UNITED ARAB EMIRATES
MINISTRY OF HEALTH & PREVENTION

National Guidelines on the Empiric AntibioticTreatment of Skin and Soft Tissue Infections

Version 1: June 2024

Table of Contents

1. Purpose & Scope

1.1 The National Sub-Committee for Antimicrobial Stewardship has compiled this guideline on the empiric antibiotic management of skin and soft tissue infections (SSTIs) to provide the healthcare professionals with evidence-based information and recommendations for the antibiotic treatment of SSTIs. The guideline is based on the best current clinical evidence, taking into consideration the antimicrobial resistance patterns and trends in the United Arab Emirates; however, they can never replace clinical expertise when making treatment decisions for individual patients, but rather help to focus decisions.

1.2 This guideline is subject to revision and will be modified based on changes in international guidelines and UAE's national antibiogram when applicable.

1.3 The National Antimicrobial Stewardship Committee strongly recommends either adopting this guideline or developing/amending a facility-based guideline using this document as a reference tool.

1.4 The committee panel is composed of infectious diseases specialists, infection control practitioners, medical intensivists, epidemiologists, public health specialists, microbiologists, clinical pharmacists, and researchers practicing in government, private and academic sectors.

2. Acknowledgment

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3. Policy statement

The guideline is applicable to all adult patients with suspected or confirmed skin and soft tissue infections.

4. Definitions

4.1. **Carbuncles:** A carbuncle is a coalescence of several inflamed follicles into a single inflammatory mass with purulent drainage from multiple follicles. It is often located on the nape of the neck and back of the thighs. Fever and malaise are also frequently present.

4.2. **Cellulitis:** Cellulitis is inflammation of the skin secondary to infection that involves the deeper dermis and subcutaneous fat.

4.3. **Erysipelas:** An infection involving lymphatic tissue and more superficial skin layers. It is typically indurated with a raised border that is clearly demarcated from normal skin.

4.4. **Folliculitis:** An infection involving hair follicles that typically manifests as a pustule.

4.5. **Furuncle(boil):** A deep, inflammatory nodule extending into the subcutaneous tissue, that develops from folliculitis. It occurs in skin areas of friction and perspiration and contains hair follicles. Nodules become painful and fluctuant. Spontaneous drainage commonly occurs.

4.6 **Impetigo:** A superficial skin infection that is associated with pustules or blisters (bullae) but is most commonly encountered as “honey-colored” crusts.

4.7 **Necrotizing Skin and Soft Tissue Infections:** Infections of the deep soft tissues that are characterized clinically by fulminant tissue destruction, systemic signs of toxicity, and high mortality.

4.8 **Tinea:** Typically confined to the superficial epidermis and caused by fungi. These forms of infection usually manifest with scaling patches, plaques, or papules.

4.9 **Skin Abscess:** A skin abscess is a collection of pus within the dermis or subcutaneous space.

4.10 **Sepsis**: defined as life-threatening organ dysfunction caused by a dysregulated host response to infection.

4.11 **Source Control**: encompasses all those physical measures used to control a focus of invasive infection and to restore the optimal function of the affected area.

5 Abbreviations

ASP: Antibiotic Stewardship Program.

AG: Aminoglycosides.

AUC: Area under the curve.

CRE: Carbapenem-resistant Enterobacterales.

CT: Computerized tomography.

E. coli: Escherichia coli.

ESBL: Extended spectrum beta-lactamase.

FQ: Fluoroquinolones.

Gm: Grams.

GNR: Gram Negative Rods.

GPC: Gram Positive Cocci.

HAIs: Healthcare Associated Infections.

ID: Infectious Disease.

IV: Intravenous.

IVIG: Intravenous Immunoglobulins.

Mg: Milligrams.

MDR-GNR: Multidrug Resistant Gram-Negative Rods.

MSSA: Methicillin-Sensitive Staphylococcus aureus.

MRSA: Methicillin-Resistant Staphylococcus aureus.

MRI: Magnetic Resonance Imaging.

NA: Not Applicable.

NSTIs: Necrotizing Skin and Soft Tissue Infections.

PCN: Penicillin.

PK-PD: Pharmacokinetics/Pharmacodynamics.

PO: Per Os or by Mouth.

SIRS: Systemic Inflammatory Response Syndrome.

SSI: Surgical Site Infection.

SSTIs: Skin and Soft Tissue Infections.

TMP/SMX: Trimethoprim/Sulfamethoxazole.

TSS: Toxic Shock Syndrome.

VRE: Vancomycin-Resistant Enterococci.

6 Introduction

- A panel of experts in the management of SSTIs was convened to develop this document. The expert panel met in person and discussed via emails the preparation and revision of the consensus paper resulting from the meeting. The manuscript was successively reviewed by all national ASP members and ultimately revised as the present manuscript. This document represents the executive summary of the consensus of the national ASP members which outlines clinical recommendations based on review of currently updated and previous international guidelines as well as review of available literature on the subject of SSTI. The recommendations in this guideline have been developed following a review of studies published in English.

- Skin and soft-tissue infections (SSTIs) encompass a variety of pathological conditions that involve the skin and underlying subcutaneous tissue, fascia, or muscle, ranging from simple superficial infections to severe necrotizing infections. SSTIs may affect any part of the body and are a frequent clinical problem in surgical departments. Successful management of patients with severe SSTIs involves prompt recognition, appropriate antibiotic therapy, timely surgical debridement or drainage, and resuscitation when required.

- Skin and soft tissue infections have diverse etiologies that depend, in part, on different epidemiological settings. As a result, obtaining a careful history that includes information about the patient's immune status, geographic locale, travel history, recent trauma or surgery, previous antimicrobial therapy, lifestyle, hobbies, and animal exposure or bites is essential when developing an adequate differential diagnosis and an appropriate index of suspicion for specific etiological agents. Recognition of the physical examination findings and understanding the anatomical relationships of skin and soft tissue are crucial for establishing the correct diagnosis. In some cases, this information is insufficient, and biopsy or aspiration of tissue may be necessary. In addition, radiographic procedures may be critical in a small subset of patients to determine the level of infection and the presence of gas, abscess, or a necrotizing process. Surgical exploration or debridement is an important diagnostic, as well as therapeutic procedure in patients with necrotizing infections or myonecrosis, especially in selected immunocompromised hosts. Many different microbes can cause soft tissue infections, and although specific bacteria may cause a particular type of infection, considerable overlaps in clinical presentation occur. Clues to the diagnosis and algorithmic approaches to diagnosis are covered in detail in the text to follow. Specific recommendations for therapy are also provided.

7 Classifications of Skin and Soft Tissue Infections

7.1 Purulent Vs Non-Purulent

Non-Purulent Infections: Cutaneous nonsuppurative inflammation devoid of pus. (e.g., erysipelas, cellulitis, necrotizing fasciitis).

Purulent Infections: Cutaneous inflammation resulting in large amount of pus, which consists of neutrophils, dead cells, and fluid. (e.g., furuncles, carbuncles, abscesses).

6.1. Uncomplicated Vs Complicated

Uncomplicated: Superficial infections that can usually be treated by antimicrobial therapy or surgical incision alone.

Complicated: Infections involving deeper tissues or requiring substantial surgical intervention.

