Antimicrobial Stewardship

Federal Bureau of Prisons
Clinical Guidance

July 2019

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ABOUT THIS DOCUMENT

This document contains an **OVERVIEW AND KEY PRINCIPLES**, followed by 13 separate **TOPICS** related to Antimicrobial Stewardship. This guidance is newly designed so that the topics can be consulted separately or together. The topics are listed as clickable links on the next page. For details on what a particular topic covers, see the short table of **CONTENTS** at the beginning of that chapter.

PRINTING: Most likely, you are viewing this document in PDF format. To print an individual topic without printing the entire document, use the page numbers listed below.

WHAT'S NEW IN THIS GUIDANCE?

In the July 2019 revision of the BOP guidance on Antimicrobial Stewardship, the guidance on following topics were revised:

- *Acute Rhinosinusitis*
- *Clostridium difficile Infection*

NOTE that these changes have altered the pagination, such that the above printing instructions for most of the topics have changed.

TOPICS

Click on any of the following topics to go to that chapter. Note that each chapter starts on its own page 1.

1. Overview and Key Principles

Contents

Antimicrobial resistance is a significant problem throughout the world—leading to increased morbidity, mortality, and healthcare costs. The Centers for Disease Control and Prevention (CDC) states that antibiotic resistance is one of the world's most pressing public health problems. The CDC estimates that over 2 million illnesses and 23,000 deaths in the U.S. are caused by resistant bacteria each year.[1]

The growth of resistant microbes is largely due to inappropriate antimicrobial prescribing practices. Studies have shown antibiotic use is unnecessary or inappropriate in as many as 50% of the cases in the United States. Common prescribing concerns include unnecessary antimicrobials, overuse of broad-spectrum antibiotics, ineffective agents, wrong doses, and extended durations of therapy.

To combat these circumstances, the BOP Antimicrobial Stewardship Program has been developed. This program relies upon a common centralized approach that is augmented by local institution efforts.

A. Goals of the BOP Antimicrobial Stewardship Program

1. Improve patient outcomes.
2. Decrease antimicrobial resistance.
3. Decrease unnecessary antibiotic use.
4. Decrease unintentional antimicrobial adverse effect.

[1] https://www.cdc.gov/drugresistance/about.html

B. CDC Core Elements of Antimicrobial Stewardship[2, 3]

- Leadership commitment
- Accountability
- Drug expertise
- Action
- Tracking
- Reporting
- Education

C. Key Components of Antimicrobial Stewardship

1. **EDUCATION:** Recommended topics should address the appropriate use of antibiotics (e.g., antibiotics used for bacterial infections, but not viral infections; many colds do not require antibiotics; risk of overuse, etc.). Topics can include, but are not limited to, current clinical practice guidelines, drug utilization reviews, current diagnostic methods, peer review findings, risks of antibiotic use, and drug information.

   Education is recommended for all stakeholders in the healthcare system, including:

   - Prescribers
   - Staff who administer or distribute medications
   - Patients
   - Executive Staff
   - Department Heads
   - Non-medical staff

   ➔ *See Educational Resources on page 4, Section F.*

2. **FORMULARY MANAGEMENT:** The BOP utilizes a formulary with varying degrees of restrictions. Medications are either ***unrestricted*** (e.g., amoxicillin) or ***restricted*** (e.g., clarithromycin as a second-line agent requiring physician co-sign). Additionally, some medications may be restricted to use for certain diagnoses.

   Depending upon local circumstances, the pharmacy and therapeutics (P&T) committees in some institutions may choose to place additional restrictions on BOP National Formulary medications or to remove certain items from their local formularies. Restrictions on a formulary medication may include limited duration of use, use limited to certain diagnoses, removal from the formulary based on local resistance patterns, or ***local prior approval*** (see below).

3. **LOCAL PRIOR APPROVAL:** As part of ***formulary management***, the P&T committee in some institutions may require that the use of certain formulary medications require approval from the institution's clinical director or pharmacist, or both. Local prior approval, when used, is often applied to second-line therapy and may require culture and sensitivity data.

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[2] Sanchez GV, Fleming-Dutra KE, Roberts RM, Hicks LA. Core Elements of Outpatient Antibiotic Stewardship. *MMWR Recomm Rep*. 2016;65(No. RR-6):1–12. Available at: http://dx.doi.org/10.15585/mmwr.rr6506a1.

[3] CDC. Core Elements of Hospital Antibiotic Stewardship Programs. Atlanta, GA: US Department of Health and Human Services, CDC; updated February 23, 2017. Available at: https://www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements.html.

D. Interventions to Improve Antimicrobial Prescribing

- De-escalation: Convert empiric therapy to narrow therapy (see *Streamlining* below).
- Dose optimization: Adjust dosing for renal insufficiency, hepatic insufficiency, body weight, etc.
- Converting IV to PO (see *IV to PO* below).
- Automatic Stop Orders, with mandatory reassessment in 48–72 hours: Reassess the patient once cultures/sensitivities come back; assess whether the patient is improving on the current regimen.
- Alerts for duplicate therapy.
- Distribution of antibiograms, if available.
- Analysis of antimicrobial resistance rates, if available.
- Surveillance of antimicrobial usage.
- Conducting prescribing audits, with feedback to individual prescribers.

★ ***Note:*** *When determining specific dosing of medications, providers should consider if alternate medication selection or dosing adjustment is necessary due to unrelated conditions (i.e., pregnancy, hepatic disease, renal disease, etc.).*

STREAMLINING

Streamlining refers to the practice of converting a patient from broad-spectrum to narrow-spectrum antimicrobial therapy. If a provider starts a patient on empiric treatment with broad-spectrum antimicrobials, narrowing the treatment selection is recommended to better meet the patient's specific needs once culture and sensitivity data are available. This may involve changing antibiotics, reducing the number of medications, or discontinuing treatment.

Benefits associated with streamlining include:

- Reduced secondary infections
- Decreased morbidity and mortality
- Minimized antimicrobial resistance
- Minimized toxicity and adverse effects
- Reduced healthcare expenses

IV TO PO CONVERSION

The IV to PO conversion promotes many positive clinical outcomes, including:

- Increased quality of life
- Decreased risk of the adverse events associated with IV infusions
- Decreased administration errors, due to the ease of PO administration
- Decreased risk of the secondary infections related to IV catheters
- Hastened discharge for patients in inpatient beds
- Decreased costs related to medications
- Decreased laboratory monitoring
- Decreased personnel time for preparation and administration

General Interventions

- Recommend pharmacy, lab, and quality improvement staff prepare and submit annual reports to the P&T committee that include general antibiotic usage data, antibiograms, and review of prescriber usage.
- Recommend quality improvement and health services staff should review, disseminate, and provide training on infection prevention protocols, including hand-washing, catheter, and other protocols meant to reduce the risk of infection.

E. Development of a Local Antimicrobial Stewardship Team

It is recommended that each institution develop an ***Antimicrobial Stewardship Team***. This is particularly important for all Care Level 3 and Care Level 4 institutions.

Recommended members of the team include:

- Advanced practice practitioner
- Infection prevention and control specialist
- Laboratory personnel
- Nurse
- Pharmacist
- Physician

F. Educational Resources

- ***Centers for Disease Control and Prevention (CDC), Antibiotic Prescribing and Use:*** *https://www.cdc.gov/antibiotic-use/index.html*
- ***Infectious Diseases Society of America (IDSA):*** *http://www.idsociety.org/Index.aspx*
- ***Society of Infectious Diseases Pharmacists (SIDP):*** *http://sidp.org/*
- ***The Joint Commission, Antimicrobial Stewardship:*** *https://www.jointcommission.org/topics/hai_antimicrobial_stewardship.aspx*

2. ACUTE RHINOSINUSITIS

CONTENTS

A. Key Points

- **DEFINITION OF ACUTE RHINOSINUSITIS (ARS):** ARS is defined as up to 4 weeks of purulent nasal drainage (anterior, posterior, or both) ***PLUS*** nasal obstruction and/or facial pain-pressure-fullness.
  - ★ *Nasal obstruction and/or facial pain-pressure-fullness without purulent discharge is NOT considered ARS.*
- **ETIOLOGY OF ARS:** Causes of ARS include allergens, environmental irritants, viruses, bacteria, and fungi. Most cases of ARS (≥ 98%) are viral. The prevalence of bacterial infection during ARS is estimated to be 0.5–2% and is usually self-limiting.
  - ★ *Consequently, antibiotics are NOT indicated for the majority of ARS cases.*
- **ACUTE BACTERIAL RHINOSINUSITIS (ABRS):**
  - **DIAGNOSIS:**
    1. Signs and symptoms of ARS (as defined above) are persistent and fail to improve after 10 days or more beyond the onset of upper respiratory symptoms.

