, Bayer A, Cosgrove SE, et al. Clinical practice guidelines by the Infectious Diseases Society of America for the treatment of methicillin-resistant Staphylococcus aureus infections in adults and children. Clin Infect Dis 2011; 52:285.

Reference:

1. *Rybak MJ, Le J, Lodise TP, et al. Therapeutic Monitoring of Vancomycin for Serious Methicillin-Resistant Staphylococcus Aureus Infections: A Revised Consensus Guideline and Review by the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, the Pediatric Infectious Diseases Society, and the Society of Infectious Diseases Pharmacists. Am J Health Syst Pharm 2020; 77:835.*

Graphic 110072 Version 11.0