6.2. Severity

Several classifications exist.

Classification of SSTIs according to severity is illustrated in **attachment 1.**

8 Microbiology of Skin and Soft Tissue Infection

Skin and soft tissue infection can be caused by a variety of microorganisms. This is summarized in **attachment 2.**

9 Principles of Treatment of Skin and soft tissue infection

Principles of antibiotic therapy:

Most SSTIs involving healthy skin are caused by aerobic Gram-positive cocci, specifically *S. aureus*, and streptococci. Strains of *S. aureus* and group A streptococci (GAS) can produce a variety of toxins that may both potentiate their virulence and affect the soft tissues and allow invasion of the dermis. Polymicrobial infections occur when aerobic gram-negative and anaerobes invade soft tissues.

Principles of source control:

Source control includes drainage of infected fluids, debridement of infected soft tissues, and removal of infected devices or foreign bodies. Appropriate source control is of utmost importance in the management of SSTIs and is the most important determinant of outcome in necrotizing skin and soft tissue infections (NSTIs). Delayed or inadequate source control results in preventable morbidity and mortality in patients with NSTI.

10 Procedure and Responsibility

	Procedure	Responsibilities
10.1	• The empiric antibiotic choice for skin and soft tissue infections is based on the attached 2021 UAE antibiogram. According to UAE National Antibiogram, more than 35% of purulent SSTIs are cause by MRSA. **(Attachment 9)**. Empiric antibiotic choice for patients	

	with SSTI should be with an agent that is active against MRSA. Antibiotics should be de-escalated according to clinical response and culture and sensitivity results.	
10.2	**Management of Limited Impetigo and Ecthyma** • Limited impetigo is identified by the presence of a limited number of lesions. • Mupirocin or Fusidic acid three times daily is recommended for five days.	**Physician**
10.3	**Management of Extensive Impetigo and Ecthyma** • Oral antibiotic therapy should be administered to patients with numerous impetigo lesions or ecthyma. • Unless cultures reveal o • Only beta-hemolytic streptococci (usually group A Streptococcus [GAS]), antibiotic chosen should be effective against both *S. aureus* and streptococci. • **Recommended Empiric Antibiotics:** - No Penicillin allergy: Cephalexin, Flucloxacillin or Dicloxacillin. - Severe Penicillin allergy or MRSA is highly suspected: Oral Clindamycin or Doxycycline. - Antibiotics should be de-escalated based on clinical response and culture results. • **Duration:** 5-7 days.	**Physician**
10.4	**Management of Folliculitis:** • Superficial bacterial folliculitis is the most common form of folliculitis and is usually caused by the bacteria *S. aureus.* • Gram-negative bacterial folliculitis is usually caused by *pseudomonas aeruginosa*. Other organisms include *Klebsiella* and *Enterobacter.* Patients who receive prolonged oral antibiotic therapy may develop this type of folliculitis. • Immunosuppression should Increases suspicion for fungal, viral, or demodectic folliculitis (related to mites). • Mild/Moderate folliculitis is usually managed using local measures such as saline compresses. • In severe folliculitis, cultures or biopsy should be obtained to assess uncommon etiologies or non-infectious processes.	**Physician**

	• **Recommended Empiric Antibiotics:** - **Mild/Moderate:** topical antibiotics such as mupirocin, fusidic acid or anti-fungal agents such as clotrimazole. - **Severe or widespread** (numerous papules or pustules or with involvement of more than one body area): o Oral Clindamycin, or Doxycycline. o If *pseudomonas* is suspected: oral Ciprofloxacin or Levofloxacin o Antibiotics should be de-escalated based on clinical response and culture results. • **Duration:** usually 5-7 days**.**	
10.5	**Management of Mild Furunculosis:** • Furunculosis is a deep infection of the hair follicle leading to abscess formation with accumulation of pus and necrotic tissue. • Most cases are caused by *S. aureus* including MRSA. • Most furuncles can be successfully treated by application of moist heat which promotes localization and drainage.	**Physician**
10.6	**Management of Moderate Furunculosis:** • May need oral antibiotics in addition to the above measures. Larger areas may require drainage. • **Recommended Empiric Antibiotics:** - Oral Clindamycin, Doxycycline. - Antibiotics should be de-escalated based on clinical response and culture results. • **Duration:** 5-7 days	**Physician**
10.7	**Management of Severe Furunculosis:** • Source control is paramount and surgical drainage should be prompt after hemodynamic stabilization. Systemic antibiotic therapy is recommended. • **Recommended Empiric Antibiotics**: - Anti-MRSA antibiotics such as IV Vancomycin, Teicoplanin, Linezolid, Ceftaroline, or Daptomycin. - Antibiotics should be de-escalated based on clinical response and culture results. • **Duration:** 5-7 days**.**	**Physician**

10.8	**Management of Cutaneous Abscess:** • Management of cutaneous abscess is illustrated i**n attachment** 3. • The most common bacterial cause of skin abscess is *S. aureus*, which occurs in up to 75% of cases. Empiric therapy should cover *S. aureus*, including MRSA. Risk factors for MRSA skin and soft tissue infection are illustrated in attachment 4. • Cultures of debrided material and blood cultures (prior to initiation of antibiotic therapy) are warranted. All patients with a fluctuant skin abscess should undergo incision and drainage to evacuate pus and necrotic debris. • Antibiotics are not recommended if all of the following criteria are met 1. Single abscess. 2. Size of abscess <2 cm in diameter. 3. No or minimal surrounding cellulitis. 4. No systemic signs of toxicity (e.g., fever >38°C, hypotension, or sustained tachycardia). 5. No immunosuppression or other comorbidities. 6. No prior clinical failure with incision and drainage alone. 7. No indwelling medical device (such as prosthetic joint, vascular graft, or pacemaker). 8. No risk factors for endocarditis. 9. No exposure to situations that could increase transmission to others (e.g., contact sports). • 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: 1. If incision and drainage cannot be performed promptly. 2. Patients who have an indication for parenteral therapy. 3. Patients with risk factors for endocarditis. • Antibiotics should be adjusted to the culture's results once available. • **Recommended Empiric Antibiotics:** - **Mild/Moderate:** ○ Oral Clindamycin, or oral Doxycycline. ○ Antibiotics should be de-escalated based on clinical response and culture results. ○ **Duration:** 5 days.	**Physician**