       OR
    2. Signs and symptoms of ARS worsen within 10 days after initial improvement (also known as **DOUBLE WORSENING**).
  - **NATURAL HISTORY AND INITIAL MANAGEMENT:** Most cases of ABRS are self-limiting and resolve without antibiotic therapy. Although antibiotics may shorten the duration of the illness, they are also likely to cause adverse effects. Adults with diagnosed ARBS should be offered watchful waiting and symptomatic management for a 7-day observation period (after the initial 10-day period used to diagnose ARBS).
    - ★ *Antibiotics can be initiated if symptoms fail to improve after 7 days or worsen at ANY time.*
    - ★ *Patients with immunocompromised conditions should be treated on a case-by-case basis.*
  - **URGENT REFERRAL:** Urgent referral is indicated for complicated ABRS or in cases of high persistent fever (>102˚F), periorbital edema/inflammation, cranial nerve palsies, abnormal extraocular movements, proptosis, vision changes, severe headache, altered mental status, or meningeal signs.

B. Antimicrobial Therapy for ABRS

1. Initial Oral Therapy (Adults):

- Amoxicillin 500mg po tid ***or*** 875mg po bid ***OR***
- Amoxicillin-Clavulanate 500mg/125mg po tid ***or*** 875mg/125 mg po bid ***OR***
- Amoxicillin-Clavulanate* ER 2000mg/125mg po bid (high dose for higher risk of pneumococcal resistance or poor outcomes; will require non-formulary approval)

* *Clinicians may consider high dose Amoxicillin-Clavulanate over Amoxicillin if bacterial resistance is likely or if presence of moderate-to-severe infection, age ≥ 65, immunocompromised patients, antibiotics in the last month, and/or presence of comorbidities (diabetes or chronic cardiac, hepatic, or renal diseases).*

- ***Exception* – Adult patient with penicillin type 1 allergy (e.g., anaphylaxis):**
  - Doxycycline 100mg po bid ***OR***
  - Levofloxacin 750mg po daily ***OR*** Moxifloxacin 400mg po daily**

** *Reserve fluoroquinolones for patients who have NO alternative treatment options; the serious adverse effects associated with fluoroquinolones generally outweigh the benefits.*

- ***Exception* – Adult patient with penicillin type 2 allergy (e.g., skin rash):**
  Third generation cephalosporin:
  - Cefdinir 300mg po bid ***or*** 600mg po q24h ***OR***
  - Cefpodoxime 200mg po q12h + Clindamycin 300mg q6h ***OR***
  - Cefixime 500mg po q12h + Clindamycin 300mg q6h

2. Duration:

Initial therapy should continue for a total of 5–7 days. If failure occurs after initial therapy and ABRS is re-evaluated and confirmed, a total course of 7–10 days is recommended.

3. Failure of Initial Oral Therapy:

Patients who have worsening symptoms or fail to improve within 3–5 days on initial antibiotic therapy should have the diagnosis of ABRS re-evaluated. If ABRS is confirmed, broaden coverage and/or switch to a different drug class, listed below.

- Amoxicillin-Clavulanate ER 2000mg/125mg po bid ***OR***
- Doxycycline 100mg po bid for patients who are beta-lactam allergic ***OR***
- Cefdinir (300mg po bid ***or*** 600mg po q24h) plus Clindamycin 300 mg q6h ***OR***
- Levofloxacin 750mg po daily ***OR*** Moxifloxacin 400mg po daily**

** *Reserve fluoroquinolones for patients who have no alternative treatment options; the serious adverse effects associated with fluoroquinolones generally outweigh the benefits.*

4. Relapse After Oral Therapy:

A recurrence within 2 weeks of successfully completing an antibiotic course is considered a **relapse**.

- Mild symptoms: Treat with the same antibiotic for longer duration.
- Moderate to severe symptoms: Resistance is likely; consider an alternative drug class.

5. Multiple Failures of Oral Antibiotics:

- If the patient fails a second course of appropriate antibiotic therapy, consider referral to a specialist.

C. References

- Patel ZM, Hwang PH. Uncomplicated acute sinusitis and rhinosinusitis in adults: treatment. In: UpToDate. File T, Deschler DG, Bond S (Eds), UpToDate, Waltham, MA. (Accessed on February 6, 2019.)
- Rosenfeld RM, Piccirillo JF, Chandrasekhar SS, et al. Clinical practice guideline (update): adult sinusitis. *Otolaryngol Head Neck Surg*. 2015; 152:S1. Available at: *https://journals.sagepub.com/doi/full/10.1177/0194599815572097*

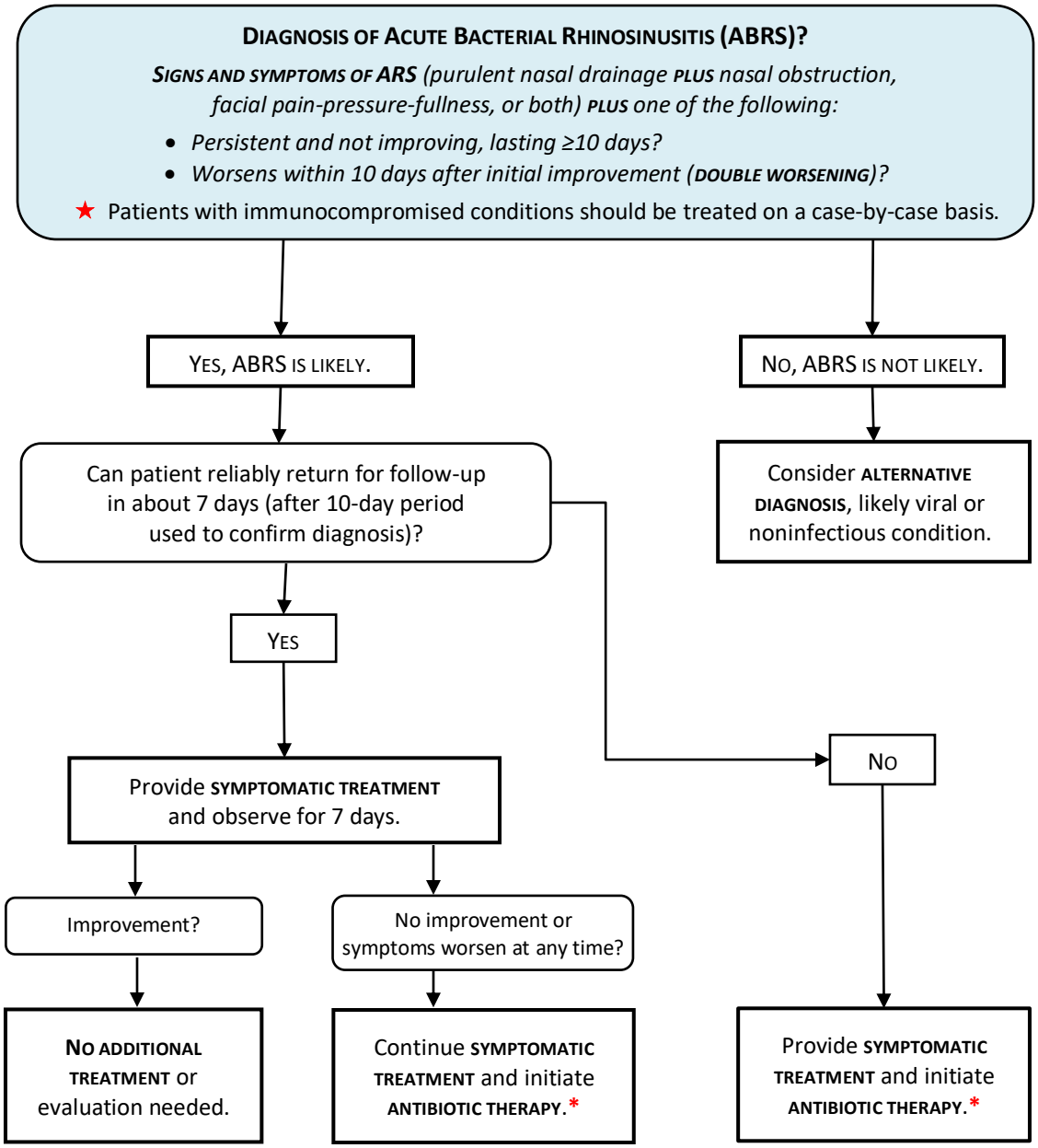
D. About the Algorithms

The following algorithms for decision-making in treating ARS and ABRS appear on the next two pages:

- ARS/ABRS Differential Diagnosis & Treatment Approach
- Treating ABRS with Antibiotics

Both algorithms are adapted from the sources listed in the ***References*** section above.

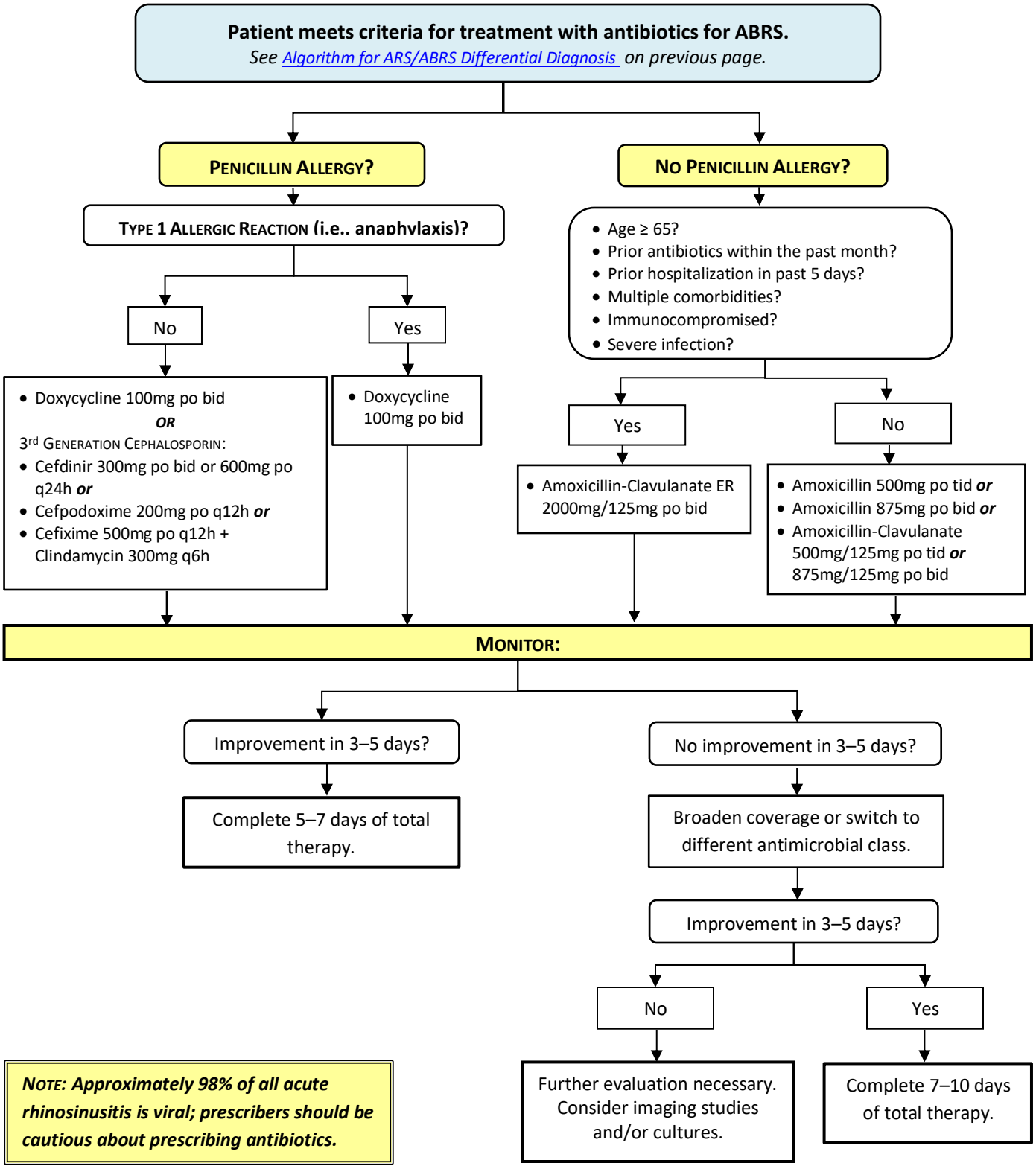
E. Algorithm: ARS/ABRS Differential Diagnosis & Treatment Approach



* *See Algorithm for Treating ABRS with Antibiotics on next page.*

ADAPTED FROM: *Rosenfeld, et al., and Patel & Hwang. See previous References section.*

F. Algorithm: Treating ABRS with Antibiotics



ADAPTED FROM: Rosenfeld, et al., and Patel & Hwang. See previous References section.

3. PHARYNGITIS

CONTENTS

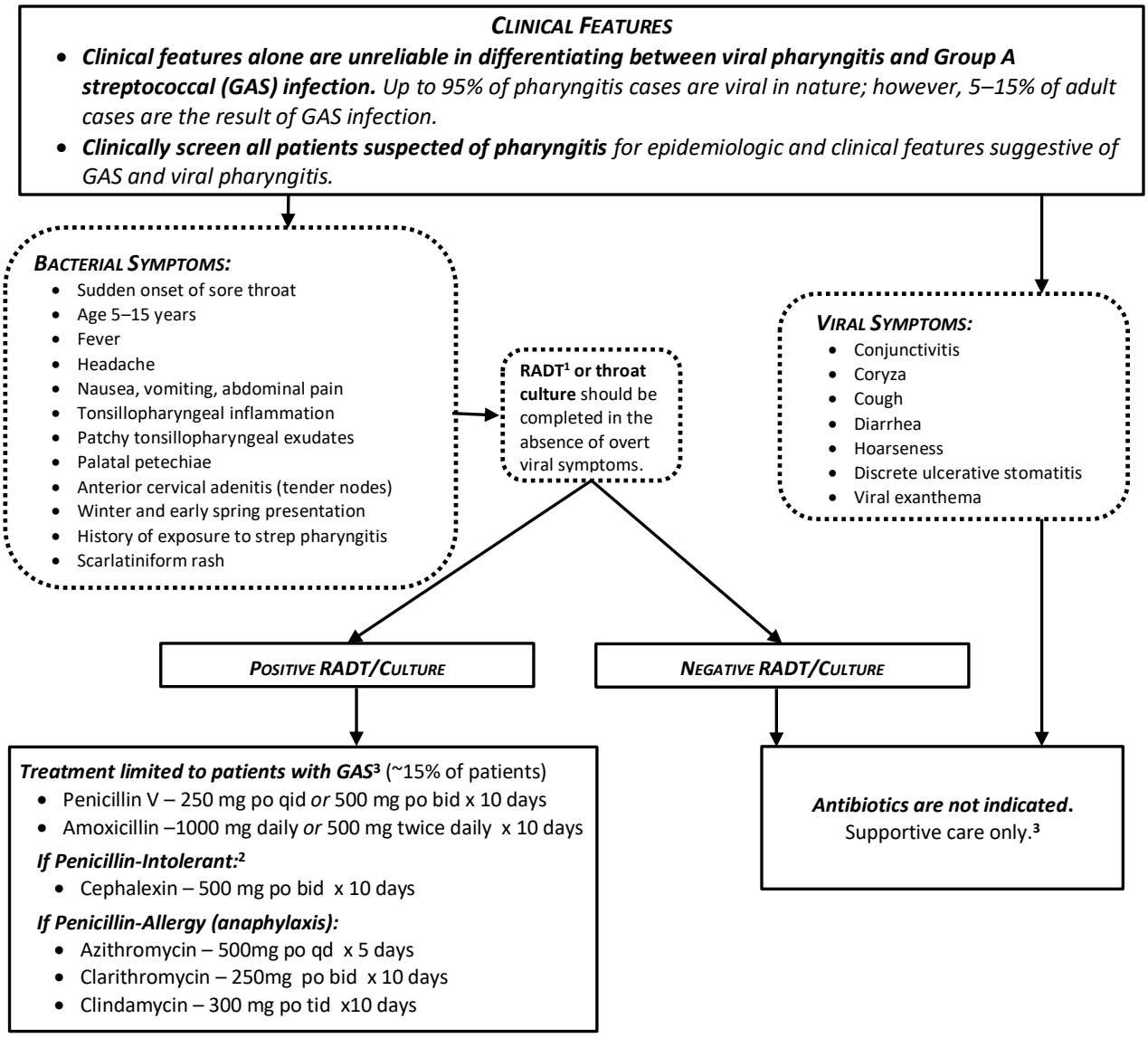
A. Key Points

- **TREATMENT:**
  - The large majority of adults with acute pharyngitis have a self-limiting illness that should be treated with supportive care only.
  - The benefits of antibiotic treatment of adult pharyngitis are limited to patients with group A streptococcal (GAS) infection. GAS is the etiologic agent in approximately 5–15% of adult cases of pharyngitis.
- **DIAGNOSIS:**
  - Clinical features alone are unreliable in differentiating between GAS and viral pharyngitis, except where overt viral features are present (e.g., rhinorrhea, cough, oral ulcers, and/or hoarseness).
  - Because the signs and symptoms of streptococcal and non-streptococcal (usually viral) pharyngitis overlap, diagnosis should be accomplished through laboratory testing with either a throat culture or a rapid antigen detection test (RADT).
  - Throat cultures are *not* recommended for confirming negative RADT results in adults. Throat cultures may be indicated when investigating outbreaks of GAS infection, as a means of monitoring the development and spread of antibiotic resistance, or when pathogens such as gonococcus are being considered.