	- **Severe:** o IV Vancomycin, Teicoplanin, Linezolid, Ceftaroline, or Daptomycin. o Gram negative coverage (e.g. Cefepime, Piperacillin/Tazobactam) should be added if patient is immunocompromised or in septic shock. o Antibiotics should be de-escalated based on clinical response and culture results. o **Duration:** the duration of therapy should be individualized based on clinical response. Extension of the duration (up to 14 days) may be warranted in the setting of severe infection, slow response to therapy, or immunosuppression.	
10.9	**Management of Inflamed Epidermoid Cyst:** • Epidermoid cysts may become secondarily infected by the normal skin flora. • Treatment of stable, uninfected epidermoid cysts is not necessary, unless desired by the patient. • Inflamed, ruptured cysts that are not infected may resolve spontaneously without therapy. If the lesion is fluctuant, incision and drainage is indicated.	**Physician**
10.10	**Management of Abscesses at an Intravenous Drug Injection Sites** - *Staphylococcus aureus*, gram negative bacilli or anaerobes are usually the etiology. Oral flora organisms, including anaerobes, are most frequently seen among intravenous drug users. Blood cultures may be positive. - **Recommended Empiric Antibiotics:** - Mild/Moderate: treat as cutaneous abscess. - Severe infection: IV anti-MRSA (Vancomycin, Teicoplanin, Linezolid, Ceftaroline, or Daptomycin) and IV anti-pseudomonas agents (Piperacillin/Tazobactam, Ceftazidime, Cefepime, Fluoroquinolones) and IV anaerobic coverage (Metronidazole or Clindamycin) - Antibiotics should be de-escalated based on clinical response and culture results. - **Duration:** the duration of therapy should be individualized based on clinical response. Extension of the duration (up to 14 days) may be warranted in the setting of severe infection, slow response to therapy, or immunosuppression.	**Physician**
10.11	**Evaluation of Recurrent Skin Abscesses** • Recurrent skin abscess at a previous site of infection may be caused by local factors such as foreign material, hidradenitis suppurativa, or pilonidal cyst. Treatment of these underlying conditions can eradication of which can be curative. • Adult patients should be evaluated for neutrophil disorders if the history of recurrent	**Physician**

	abscesses began in early childhood. • Human immunodeficiency virus (HIV) testing should be strongly considered in patients with recurrent abscesses	
10.12	**Treatment and Prevention of Recurrent Abscesses** • Recurrent abscesses should be drained and cultured early in the course of infection. After obtaining cultures of recurrent abscess, treat with a 5- to 10-day course of an antibiotic active against the pathogen isolated. • Consider a 5-day decolonization regimen twice daily of intranasal mupirocin, daily chlorhexidine washes, and daily decontamination of personal items such as towels, sheets, and clothes for recurrent *S. aureus* infection.	**Physician**
10.13	**Evaluation of Erysipelas and Cellulitis** • Erysipelas is commonly caused by *Streptococcus spp*., usually *S. pyogenes*. S*. aureus* rarely causes erysipelas. • Clinically, erysipelas can be distinguished from cellulitis by the following two features: 1. In erysipelas the lesions are raised above the level of the surrounding skin. 2. Erysipelas is characterized by a clear line of demarcation between involved and uninvolved tissue. • Blood cultures are not routinely indicated due to low yield (positive in <5%). • Blood cultures may be indicated in extensive cellulitis and in special populations (Immunosuppressed, severe post-surgical wounds).	**Physician**
10.14	**Management of Mild Cellulitis or Erysipelas** • Defined as typical cellulitis or erysipelas without evidence of purulence or systemic signs of infection. • **Attachment 5** summarizes empiric antibiotic management of cellulitis. • **Recommended Empiric Antibiotics:** Oral Clindamycin or oral Doxycycline. • **Duration:** 5 days	**Physician**
10.15	**Management of Moderate/Severe Cellulitis or Erysipelas** • Moderate disease is defined as cellulitis or erysipelas associated with systemic signs of infection such as fever. • Severe cellulitis or erysipelas is defined as that associated with one or more if the following features:	**Physician**

- Failed oral antibiotics.
- Presence of SIRS.
- Immunocompromised patients.
- Presence of skin sloughing or bullae.
- Hypotension.
- End organ damage.

- Indications for parenteral antibiotics:

1. Systemic signs of toxicity such as fever > 38°C, hypotension, or sustained tachycardia (refractory hypotension should prompt consideration of toxic shock syndrome).
2. Rapid progression of erythema (e.g., doubling of the affected area within 24 hours; in particular, expansion over a few hours with severe pain should prompt consideration of necrotizing fasciitis).
3. Extensive erythema.
4. Immunocompromising condition (e.g., neutropenia, use of immunosuppressive drugs such as chemotherapy for malignancy).
5. Inability to tolerate or absorb oral therapy.
6. Lymphangitis accompanying cellulitis.

- **Recommended Empiric Antibiotics:**
-
  - First Line: IV Anti-MRSA (Vancomycin, Teicoplanin, Linezolid, Ceftaroline, or Daptomycin).
  - Gram-negative coverage is added if the patient is immunocompromised or in septic shock
    - No Penicillin allergy: Antipseudomonal beta-lactams (Ceftazidime, Cefepime, Piperacillin/Tazobactam)
    - Severe Penicillin allergy: Antipseudomonal Fluoroquinolone (Ciprofloxacin or Levofloxacin)
  - Antibiotics should be de-escalated based on clinical response and culture results.
- **Duration:** The duration of therapy should be individualized depending on clinical response. In general, five to six days of therapy is appropriate for patients with uncomplicated cellulitis whose infection has improved. Extension of antibiotic therapy (up to 14 days) may be warranted in the setting of severe infection, slow response to therapy, or immunosuppression.

10.16	**Approach to Patients with Recurrent Cellulitis** • Patients with optimized predisposing conditions but develop recurrent cellulitis due to venous or lymphatic obstruction may benefit from antibiotic suppressive therapy with oral Penicillin V, Benzathine Penicillin G, Amoxicillin, or Erythromycin since it is often caused by Streptococci. • If tinea pedis is the predisposing factor, treat with topical or systemic antifungals.	**Physician**
10.17	**Approach to Patients with Necrotizing Soft Tissue Infections** • Necrotizing soft-tissue infections (NSTIs) are life-threatening, invasive, soft-tissue infections with a necrotizing component involving any or all layers of the soft-tissue compartment, from the superficial dermis and subcutaneous tissue to the deeper fascia and muscle. The latter is most commonly called “necrotizing fasciitis.” • Risk factors for NSIs include diabetes mellitus, renal insufficiency, arterial occlusive disease, intravenous drug abuse, body mass index (BMI)>30 kg/m2, breach to mucosa (hemorrhoids, fissure, episiotomy), recent surgery, skin laceration, major penetrating trauma, and Immunosuppressed status. • Classification of NSIs is outlined in **attachment** 6.	**Physician**
10.18	**Management of NSIs** Prompt surgery with aggressive debridement of necrotic tissue is required for source control and to obtain samples for microbiological culture Early and aggressive surgical exploration and debridement is the mainstay of treatment of NSIs. • Broad-spectrum antibiotic therapy and hemodynamic support are also required; however antibiotic therapy alone without surgical intervention is associated with high mortality (about 100%) hence surgical intervention should not be delayed.	**Physician**
10.19	**Empiric antibiotics for NSTIs, Including Fournier Gangrene** • Empiric antibiotics therapy should consist of broad-spectrum gram-positive coverage (including anti-MRSA), gram-negative coverage, anerobic coverage and an antibiotic with an antitoxin activity. • **Recommended Empiric Antibiotics:** - No Penicillin allergy:	