B. References:

- CDC. *Get Smart: Know When Antibiotics Wor*k. *Acute Pharyngitis in Adults: Physician Information Sheet*. Available at: *https://www.cdc.gov/getsmart/community/materials-references/print-materials/hcp/adult-acute-pharyngitis.html*
- Shulman ST, Bisno AL, Clegg HW, et al. Clinical practice guideline for the diagnosis and management of group A streptococcal pharyngitis: 2012 update by the Infectious Diseases Society of America. *Clin Infect Dis.* 2012;55(10):e86–e102. Available at: *http://cid.oxfordjournals.org/content/55/10/e86.full.pdf+html*

C. Algorithm: Treatment of Pharyngitis



NOTES:

[1] RADT tests should only be performed under structured waived testing programs, and each site must have their own CLIA waiver and ensure that the test being utilized is a CLIA-waived variety. Throat cultures are not recommended for confirming negative RADT results in adults. Throat cultures may be indicated when investigating outbreaks of GAS infection, as a means of monitoring the development and spread of antibiotic resistance, or when pathogens such as gonococcus are being considered.

[2] Cephalexin or cefadroxil are preferred agents for penicillin-intolerant patients; however, they are to be avoided in individuals with immediate type hypersensitivity to penicillin.

→ *Consider pill line for patients with compliance concerns.*

[3] All patients with pharyngitis should be offered, or be referred to the commissary for, appropriate doses of analgesics, antipyretics, and other supportive care, in accordance with the BOP National Formulary Part I, Over the Counter Prescribing Criteria Matrix.

Adapted from: Shulman ST, et al. See *References* on previous page.

4. ACUTE BRONCHITIS

CONTENTS

A. Key Points

- Acute bronchitis, also known as a "chest cold," occurs when the airways in the lungs swell and produce mucus, causing a person to cough.
- Exposure to secondhand smoke, chemicals, dust, or air pollution can increase the risk for acute bronchitis. A weakened immune system or contact with another person with bronchitis can also increase the risk.
- Most causes (>90%) of acute bronchitis are viral in nature, and include respiratory syncytial virus, adenovirus, influenza, and parainfluenza.
- Signs and symptoms of acute bronchitis include coughing, fatigue, mild headache, mild body aches, fever, watery eyes, and sore throat. Most symptoms last for up to 2 weeks, but coughing can last up to 8 weeks.

  ★ *The presence of purulent sputum is NOT predictive of bacterial infection.*
- Diagnosis should include ruling out pneumonia. In healthy, non-elderly adult patients, pneumonia is uncommon in the absence of vital sign abnormalities or with findings of consolidation on lung auscultation.

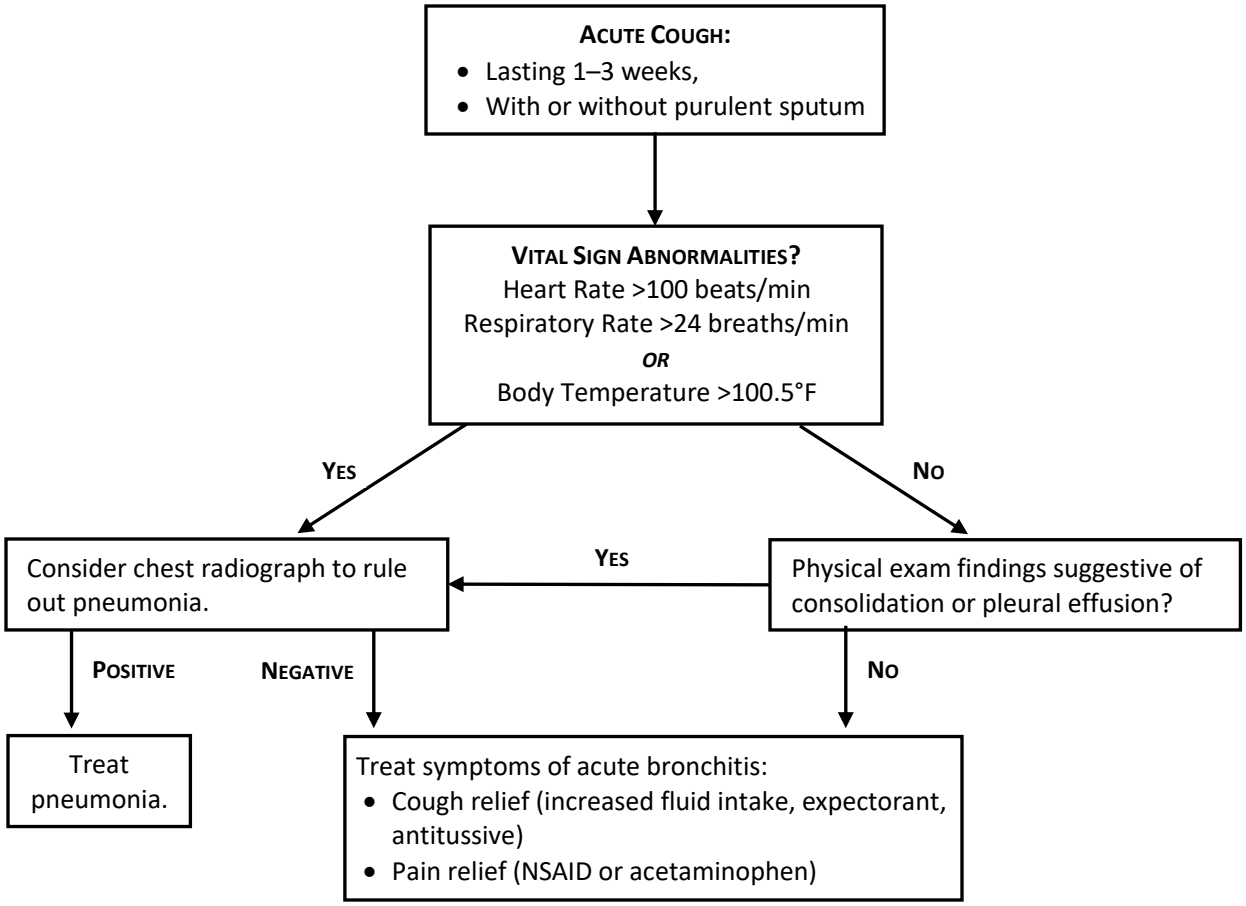
B. Communicating with the Patient: Tips to Reduce Antibiotic Use

- Refer to acute cough illness as a "chest cold" to reduce the patient's expectation for antibiotics.
- Tell patients that antibiotic use increases the risk of an antibiotic-resistant infection.
- Identify and validate the patient's concerns and recommend specific therapy to address symptoms.
- Spend time answering questions and offer a contingency plan if symptoms worsen.
- REMEMBER: Effective communication is more important than an antibiotic for patient satisfaction.

C. References

- CDC. *Acute Cough Illness (Acute Bronchitis)*. Available at: https://www.cdc.gov/getsmart/community/materials-references/print-materials/hcp/adult-acute-cough-illness.pdf
- CDC. *Bronchitis (Chest Cold)*. Available at: https://www.cdc.gov/antibiotic-use/community/for-patients/common-illnesses/bronchitis.html

D. Algorithm: Treatment of Acute Bronchitis



5. PNEUMONIA

CONTENTS

A. Key Points

- Pneumonia is divided into three types:
  - **COMMUNITY-ACQUIRED PNEUMONIA (CAP)** – An incidence of pneumonia demonstrated by select clinical signs and symptoms that occurs in the community or institutional setting.
  - **HOSPITAL-ACQUIRED PNEUMONIA (HAP)** – Refers to pneumonia that occurs at least 48 hours or more after admission, but was not incubating at the time of admission.
  - **VENTILATOR-ASSOCIATED PNEUMONIA (VAP)** – Refers to pneumonia that arises more than 48–72 hours after endotracheal intubation.

  ➔ ***This guidance focuses on the pathogens, diagnostic criteria, and treatment guidelines for CAP.***

- **DIAGNOSIS:** Pneumonia is diagnosed according to suggestive clinical features (cough, fever, sputum production, pleuritic chest pain, leukocytosis), in addition to a demonstrable infiltrate by chest radiograph (or other imaging technique). Additional diagnostic tests may include the following, which are more routinely used in the presence of *severe* CAP, HAP, and VAP:
  - Pulse oximetry
  - Blood cultures
  - Sputum cultures/gram stain

  ★ ***Prior to diagnosing pneumonia, providers should consider the possibility of tuberculosis and evaluate accordingly.***

- **SITE OF CARE RECOMMENDATION:** The ***CURB-65*** score is a severity-of-illness score that may be used to help determine whether a patient with CAP is a good candidate for outpatient treatment at the facility or whether the patient should be transferred to a higher level of care. Providers should always supplement this objective score with physical exam findings, any additional patient factors, and sound clinical judgment. A CURB-65 score ≥2 would suggest that the patient receive more intensive treatment (i.e., hospitalization).

  CURB-65:

  Confusion (oriented x3)
  Uremia (BUN >20mg/dL)
  Respiratory Rate > 30
  Blood Pressure (SBP <90 or DBP <60)
  65 years or older

B. Most Common Etiologies of CAP

LOCATION OF CARE*	ETIOLOGY							
	Chlamydophila pneumoniae	*Mycoplasma pneumoniae*	Respiratory viruses	*Haemophilus influenzae*	*Streptococcus pneumoniae*	*Legionella* species	Gram-negative bacilli	*Staphylococcus aureus*
Outpatient	X	X	X	X	X			
Inpatient (non-ICU)	X	X	X	X	X	X		
Inpatient (ICU)				X	X	X	X	X
* *LOCATION OF CARE is based on severity of disease.*								

C. Culture and Sensitivity (C&S) Notes

- Microbiological studies of blood and sputum cultures support the diagnosis of CAP, but are generally not required before initiating empiric treatment.
- At times, clinicians may suspect specific pathogens based on clinical and epidemiologic clues. If this is the case, providers are encouraged to further study these possibilities, as specific pathogens could significantly alter standard treatment decisions.
- Medical Centers are encouraged to create antibiograms to help guide prescribing.

D. Antibiotic Resistance

Resistance to commonly prescribed antibiotics for CAP is a major consideration in choosing empiric antibiotic treatment. Patient assessment for possible infection by multidrug resistant (MDR) pathogens is recommended to determine if alternate treatment should be considered.

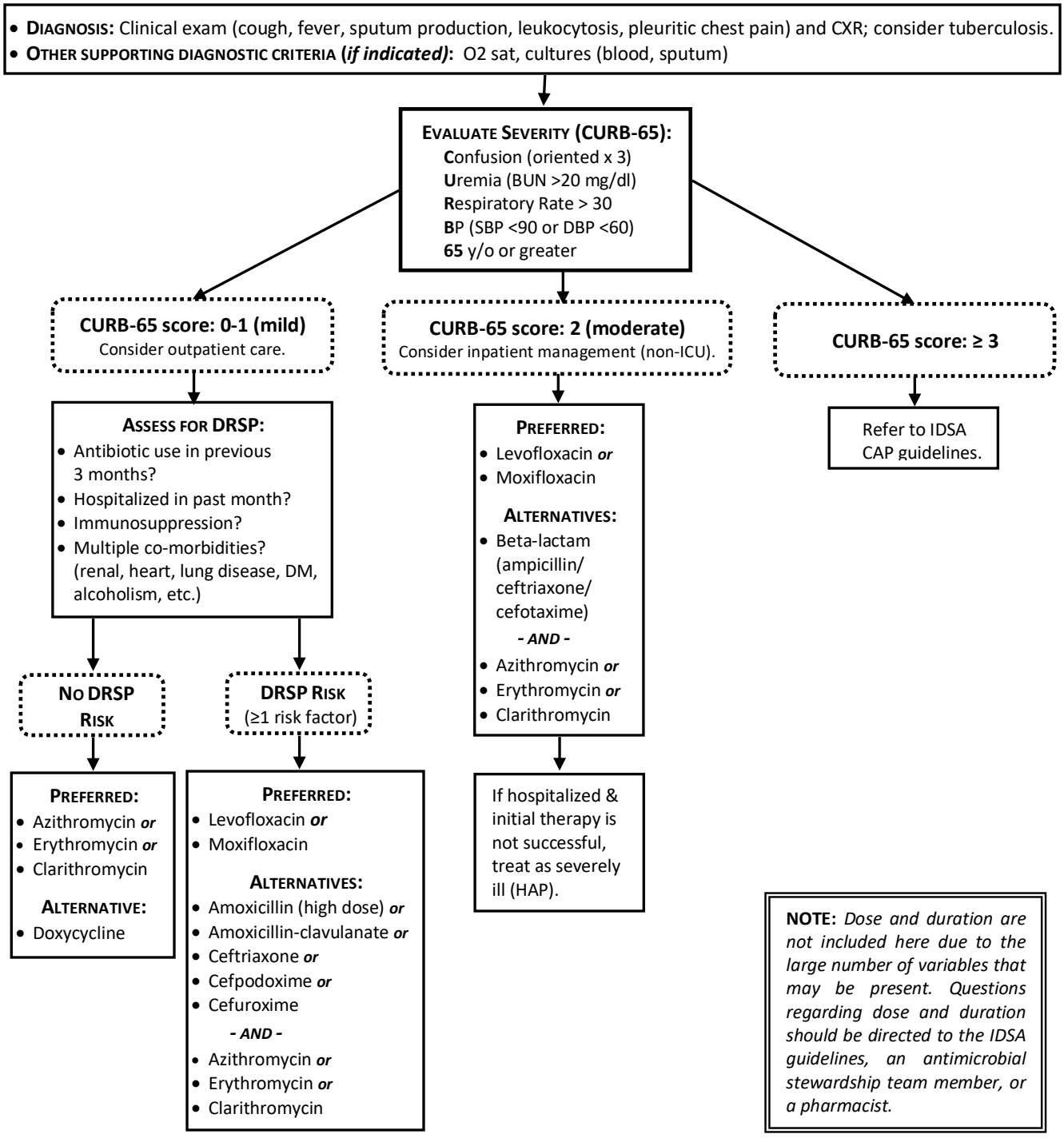
Drug-resistant *Streptococcus pneumoniae* (DRSP) and **community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA)** are two emerging pathogens that require special consideration.

- ***Risk factors for DRSP include:***
  - Antibiotic use in the previous 3 months
  - Hospitalized in the past month
  - Immunosuppression (conditions or use of immunosuppressing drugs)
  - Presence of co-morbidities (e.g., chronic renal disease, liver disease, heart disease, lung disease, diabetes mellitus, alcoholism, malignancies, asplenia)
- ***Risk factors for CA-MRSA include:***
  - End-stage renal disease
  - IV drug use
  - Prior influenza
  - Prior antibiotics

E. References

- Kalil AC, Metersky ML, Klompas M, et al. Management of adults with hospital-acquired and ventilator-associated pneumonia: 2016 Clinical Practice Guidelines by the Infectious Diseases Society of America (IDSA) and the American Thoracic Society (ATS). *Clin Infect Dis.* 2016;63:1-51. Available at: *http://cid.oxfordjournals.org/content/early/2016/07/06/cid.ciw353.full.pdf+html*
- Mandell LA, Wunderink RG, Anzueto A, et al. IDSA/ATS consensus guidelines on the management of community-acquired pneumonia in adults. *Clin Infect Dis.* 2007;44(suppl 2): S27-S72. Available at: *http://cid.oxfordjournals.org/content/44/Supplement_2/S27.full.pdf+html*

F. Algorithm: Treatment of CAP



Adapted from: *Mandell LA, et* al. See *References* on previous page.

6. OTITIS MEDIA

CONTENTS

A. Bacterial Etiologies

- Streptococcus pneumoniae (49%)
- Haemophilus influenzae (29%)
- Moraxella catarrhalis (28%)

B. Key Points

- **ACUTE OTITIS MEDIA (AOM)** occurs primarily in childhood. Diagnosis and treatment is therefore largely extrapolated from studies in children,
- Seasonal allergic rhinitis and/or upper respiratory infections are the most important pathological factors in the development of AOM
- Clindamycin is not active against *H. influenzae* or *M. catarrhalis,* two common bacterial contributors of otitis media.
- Due to the prevalence of drug-resistant *Strep. pneumoniae*, trimethoprim/sulfamethoxazole and macrolides are no longer recommended.
  - Up to 50% of *Strep. Pneumoniae* is resistant to macrolides.
  - *Strep. Pneumoniae* that is resistant to macrolides is also typically resistant to clindamycin.

C. Diagnosis

- AOM is usually marked by the presence of middle ear fluid and inflammation of the mucosa that lines the middle ear space.
- AOM is often caused by obstruction of the eustachian tube, resulting in fluid retention and suppuration of retained secretions.
- A triad of bulging tympanic membrane, impaired tympanic membrane mobility, and redness and/or opacification of tympanic membrane predicted the diagnosis of AOM in 83–99% of cases. If these three are not present, the provider should consider other possible diagnoses.
- Purulent otorrhea may be present with tympanic membrane rupture.
- AOM is usually unilateral, and hallmark symptoms include otalgia and decreased hearing.