	1. Carbapenem (Meropenem, Imipenem) + IV Anti-MRSA (Clindamycin or Linezolid are chosen because of antitoxin activity)) 2. We recommend adding Aminoglycoside in patients with septic shock. - Severe Penicillin allergy: Antipseudomonal Fluoroquinolone (Ciprofloxacin or Levofloxacin) + Aminoglycosides (Amikacin or Gentamicin) + Clindamycin. • **Duration:** 7-14 days is recommended depending on individual patient's condition, surgical intervention, and circumstance. We recommend continuing antibiotics until 48–72 h after the last surgical debridement. Consider extending antimicrobial treatment for 48-72 hours if skin graft is planned, to allow for graft uptake. However, this is controversial, and practice should be guided by the plastic surgery team. • De-escalate and adjust antibiotics according to culture results. If prolonged treatment is required, consider switching to oral regimen if available.	**Physician**
10.20	**Management of Pyomyositis:** • Early drainage of purulent material is strongly recommended. Antibiotics should be administered intravenously initially, however once the patient is clinically improved, oral antibiotics are appropriate for patients who are no longer bacteremic and do not have any evidence of endocarditis or metastatic abscess. • **Recommended Antibiotics:** - Anti-MRSA: (Vancomycin, Teicoplanin, Linezolid, Ceftaroline, or Daptomycin). - Add gram negative coverage for patients with penetrating trauma to the muscle or immunocompromised. • **Duration:** 2 to 3 weeks.	**Physician**
10.21	**Management of Clostridial Gas Gangrene or Myonecrosis** • Urgent surgical exploration of the suspected gas gangrene site and surgical debridement of involved tissue should be performed. **Recommended Antibiotics:** - **Empiric:** broad-spectrum treatment with Vancomycin or Clindamycin plus (Piperacillin/ Tazobactam) - **Definitive:** ✓ No Penicillin allergy: Penicillin and Clindamycin ✓ Severe Penicillin allergy: Clindamycin. • **Duration:** The optimal duration of antibiotic treatment has not been defined in clinical trials. Antibiotics should be continued until no further debridements are needed and the	**Physician**

	patient's hemodynamic status has normalized; this duration must be tailored to individual patient circumstances.	
10.22	**Evaluation of Animal and Human Bite** • Purulent bite wounds and abscess are more likely to be polymicrobial (mixed aerobes and anaerobes), whereas non-purulent wounds commonly yield staphylococci and streptococci; and can be polymicrobial in some cases. • Pasteurella species are commonly isolated from both non-purulent wounds with or without lymphangitis and from abscesses.	**Physician**
10.23	**Management of Human or Animal Bite:** • Thorough washing and flushing of the wound (~15 minutes), with soap or detergent and copious amounts of water as soon as possible, followed by debridement and immobilization is recommended. • Evaluate the need of antibiotic prophylaxis **(Attachment 7)** • **High risk indications for antibiotics prophylaxis:** 1. **High-risk areas:** include the hands, feet, face, genitals, skin overlying cartilaginous structures or an area of poor circulation. 2. **High-risk-people:** include those at risk of a serious wound infection because of a co-morbidity (such as diabetes, immunosuppression, asplenia or decompensated liver disease) • If indicated, give oral antibiotics. • If the patient is unable to take oral medication or severe illness, IV antibiotics can be considered. • Review IV antibiotics within 48 hours and consider switching to oral antibiotics if possible. • If there is discharge (purulent or non-purulent), take a swab for culture to guide treatment; evaluate antibiotic choice based on culture results. • Reassess if: - Symptoms or signs of infection develop or worsen rapidly or significantly. - Lack of improvement within 24 to 48 hours of starting treatment. - The patient becomes systemically unwell. - There is severe pain which is out of proportion to the infection. • Evaluate the patient for need of tetanus and rabies post-exposure prophylaxis.	**Physician**

	• **Recommended Empiric Antibiotics for Animal Bite** - No Penicillin allergy: 1. Amoxicillin/Clavulanic acid. 2. Second generation Cephalosporin (Cefuroxime) + anerobic coverage (Clindamycin or Metronidazole) 3. Third generation Cephalosporin (Ceftriaxone) + anaerobic coverage - Severe Penicillin allergy: 1. Trimethoprim/Sulfamethoxazole + anerobic coverage 2. Fluoroquinolone (Ciprofloxacin, Levofloxacin or Moxifloxacin) + anerobic coverage • **Recommended Empiric Antibiotics for Human Bite** - No Penicillin allergy: Amoxicillin/Clavulanic acid - Penicillin allergy: Doxycycline • **Duration:** - Prophylaxis (if indicated) for 3 days. - Treatment for 5-7 days.	
10.24	**Evaluation of Burn** • Burn wounds shall be monitored for signs of infection such as increased pain, redness or swelling of the area surrounding the wound. • Redness alone may not indicate infection. • Signs of invasive infection include change in wound color or signs of sepsis.	**Physician**
10.25	**Principles of Burns Management** • Routine testing (including wound cultures) is not needed in mild cases with no signs of systemic infection. • Because of the inflammatory response associated with the burn, biomarkers of infection are of limited use to diagnose bacterial infections. • Strict infection control measures help in preventing transmission of multidrug-resistant organisms. • Necrotic tissue irrigation and debridement help in preventing infection.	

	• Antibiotics should not be prescribed pre-emptively or prophylactically without clinical evidence of infection. • Avoid the routine use of antibiotics to prevent infections (no clear evidence of a benefit and increased risk of colonization with resistant bacteria) • Only infected wounds shall be treated; coverage against MRSA may be considered based on local prevalence and on individual risk factors. • Maximize use of topical antimicrobials especially for non-invasive infections • Early source control with excision, skin grafting, wound cleansing and dressings should always be implemented in preference to use of broad-spectrum antibiotics. This strategy improves outcomes and can reduce the duration of antibiotic therapy. • Systemic antibiotics are required for systemic infection and invasive burn wound infections (cellulitis). • Delaying burn wound excision increases bacterial load and colonization of burn wounds. • In all infected cases, appropriate specimens should be obtained, if feasible before starting antibiotics. • Do not treat positive swab results unless there are signs that the patient is clinically unwell. • Keep duration of antibiotics as short as possible and switch to orals as soon as feasible. Most infections do not require more than 5 days of treatment. • Prolonged broad-spectrum antibiotic use should be avoided because it increases the risk of colonization with resistant bacteria. • Systemic antibiotics should be avoided, and topical antibiotic dressings used in preference especially when wounds are colonized or there is local infection without signs of systemic infection. • Tetanus immunization is important in patients with severe burns/sepsis (neonates, the elderly or the debilitated may require immunoglobulin). • Advice on the management of burn patients can be obtained from the National Burn's Unit team at Sheikh Shakhbout Medical City, Abu Dhabi.	**Physician**

10.26	**Empiric Antibiotic Management of Burn**
	
	- **Mild:**
	  ○ Clindamycin or Doxycycline +/- Ciprofloxacin.
	  ○ **Duration:** 5 days.
	- **Moderate/Severe:**
	  ○ No penicillin allergy: IV Anti-MRSA + IV antipseudomonal beta-lactam (Cefepime, Ceftazidime or Piperacillin/Tazobactam).
	  ○ Severe Penicillin allergy: IV Anti-MRSA + IV antipseudomonal fluoroquinolone (Ciprofloxacin or Levofloxacin).
	  ○ Consider Adding Aminoglycosides for patients in shock.
	  ○ **Duration:** Could extend beyond 5 days depending on patients' response and severity of the infection.	