(list continues on next page)

- Other clinical manifestations include conductive hearing loss, fever, pain behind the ear, and facial paralysis.
- Otitis media with effusion (OEM), also known as serous otitis media, usually follows AOM. It is defined by the presence of middle ear fluid without signs of illness or inflammation of the middle ear mucosa.
  ★ *OEM usually resolves spontaneously and does not require antibiotic treatment.*

D. Empiric Antibiotic Therapy

- ***Amoxicillin remains the drug of choice:***
  - Mild to moderate disease: 500 mg every 12 hours.
  - Severe disease: 500 mg every 8 hours.
  - Doses up to 2 grams every 8 hours have been used and are indicated in areas where the local antibiogram indicates strains of *S. pneumoniae* that are not fully susceptible to penicillin.
  - If severe penicillin allergy (i.e., anaphylaxis), a macrolide (azithromycin or clarithromicin) is preferred.
- ***Duration of treatment:***
  - Mild to moderate disease: 5–7 days.
  - Severe disease: 10 days.
  - Improvement should be seen within 48 to 72 hours. If there is no improvement, the patient should be reexamined and treated as below.

E. Antibiotic Therapy for Treatment Failure

- Treatment failure after 3 days of therapy indicates concern for drug-resistant *S. pneumoniae*.
- An agent with broader coverage than the initial therapy is recommended:
  - Amoxicillin-clavulanate 2000 mg/125 mg bid.
  - For patients with severe penicillin allergies, please contact a member of the Antimicrobial Stewardship Workgroup for alternative antibiotic recommendations.
- Duration of treatment after treatment failure is 10 days.
- Although levofloxacin and ceftriaxone may be viable therapy options, they should be reserved for ONLY those patients with absolute contraindications to amoxicillin-clavulanate.

F. References

- Limb CJ, Lustig LR, Klein JO. Acute otitis media in adults (suppurative and serous). In: *UpToDate*, Deschler DG, ed., Up to Date, Waltham, Massachusetts. (Accessed on September 30 and December 9, 2016.) Available at: http://www.uptodate.com/contents/acute-otitis-media-in-adults-suppurative-and-serous
- Sanford Guide Web Edition. Otitis media: acute, empiric therapy. Retrieved from: http://webedition.sanfordguide.com/sanford-guide-online/disease-clinical-condition/otitis-media (Accessed on September 30, 2016.)

7. PURULENT SKIN AND SOFT TISSUE INFECTIONS (SSTIS), INCLUDING MRSA

CONTENTS

A. Key Points

Purulent SSTIs include cutaneous abscesses, furuncles, carbuncles, folliculitis, and methicillin-resistant Staphylococcus aureus (MRSA).

- **CUTANEOUS ABSCESSES** are collections of pus within the dermis and deeper skin tissues that are typically painful, tender, and fluctuant red nodules surrounded by inflamed tissue.
  - **FURUNCLES** (also known as **BOILS**) are infections of the hair follicle and adjacent tissue, forming a hard central core and pus that extends through the dermis into the subcutaneous tissue.
  - **CARBUNCLES** are similar to furuncles, but involve several adjacent follicles that drain pus.
  - **FOLLICULITIS** is inflammation of the hair follicle that appears clinically as an eruption of *pustules* and/or *papules* centered upon hair follicles.

> **NOTE:** *The term "cellulitis" is NOT appropriate for cutaneous inflammation associated with collections of pus such as in septic bursitis, furuncles, or skin abscesses.* ***In such cases of purulent infection, the appropriate terminology is "with surrounding inflammation," and NOT "with surrounding cellulitis." This distinction is critical.*** *The treatment of purulent infections is with incision and drainage (I&D), whereas the treatment of cellulitis is with antibiotics. (See Chapter 8 for more about cellulitis and other non-purulent SSTIs.)*

- **COLONIZATION** is the presence of bacteria on or in the body without causing infection.
- **INCISION AND DRAINAGE (I&D)** is the recommended treatment for both non-MRSA and MRSA-suspected abscesses, carbuncles, and large furuncles that are not accompanied by systemic signs of infection.
  - The addition of systemic antibiotics to I&D does NOT improve cure rates in these cases.
  - Smaller furuncles often rupture and drain spontaneously or after treatment with moist heat (**WARM SOAKS AND COMPRESSES**).

- Systemic antibiotics are warranted in the presence of **SYSTEMIC INFLAMMATORY RESPONSE SYNDROME (SIRS)**, indicated by temperature >38°C or <36°C, tachypnea >24 breaths per minute, tachycardia >90 beats per minute, or white blood cell count >12,000 or <400 cells/µL.
- **ORAL ANTIBIOTIC THERAPY** can be provided to patients with SSTIs that do not involve either significant cellulitic changes or signs/symptoms of systemic infection.
- **IV ANTIBIOTIC THERAPY** is needed for systemic infections, significant cellulitis, endocarditis and other endovascular infections, osteomyelitis, necrotizing fasciitis, pneumonia.
- **THE CAUSE FOR RECURRENT ABSCESSES** at a particular site should be determined, including the possibility of a pilonidal cyst, hidradenitis suppurativa, or foreign material.
- **PATIENT EDUCATION** is crucial for effective treatment and the prevention of transmission of SSTIs. Inmate factsheets, *General Instructions for Skin Infections* and *Information on MRSA*, are available in Sections G and H of this chapter.

B. Culture and Sensitivity (C&S)

- C&S results are used to direct and streamline therapy.
- Consider for moderate to severe infections, and those requiring IV therapy.
- Culturing of areas that are normally colonized is of little value. Culturing of wounds can often include normal skin flora. Samples should be taken from areas that are not normally colonized (e.g., wounds) by a clinician experienced in obtaining sterile cultures.
- Culture diagnosis should be obtained whenever clinically warranted, including:
  - For patients with recurrent SSTIs.
  - For an SSTI that is not resolving with current treatment.
  - As part of periodic surveillance to determine the predominant circulating pathogens in a given facility.
- Cultures from abscesses and other purulent SSTIs are recommended in the following cases:
  - If the provider believes antibiotic therapy is indicated for the patient.
  - For patients with severe local infection or signs of systemic illness.
  - For patients who have not responded adequately to initial treatment.
  - If there is concern for a cluster or outbreak.
- Positive diagnostic cultures include cultures from blood, sterile body fluids (e.g., joint fluid, pleural fluid, cerebrospinal fluid), expressed pus that avoids skin contamination, and aspirated abscess fluid.

C. Empiric Treatment

➔ *See Treatment Algorithm in Section E.*

Conservative and Mechanical Treatment Measures

- The primary treatment of choice for cutaneous abscesses is I&D and/or warm compresses.
  - ➔ *See Section F for I&D Procedure and see the Treatment Algorithm* for information on using warm soaks and compresses.
- While smaller furuncles often rupture and drain spontaneously—or after treatment with moist heat—I&D is the recommended treatment for both non-MRSA and MRSA-suspected abscesses, carbuncles, and large furuncles that are not accompanied by systemic signs of infection.
  - An indication of the presence of pus in a bacterial skin infection is fluctuance: As the skin becomes infected, redness and induration (hardness) develop. If the pus does not drain, touching this area produces a soft, boggy feel known as fluctuance. In general, fluctuant lesions need to be incised and drained.
  - The addition of systemic antibiotics to I&D does not improve cure rates in these cases.
  - Once the abscess is drained, frequently reassess to determine whether repeated I&D is warranted.

Antibiotic Therapy

★ *The decision to initiate antibiotic treatment should be based on culture and sensitivity results when possible. The use of antibiotics for the suspected presence of MRSA should be reserved for the following:*

- Severe or extensive disease (e.g., involving multiple sites of infection) or rapid progression in the presence of associated cellulitis.
- Signs and symptoms of systemic illness.
- Associated comorbidities or immunosuppression (diabetes mellitus, HIV/AIDS, neoplasm).
- Extremes of age.
- Abscess in an area difficult to drain completely (e.g., face, hand, genitalia).
- Associated septic phlebitis.
- Lack of response to I&D alone.

Decolonization of MRSA Infections

Decolonization is the use of antimicrobial or antiseptic agents to suppress or eliminate *S. aureus* to aid in preventing recurrent auto-infection or transmission to others.

- Decolonization is NOT routinely recommended.
- The efficacy of decolonization has NOT been well-established.

- ***Two circumstances in which decolonization can be considered are described in the table below:***

Circumstances of MRSA Infection	Decolonization Procedure*
• **INMATES WITH RECURRENT MRSA INFECTIONS** (e.g., three or more infections in less than six months) • **OUTBREAK SITUATIONS** in which ongoing MRSA transmission is occurring among a well-defined cohort with close contact. ➔ *Requires consultation with Central Office infection control.*	**FOR 5–10 DAYS:** • **DAILY:** Decontamination of personal items such as towels, sheets, and clothes; **PLUS…** • **DAILY:** Chlorhexidine washes; **PLUS…** • **TWICE DAILY:** 2% mupirocin ointment generously applied throughout the inside of both nostrils with a cotton swab. ➔ *Due to security concerns related to chlorhexidine formulations, the judicious use of chlorhexidine for decolonization is recommended on a case-by-case basis. Chlorhexidine formulations should NOT be dispensed directly to the inmate as a self-carry.*
* *Surveillance cultures following decolonization are NOT recommended in the absence of active infection.*	

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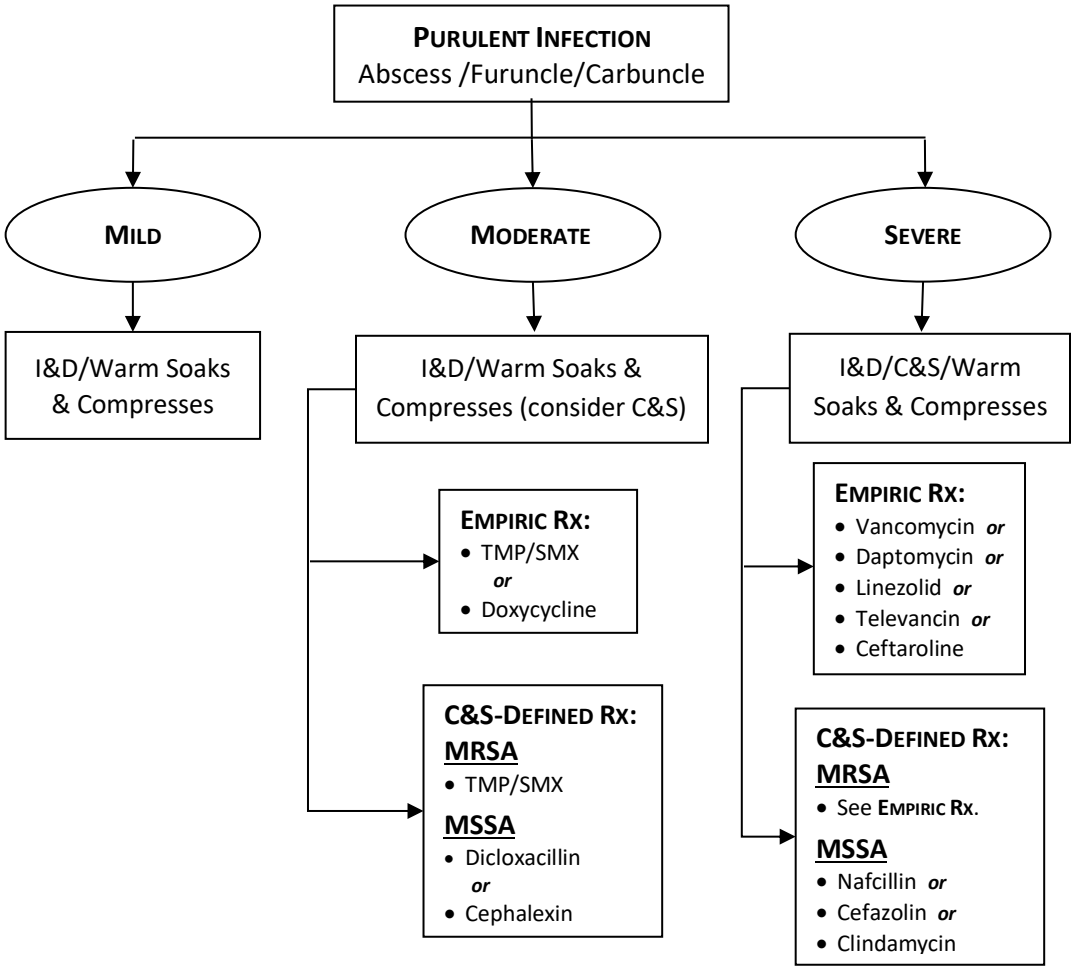
E. Algorithm: Treatment of Purulent SSTIs



DEFINITIONS:

MILD: No signs of systemic infection.

MODERATE: Systemic signs of infection.

SEVERE: Patients who have failed I&D plus oral antibiotics ***OR*** patients with systemic signs of infection plus hypotension (*see SIRS in Section A*).

I&D: Incision and drainage (*see Section F for I&D Procedure*).

C&S: Culture and sensitivity (*see Section B for information on C&S*).

MRSA: Methicillin-resistant *Staphylococcus aureus*

MSSA: Methicillin-sensitive *Staphylococcus aureus*

TMP/SMX: Trimethoprim/sulfamethoxazole

WARM SOAKS AND COMPRESSES:

- Soak the infected area in warm water for 20 minutes, 2–3 times a day or apply a heating pad or a warm, moist clean washcloth to the area for 20 minutes, 2–3 times a day.
- Decisions about how to safely implement warm soaks and/or compresses in the correctional setting must be made on a case-by-case basis, in consultation with the infection control officer.

ADAPTED FROM: *Figure 1* in http://cid.oxfordjournals.org/content/early/2014/06/14/cid.ciu296.full.pdf+html

NOTE: *Providers should consult with a pharmacist for assistance with medication selection, specific dosing recommendations, and medication monitoring.*

F. Incision and Drainage (I&D) Procedure

Abscesses are localized infections of tissue marked by a collection of pus surrounded by inflamed tissue. Abscesses may be found in any area of the body, but most abscesses presenting for urgent attention are found on the extremities, buttocks, breast, perianal area, axilla, groin, or hair follicles (furuncles and carbuncles). Abscesses begin when the normal skin barrier is breached, and microorganisms colonize the underlying tissues. Causative organisms commonly include *Streptococcus sp.*, *Staphylococcus sp.*, enteric bacteria (perianal abscesses), or a combination of anaerobic and gram-negative organisms.

Abscesses resolve by drainage:

- Smaller abscesses may resolve with conservative measures (see description of *warm soaks* above in the Algorithm) to promote spontaneous drainage.
- Larger abscesses will require incision to drain them (I&D), since the increased inflammation, pus collection, and walling-off of the abscess cavity diminish the effectiveness of antibiotic treatment. Healing following an I&D should progress from the inside of the abscess outward to the incision site. This will require a gauze packing to promote healing from the inside outward.

INDICATION FOR I&D

Abscess within the skin that is palpable.

CONTRAINDICATIONS FOR I&D

- Extremely large abscesses that require extensive incision, debridement, or irrigation—best done in operating room.
- Deep abscesses in very sensitive areas (labial, supralevator, ischiorectal, perirectal)—require a general anesthetic to obtain proper exposure.
- Abscess in the hands or feet.
- Abscesses in the triangle formed by the bridge of the nose and the corners of the mouth—should generally be treated with warm compresses and aggressive antibiotic therapy.
- Abscesses located near major vessels—must be differentiated from aneurysms before I&D is performed, to avoid fatal hemorrhage. The distinction is made through aspiration with a large bore needle.

MATERIALS

- Sterile gloves
- Mask/eye protection, if abscess appears to be under pressure enough to cause expulsion of contents with the incision
- Local anesthesia: 1% or 2% lidocaine with epinephrine; 10 cc syringe and 23-gauge needle for infiltration. *(Note: Epinephrine is contraindicated in areas such as the fingers, nose, toes, and penis).* Alternatively, diphenhydramine (Benadryl) 10 to 25 mg can be used for anesthesia. Dilute a 50 mg (1 cc) vial in a syringe with 4 cc of normal saline.
- Alcohol or povidone-iodine wipes

(list of I&D materials continued on next page)

- #11 scalpel blade with handle
- Draping
- Hemostat or sterile cotton-tipped applicator
- Packing (plain or iodoform, ½" or ¼" packing)
- Scissors
- Gauze and tape
- Culture swab (aerobic and anaerobic)

PRE-PROCEDURE EDUCATION

- Obtain informed consent. Inform the patient of potential severe complications and their treatment.
- Explain the steps of the procedure, including the pain associated with anesthetic infiltration.

I&D PROCEDURE

1. Use Standard Precautions.
2. Cleanse site over abscess with skin preparation of choice.
3. Drape to create a sterile field.
4. Infiltrate local anesthetic, allowing 2–3 minutes for anesthetic to take effect.
5. Incise over abscess with the #11 blade, cutting through the skin into the abscess cavity. Follow skin fold lines whenever possible while making the incision. The incision should be sufficiently wide to allow the abscess to drain and to prevent premature closure of the incision.