10.27	**Classification of Surgical Site Infections (SSI)** • Wound infections, or surgical site infections (SSIs) are the most common adverse events affecting hospitalized surgical patients. • Classification of SSIs: 1. **Superficial incisional SSI**: involves only the subcutaneous space, between the skin and underlying muscular fascia, occur within 30 days of the surgery. 2. **Deep incisional SSI**: involves the deeper soft tissue (e.g., fascia and muscle), and occurs within 30 days of the operation or within 1 year if a prosthesis was inserted. 3. **Organ/space SSI**: defined by the same time constraints and evidence for infection as a deep incisional SSI and may involve any part of the anatomy (organs or spaces) other than the original surgical incision.	**Physician**

10.28	**Principles of Treatment of Surgical Site Infections** • The most important therapy for an SSI is to open the incision, evacuate the infected material, and continue dressing changes until the wound heals by secondary intention. • **Localized SSTIs**. If there is <5 cm of erythema and induration, and the patient has minimal systemic signs of infection (temperature <38.5°C, WBC count <12 000 cells/µL, and pulse <100 beats/minute), antibiotics are unnecessary. • **Surgical Site Infections with SIRS:** Patients with temperature >38.5°C or heart rate >110 beats/minute or erythema extending beyond the wound margins for >5 cm may require a short course of antibiotics, as well as opening of the suture line. • Antibiotics choice is usually empiric however can be supported by gram stain, culture of the wound contents and the site of surgery as well as institutional antibiogram and rate of resistant organisms. As such if the institution has a high proportion of MRSA infections or the patient has had prior MRSA infection, nasal colonization or was previously on antibiotics, the initial antibiotics regimen should include coverage for MRSA. • **Recommended Empiric Antibiotics:** - Anti MRSA: Clindamycin, Vancomycin, or Teicoplanin - Gram negative coverage (Piperacillin Tazobactam or Fluoroquinolone) + Anaerobic coverage (Metronidazole) should be added if 1. Wound was known to be grossly contaminated in the case of traumatic injury or gastrointestinal tract perforation 2. Following operations on the axilla, gastrointestinal (GI) tract, perineum, or female genital tract - For patients with hemodynamic instability, empiric therapy should be with Carbapenems, given the high ESBL rate amongst gram negative organisms in UAE. • Duration: In the absence of retained foreign material, antibiotics should be stopped with resolution of cellulitis and/or normalization of physiologic parameters such as leukocytosis. Guidelines suggest a short course of antibiotics (24 to 48 hours) for cellulitis that has not improved with opening the wound [76,77]. In the case of intra-abdominal organ/space infection, antimicrobial treatment may be discontinued four days after source control has been achieved.	**Physician**
10.29	Attachment 8 summarizes antibiotic management of SSTIs.	**Physician**

10.30	**Anti-inflammatory Agents and IVIG in SSTI** • We recommend against not to using use non-steroidal anti-inflammatory drugs NSAIDS or systemic corticosteroids in adult patients with cellulitis as it may masks signs of necrosis. • We suggest considering the addition of high dose IVIG to systemic antibiotics in cases of confirmed or suspected streptococcus pyogenes (GAS) with toxic shock syndrome.	**Physician**

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12 Tools/Attachments Forms

12.1 Attachment 1: Classification of SSTIs According to Severity.
12.2 Attachment 2: Microbiology of Skin and Soft Tissue Infections.
12.3 Attachment 3: Management of Cutaneous Abscess Flow Chart.
12.4 Attachment 4: Risk Factors of MRSA Skin and Soft Tissue Infections.
12.5 Attachment 5: Management of Acute Cellulitis Flow Chart
12.6 Attachment 6: Classification of Necrotizing Skin and Soft Tissue Infections.
12.7 Attachment 7: Antibiotic Prophylaxis for Uninfected Human/Animal Bites.
12.8 Attachment 8: Empiric Antibiotics Choice for SSTIs.
12.9 Attachment 9: Percent Susceptible Isolates (%S) for *Staphylococcus aureus*, United Arab Emirates, 2021.
12.10 Attachment 10: Percent Susceptible Isolates (%S) for *Pseudomonas aeruginosa*, United Arab Emirates, 2021.
12.11 Attachment 11: Number of Top 20 Skin and Soft Tissue Isolates, UAE (2021).

13 Key Performance Indicators

13.1 % of patients with mild cellulitis who are prescribed oral linezolid (in ER or outpatient clinic).

13.2 % of Patients with mild cellulitis who are prescribed oral antibiotics for more than 5 Days.

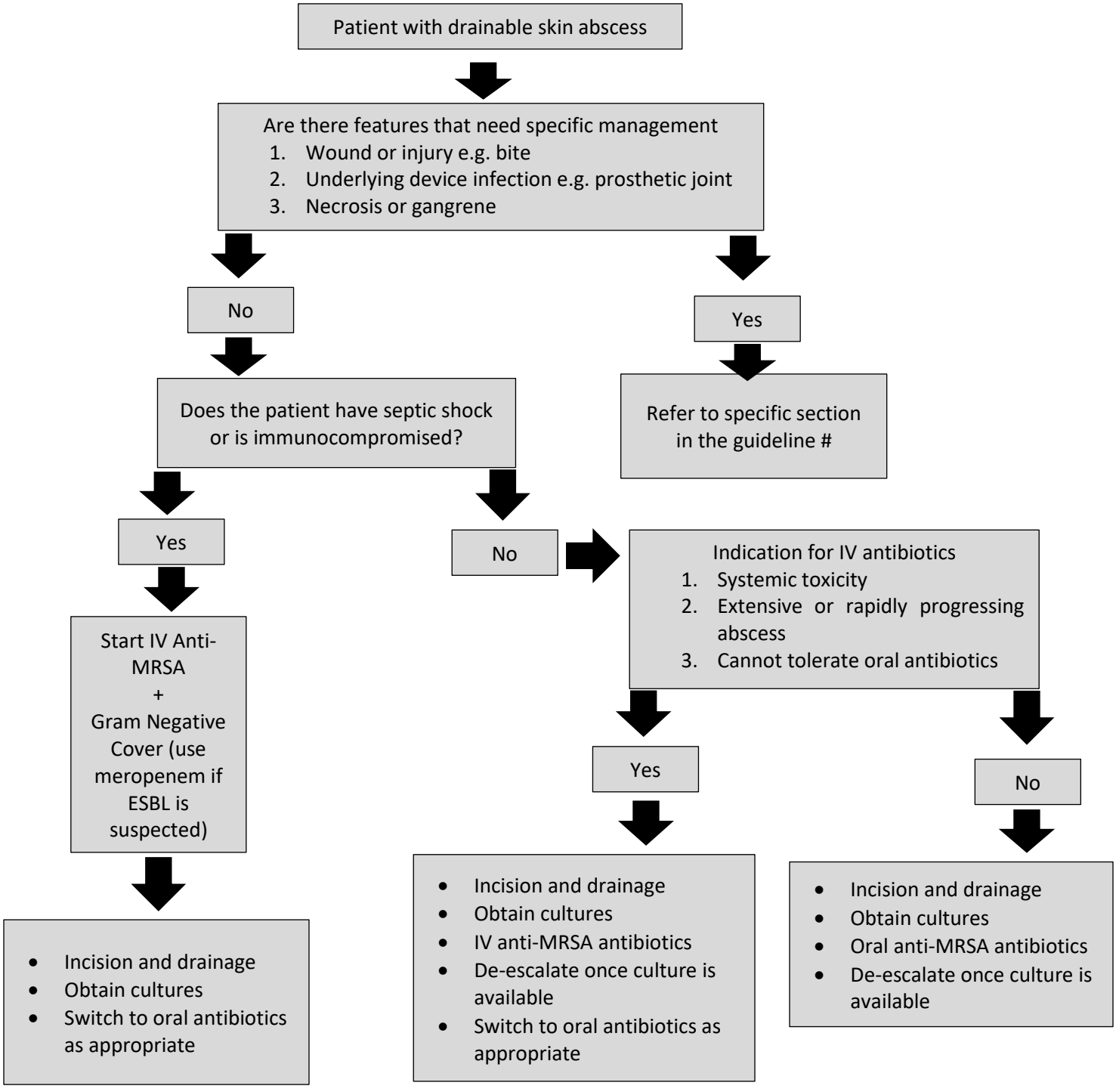
Attachment 1: Classification of SSTIs According to Severity

Class	Description
1	Simple infection with no systemic signs or symptoms indicating spread* and no uncontrolled comorbidities that may complicate treatment; amenable to outpatient management with topical or oral antimicrobials.
2	Infection with systemic signs or symptoms indicating spread or with stable comorbidities, or infection without systemic spread but with uncontrolled comorbidities; may require inpatient management or parenteral antibiotics.
3	Infection with signs or symptoms of systemic spread (fever, tachycardia, diaphoresis, fatigue, anorexia, and vomiting) or uncontrolled comorbidities; inpatient management with parenteral antibiotics required.
4	Infection with signs of potentially fatal systemic sepsis (mental status changes, tachycardia, tachypnea, and hypotension) requiring parenteral antibiotics; inpatient management (possibly in critical care unit) required, surgery may be indicated.

Attachment 2: Microbiology of Skin and Soft Tissue Infections

Condition	Microbiology
Impetigo/Ecthyma	Beta-hemolytic streptococci S. aureus
Folliculitis	S. aureus Pseudomonas aeruginosa Other gram negative (such as Klebsiella and Enterobacter) Candida spp
Furuncles/Carbuncles	S. aureus
Cutaneous Abscess	S. aureus (> 75%) Streptococcus, anaerobes (often polymicrobial)
Abscesses at an IV Injection Sites	S. aureus Pseudomonas Anaerobes
Erysipelas and Cellulitis	Beta-hemolytic streptococci S. aureus
Necrotizing Skin Infection	See attachment 8
Clostridial Myonecrosis	Clostridium (usually C. perfringens, C. septicum)
Fournier Gangrene	Polymicrobial
Bites (Human, Animal)	Polymicrobial (Bacteroides, Peptostreptococcus, S. aureus, Streptobacillus moniliformis)
Surgical Site Infection	Staphylococcus aureus, coagulase-negative staphylococci, Streptococcus spp, and Enterococcus spp

Attachment 3: Management of Cutaneous Abscess Flow Chart (Adapted from UpToDate)

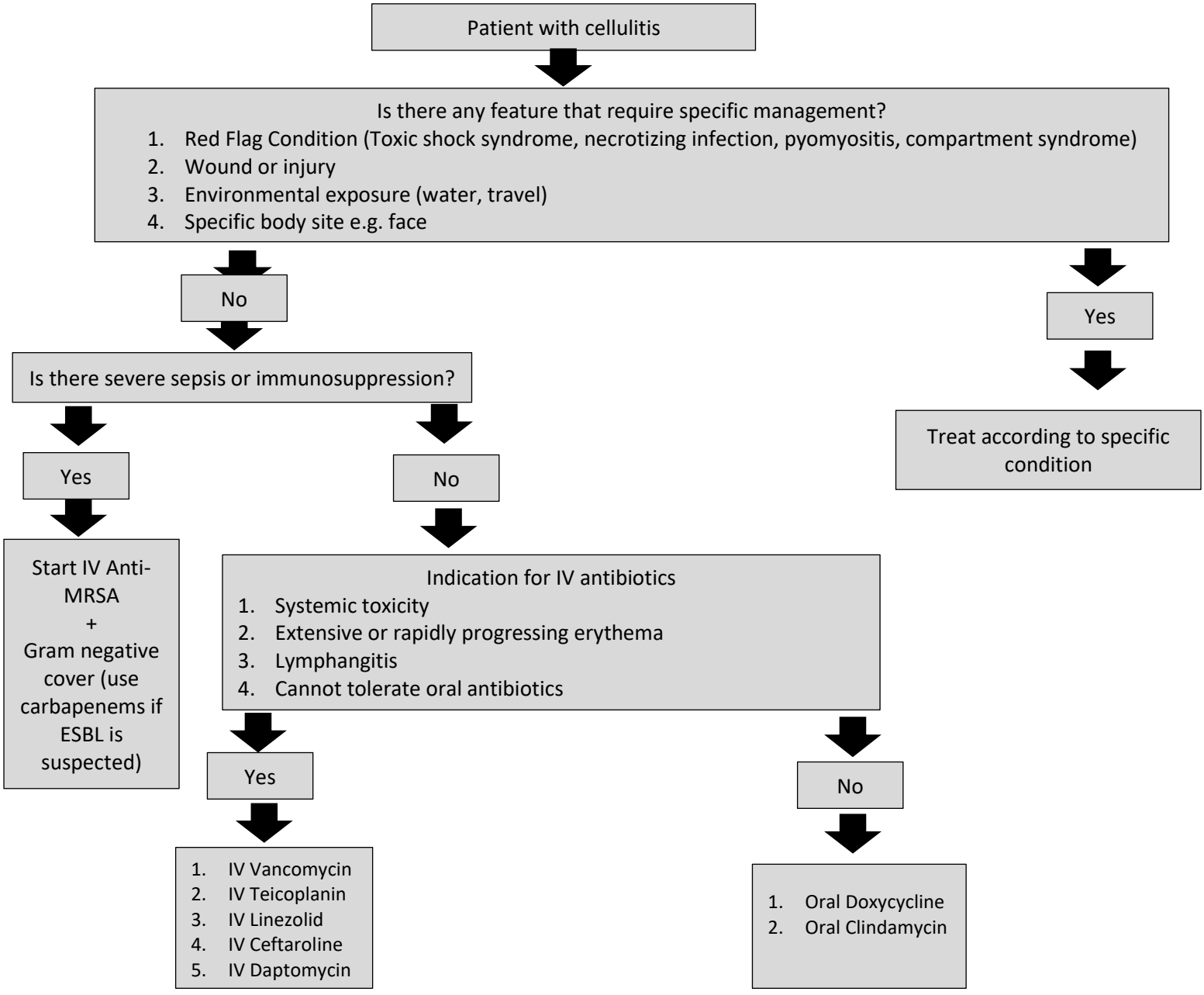


management of prosthetic joint infection is not included in this guideline.

Attachment 4: Risk Factors for MRSA Skin and Soft Infections

Health care exposures during the prior 12 months
• Recent hospitalization • Residence in a long-term care facility • Recent surgery • Hemodialysis
Patient-specific risk factors
• Known MRSA colonization or past infection with MRSA • Recent close contact with a person colonized or infected with MRSA • HIV infection • Injection drug use • Homelessness • Men who have sex with men • Antibiotic use within prior 6 months
Environmental exposures associated with outbreaks of MRSA skin abscesses
• Incarceration or working as prison guard • Military service • Attending schools or living in communities with high colonization rates • Living in crowded conditions • Attending or working in childcare centers • Playing contact sports or sharing sporting equipment • Sharing needles, razors, or other sharp objects

Attachment 5: Management of Acute Cellulitis Flow Chart (Adapted from UpToDate)



Attachment 6: Classification of Necrotizing Skin and Soft Tissue Infections

Type of NSI	Etiology	Organisms	Mortality
Type 1 (70-80% of cases)	Polymicrobial Often bowel flora derived	Mixed anaerobes and aerobes	Variable Depends on underlying comorbidities
Type 1 (20-30% of cases	Often monomicrobial Skin or respiratory derived	Usually *beta-hemolytic streptococc*i (GAS) Occasionally *S. aureus*	More than 30% Depends on associated myositis
Type 3 (more common in Asia)	Gram-negative Often marine-related organisms	*Vibrio spp.*	30-40%
Type 4 (fungal)	Trauma associated	*Candida spp.*	>50% Higher if immunocompromised

Attachment 7: Antibiotic Prophylaxis for Uninfected Human/Animal Bites (Adapted from Reference [11])

Type of bite	Bite without broken the skin	Bite with broken skin but not drawn blood	Bite with broken the skin and drawn blood
Human bite	Don't offer antibiotic	Consider antibiotic if it is in high risk area or high-risk patient	Offer antibiotics
Cat bite	Don't offer antibiotic	Consider antibiotics if the wound is deep	Offer antibiotics
Dog or other traditional bite	Don't offer antibiotic	Don't offer antibiotic	• Offer antibiotics if 1. There is considerable deep tissue damage. 2. Wound is visibly contaminated (e.g., dirt or a tooth). • Consider antibiotics if it is in a high-risk area, high risk patient.

Attachment 8: Empiric Antibiotics Choice for Skin and Soft Tissue Infections

Disease	Patient without Penicillin Allergy	Patients with Severe Penicillin Allergy	Comments
Impetigo and Ecthyma			
Limited	Topical Mupirocin or Fusidic Acid three times daily		• Duration = 5 days
Extensive	Oral Cephalexin **OR** Oral Dicloxacillin OR Oral Flucloxacillin	Oral Clindamycin **OR** Oral Doxycycline	• Duration = 5- 7 days • De-escalate depending on clinical condition and culture results
Folliculitis			
Mild/Moderate	Topical antibiotics such as Mupirocin, or Fusidic acid or anti-fungal agents such as Clotrimazole		• Duration= 5-7 days
Severe or widespread	Oral Clindamycin **OR** Oral Doxycycline		• Duration = 5-7 days • De-escalate depending on clinical condition and culture results
If *pseudomonas* is suspected	Oral Ciprofloxacin or oral Levofloxacin		
Furuncles and Carbuncles			
Mild	None		• Local measures such as heat compresses
Moderate	Oral Clindamycin **OR** Oral Doxycycline		• Local measures are used. • Larger areas may require drainage. • Duration= 5-7 days
Severe	IV Vancomycin **OR** IV Teicoplanin **OR** IV Linezolid **OR**		• Source control is very important. • Duration= 5-7 days • Ceftaroline only if there is no severe penicillin allergy

	IV Ceftaroline **OR** IV Daptomycin		
Cutaneous Abscess			
Mild/Moderate	Oral Clindamycin **OR** Oral Doxycycline		• Incision and drainage are needed. • Duration= 5 days
Severe	IV Vancomycin **OR** IV Teicoplanin **OR** IV Linezolid **OR** IV Ceftaroline **OR** IV Daptomycin		• Incision and drainage are needed. • Duration= variable, depends on response • Ceftaroline only if there is no severe penicillin allergy • Gram-negative coverage is added when there is severe sepsis/septic shock or patient is immunocompromised
Abscess at IV Injection Site			
Mild/Moderate	Treat as cutaneous abscess		• Duration= 5 days
Severe	IV Anti-pseudomonas beta-lactam (Piperacillin-Tazobactam, Ceftazidime, Cefepime) **AND** IV Anti-MRSA (Vancomycin, Teicoplanin, Linezolid, Ceftaroline, Daptomycin) AND IV Anerobic coverage (Metronidazole or Clindamycin)	IV Anti-pseudomonas Fluoroquinolone (Ciprofloxacin, Levofloxacin) **AND** IV Anti-MRSA (Vancomycin, Teicoplanin, Linezolid, Ceftaroline, Daptomycin) AND IV Anerobic coverage (Metronidazole or Clindamycin)	• Duration= same as cutaneous abscess
Cellulitis and Erysipelas			
Mild	Oral Clindamycin **OR** Oral Doxycycline		• Duration= 5 days

Moderate to severe (No sepsis or immunosuppression)	IV Vancomycin **OR** IV Teicoplanin **OR** IV Linezolid **OR** IV Ceftaroline **OR** IV Daptomycin		• See indications for parenteral antibiotics in the text • Duration= Individualized
Moderate/severe with severe sepsis/septic shock or immunosuppression	IV antipseudomonal (ceftazidime, cefepime, piperacillin tazobactam) **AND** IV anti-MRSA (Vancomycin, Teicoplanin, Linezolid, Ceftaroline, Daptomycin)	IV antipseudomonal fluoroquinolone (ciprofloxacin or levofloxacin) **AND** IV anti-MRSA (Vancomycin, Teicoplanin, Linezolid, Ceftaroline, Daptomycin)	• Duration= Individualized
Necrotizing Skin Infection			
All cases	IV Carbapenem (Meropenem, Imipenem) **AND** IV Anti-MRSA (Clindamycin or Linezolid)	IV Antipseudomonal Fluoroquinolone (Ciprofloxacin or Levofloxacin) **AND** IV Aminoglycoside (Amikacin or Gentamicin) **AND** IV Anti-MRSA (Clindamycin or Linezolid)	• Source control is needed for all cases. • Add aminoglycoside in patients with septic shock. • Duration: 7-14 days • Continue antibiotics until 48–72 h after the last surgical debridement.
Pyomyositis			
All cases	IV Vancomycin **OR** IV Teicoplanin **OR** IV Linezolid **OR** IV Ceftaroline **OR**		• Duration= 2-3 weeks • Ceftaroline only if there is no severe penicillin allergy • Add gram negative coverage if there is penetrating trauma to the muscle or immunocompromised

	IV Daptomycin		
Clostridium Gas Gangrene			
Empiric	IV Vancomycin or IV Clindamycin **AND** IV Piperacillin/ Tazobactam	IV Vancomycin or IV Clindamycin **AND** IV Fluoroquinolone (Ciprofloxacin or Levofloxacin)	• Duration= individualized
Clostridium confirmed	IV Penicillin **AND** IV Clindamycin	IV Clindamycin	• Duration= Individualized
Animal/Human Bite			
Animal Bite	Oral/IV Amoxicillin/Clavulanic acid **OR** Oral Second Generation Cephalosporin (Cefuroxime) **AND** Oral/IV Anerobic coverage (Clindamycin or Metronidazole) **OR** IV Third Generation Cephalosporin (Ceftriaxone) **AND** Oral/IV Anaerobic coverage	Oral Trimethoprim/Sulfamethoxazole **AND** Anerobic coverage OR Oral/IV Fluoroquinolone (Ciprofloxacin, Levofloxacin or Moxifloxacin) **AND** Oral/IV anerobic coverage	• Prophylaxis duration = 3 days • Treatment duration = 5-7 days
Human Bite	Oral Amoxicillin/Clavulanic acid	Oral Doxycycline	• Duration = as animal bite
Burn			

Mild/Moderate	Anti-MRSA (Clindamycin or Doxycycline) +/- Ciprofloxacin		• Duration = 5 days
Severe	IV anti-MRSA (Vancomycin, Teicoplanin) **AND** IV Anti-pseudomonas (Cefepime, Ceftazidime or Piperacillin/Tazobactam)	IV anti-MRSA (Vancomycin, Teicoplanin) **AND** IV Anti-pseudomonas Fluoroquinolone (Ciprofloxacin, Levofloxacin)	• Duration = Could extend beyond 5 days depending on patients' response and severity of the infection • Consider Adding Aminoglycosides for patients in septic shock
Surgical Site Infection			
Low risk for gram negative bacilli	IV Clindamycin **OR** IV Vancomycin **OR** Teicoplanin		• Ceftaroline only if there is no severe penicillin allergy • 24-48 hours after source control • 4 days after source control of intra-abdominal organ/space infection
SSI with possible gram-negative and anerobic organisms	IV Piperacillin-Tazobactam **AND** IV Anti-MRSA (Vancomycin, Teicoplanin) **OR** IV Carbapenem (Imipenem or Meropenem **AND** IV Anti-MRSA (Vancomycin, Teicoplanin)	IV Fluoroquinolone (Ciprofloxacin, Levofloxacin) **AND** IV Metronidazole **AND** IV Anti-MRSA (Vancomycin, Teicoplanin)	• Duration = as above • Use carbapenems if ESBL is suspected

Attachment 9: Percent Susceptible Isolates (%S) for *Staphylococcus aureus*, United Arab Emirates, 2021

		S. aureus (N=19,728) **All sources**		***S. aureus*** (N=13,886) **Skin and Soft Tissue**	
Antibiotic	**Breakpoints**	**N**	**%S**	**N**	**%S**
Oxacillin	S≤2 R≥4	17,793	**65.2**	12,418	**64.6**
Gentamicin	S≤4 R≥16	18,016	**89.4**	12,602	**88.3**
Rifampicin	S≤1 R≥4	14,104	**99.5**	9,128	**99.6**
Ciprofloxacin	S≤1 R≥4	12,336	**63.3**	8,471	**64.5**
Levofloxacin	S≤1 R≥4	12,125	**64.7**	8,207	**65.6**
Moxifloxacin	S≤0.5 R≥2	14,270	**66.9**	9,605	**68.2**
Trimethoprim/sulfamethoxazole	S≤2 R≥4	18,359	**75.6**	12,809	**72.3**
Clindamycin	S≤0.5 R≥4	18,335	**88.7**	13,057	**88.8**
Erythromycin	S≤0.5 R≥8	18,300	**69.3**	13,055	**69.3**
Linezolid	S≤4 R≥8	17,107	**99.8**	11,705	**99.8**
Vancomycin	S≤2 R≥16	16,652	**100**	11,365	**100**
Doxycycline	S≤4 R≥16	1,858	**98.5**	922	**98.6**
Tetracycline	S≤4 R≥16	18,328	**86.1**	12,828	**85.6**
Quinupristin/Dalfopristin	S≤1 R≥4	2,730	**91.0**	1,872	**91.2**
Tigecycline	S≤0.5 R≥1	13,774	**99.9**	9,012	**99.8**

Data source: UAE National AMR Surveillance System. Data shown is from 319 surveillance sites (88 hospitals,231 centers/clinics), 2021 data.

Date: 6-Feb-2023 (v1.1)

Attachment 10: Percent susceptible isolates (%S) for *Pseudomonas aeruginosa*, United Arab Emirates, 2021.

		P. aeruginosa (N=9,903) **All sources**		***P. aeruginosa*** (N=4,579) **Skin and Soft Tissue**	
Antibiotic	**Breakpoints**	**N**	**%S**	**N**	**%S**
Piperacillin/Tazobactam	S≤16 R≥128	8,923	**86.4**	4,186	**91.2**
Ceftazidime	S≤8 R≥32	9,438	**87.1**	4,354	**90.8**
Cefepime (parenteral)	S≤8 R≥32	9,177	**90.5**	4,218	**93.6**
Imipenem	S≤2 R≥8	8,874	**83.2**	4,004	**86.8**
Meropenem	S≤2 R≥8	9,035	**84.4**	4,070	**89.1**
Gentamicin	S≤4 R≥16	9,476	**91.8**	4,373	**93.8**
Tobramycin	S≤4 R≥16	5,732	**95.4**	2,354	**96.7**
Amikacin	S≤16 R≥64	9,120	**96.1**	4,196	**97.0**
Ciprofloxacin	S≤0.5 R≥2	9,450	**84.2**	4,364	**87.0**

Data source: UAE National AMR Surveillance System. Data shown is from 319 surveillance sites (88 hospitals,231 centers/clinics), 2021 data.

Date: 6-Feb-2023 (v1.1)

Attachment 11: Number of Top 20 Skin and Soft Tissue Isolates, UAE (2021)

Code	Organism	Number of Isolates	%	Number of Patients
sau	***Staphylococcus aureus***	13,886	36.0	13,886
pae	***Pseudomonas aeruginosa***	4,579	11.9	4,579
eco	*Escherichia coli*	4,428	11.5	4,428
kpn	*Klebsiella pneumoniae*	3,064	7.9	3,064
scn	*Staphylococcus, coagulase negative*	855	2.2	855
ecl	*Enterobacter cloacae*	801	2.1	801
efa	*Enterococcus faecalis*	794	2.1	794
pmi	*Proteus mirabilis*	717	1.9	717
sep	*Staphylococcus epidermidis*	614	1.6	614
sgc	*Streptococcus agalactiae*	546	1.4	546
sma	*Serratia marcescens*	536	1.4	536
eae	*Klebsiella aerogenes*	432	1.1	432
cdi	*Citrobacter koseri*	430	1.1	430
aba	*Acinetobacter baumannii*	350	0.9	350
spn	*Streptococcus pneumoniae*	311	0.8	311
mmo	*Morganella morganii*	296	0.8	296
slu	*Staphylococcus lugdunensis*	290	0.8	290
cal	*Candida albicans*	275	0.7	275
spy	*Streptococcus pyogenes*	256	0.7	256
bsb	*Streptococcus, beta-haem. Group B*	216	0.6	216