   For smaller abscesses requiring incisions, a "stab" or "cruciate" incision should be adequate. Some refer to this as a puncture or stab technique since the operator inserts the tip of the scalpel directly into the center of the abscessed tissue without making a linear incision.
6. Allow the pus to drain, using the gauzes to soak up drainage and blood. If a culture is being obtained, use the culture swab to take culture of abscess contents, swabbing inside the abscess cavity—NOT from the superficial skin over the abscess.
7. Use the hemostat or sterile cotton-tipped applicator to gently explore the abscess cavity to break up any locations within the abscess.
8. Loosely pack the abscess cavity with the packing.
9. Place gauze dressing over the wound, and tape in place (without placing tape over the incision site).
10. Remove gloves and wash hands. Properly dispose of contaminated articles and assure appropriate cleaning of the area.
11. Schedule a call-out within 24–48 hours post-op. Depending upon the location and size of the abscess, arrange for the packing material to be changed daily or several times per day.
12. Pain from the site may require acetaminophen or nonsteroidal anti-inflammatory drugs; narcotics are rarely needed. With a tense abscess, the pain relief associated with the I&D itself may be sufficient so that no pain medication is required.

(I&D procedure information continued on next page)

Post-Procedure Patient Education

➔ *An Inmate Fact Sheet—General Instructions for Skin Infections is available in Section G.*

Symptoms: Patients should be instructed to watch for the following, and be advised to seek medical attention if they experience such symptoms:

- Re-collection of pus in the abscess
- Fever and chills
- Increased pain and redness
- Red streaks near the abscess
- Increased swelling

Self-care: While some inmates will need to return to the clinic to have their dressings changed, others can be taught to do this for themselves. In addition to showing these patients how to change the packing and replace the dressings, they should be educated on:

- Disposal of dressing material
- Hand-washing technique
- Cleansing the area after the dressing is complete

I&D Complications

Prevention and management of complications associated with I&D are outlined below.

Complication	Prevention/Cause	Management
Insufficient anesthesia	Keep in mind that the tissue around an abscess is acidotic, and that local anesthetic loses effectiveness in acidotic tissues.	• Do a field block. • Use sufficient quantity of anesthetic. • Allow time for anesthetic effect.
No drainage	Localize site of incision by palpation.	Extend incision deeper or wider as needed.
Drainage is sebaceous material	Abscess was an inflamed sebaceous cyst.	• Express all material. • Break up sac with hemostat. • Pack open, as with an abscess.

- Following I&D of any abscess, the site should be observed for signs of re-collection of pus or cellulitis.
- Complications of an inadequately treated abscess include bacteremia and septicemia.
- In persons who are immunocompromised, particularly diabetics, an abscess on an extremity can be complicated by severe cellulitis or gangrene, with potential loss of the affected extremity.
- An I&D of a perianal abscess frequently results in a chronic anal fistula that requires fistulectomy by a surgeon.
- Deep palmar abscesses are a surgical emergency.

Documentation of I&D on the Medical Record

- Informed consent (signed).
- Procedure used, prep, anesthetic (type and quantity), success of drainage, culture if collected.
- Any complications (or "none").
- Who was notified of any complication (APP, attending MD).
- Follow-up arrangements for scheduled call-out and dressing changes.

G. Inmate Fact Sheet—General Instructions for Skin Infections

Handwashing and General Hygiene

- Regularly wash your hands with soap and water for at least 15 seconds, *especially*:
  - Before and after using the toilet
  - Before and after touching your wound
  - Before eating
- Shower frequently and put on clean clothes. Change your clothing whenever they become soiled with wound drainage.
- Change bed linens and towels regularly and whenever they become soiled with wound drainage.
- Do *not* share personal items such as razors, towels, wash cloths, bars of soap, etc.
- If you have an open wound, it should be covered at *all* times with a bandage.
- Do not allow other inmates to touch your wound.
- If your bandage comes off, dispose of it carefully in a leak-proof container as instructed by health services staff. Then, wash your hands. Inform a correctional worker that you need a new bandage.
- You cannot work in Food Service if you have a draining wound on your hands, or if you have wounds located elsewhere and wound drainage is not contained by a bandage.

Warm Soaks and Compresses

You may be instructed to soak your skin infection regularly in warm salt water, or apply moist compresses for 20 minutes at a time. Carefully follow the instructions you receive. If your wound begins to drain, report it to the health center.

Antibiotics

Take all medications prescribed by your doctor—exactly as you are told.

Report *any* of the following to the health center:

- Fever
- Red streaks up from the wound
- Increased foul smell from wound drainage
- Increased wound drainage

H. Inmate Fact Sheet—Information on MRSA

What is MRSA?

- *Staphylococcus aureus*, often referred to as "staph," is a common type of bacteria that is found on the skin and in the nose of healthy persons. Staph bacteria may cause minor skin infections such as boils, or more serious infections such as pneumonia and blood poisoning.
- Certain "staph" bacteria that have become resistant to the usual "first-line" antibiotics are called **MRSA**—which is short for "methicillin-resistant *Staphylococcus aureus*." MRSA infections are more difficult to treat, but they usually respond to "incision and drainage" and/or stronger antibiotics.

How is MRSA spread from person to person?

- MRSA is usually spread through direct physical contact with an infected person, but may also be transmitted through contact with contaminated objects or surfaces.
- MRSA is NOT spread by coughing unless the infected person has pneumonia.

How can you prevent becoming infected with MRSA?

- **Wash your hands thoroughly with soap and water throughout the day**, particularly every time you use the toilet and before every meal.
- Never touch another person's wounds, infected skin, or dirty bandages.
- Don't scratch skin rashes.
- Maintain personal hygiene through regular showers and by keeping your living space clean, including regularly laundering your bed linens.
- Do not hand-wash and air dry your laundry. Use the institutional laundry.
- Never share personal hygiene items with others, including toiletries or towels.
- Clean off any surfaces shared with others, such as weight benches.
- Use a towel or shirt as a barrier between your bare skin and exercise equipment.
- Shower after participating in close-contact recreational activities whenever possible.
- Don't get a tattoo in prison.
- Don't use injection drugs.
- Don't have sexual contact with other inmates.
- Shower before participating in sweat lodges and wear clean clothes. Then, shower after the sweat lodge.

How do you know if you have a MRSA infection?

- Always seek medical attention if you develop a boil, red or inflamed skin, an infected insect or spider bite, or a sore that does not go away.
- The most common way for health care providers to detect MRSA is by doing a culture of the pus from the skin infection.

How is MRSA treated?

- MRSA skin infections are often treated first with frequent warm soaks and draining of the wound.
- Strong antibiotics can be effective in treating MRSA.
- Serious or highly resistant MRSA infections may require intravenous (IV) antibiotics in the hospital.

8. NON-PURULENT SKIN AND SOFT TISSUE INFECTIONS (SSTIS)

CONTENTS

A. Key Points

Non-purulent SSTIs include **CELLULITIS**, **ERYSIPELAS**, and **NECROTIZING INFECTION**.

- **CELLULITIS** and **ERYSIPELAS** refer to diffuse, superficial, spreading skin infections. These infections cause rapidly spreading areas of erythema, swelling, tenderness, and warmth, and are caused by a bacterial breach in the skin.
  - **ERYTHEMA** is blanchable redness of the skin, which can be localized or generalized, and is caused by dilation of superficial blood vessels and capillaries near the skin's surface.
  - ***The term CELLULITIS is NOT appropriate for cutaneous inflammation associated with collections of pus such as in septic bursitis, furuncles, or skin abscesses.***
    - In such cases of purulent infection, the appropriate terminology is "***with surrounding inflammation***" and NOT "with surrounding cellulitis."
    - ★ ***This distinction is critical.*** *The treatment of purulent infections is with incision and drainage (I&D), whereas the treatment of cellulitis is with antibiotics. (See Chapter 7 for information on the treatment on purulent SSTIs.)*
  - Typical cases of cellulitis should include an antibiotic active against streptococci.
  - In cases of uncomplicated cellulitis, a 5-day course of antimicrobial therapy is adequate.
  - Methicillin-resistant *Staphylococcus aureus* (MRSA) is an unusual cause of typical cellulitis, but coverage may be prudent in cellulitis associated with penetrating trauma (especially from illicit drug use), purulent drainage, or with concurrent evidence of MRSA infection elsewhere. (See more information on the treatment of MRSA in Chapter 7.)
- **NECROTIZING INFECTIONS** are deep infections involving fascial and/or muscle compartments and causing major tissue destruction. The initial presentation is that of cellulitis, which can advance rapidly or slowly. As it progresses, there is systemic toxicity including high temperatures, disorientation, and lethargy.
  - ★ *A distinguishing feature is the wooden-hard induration of the subcutaneous tissues.*

B. References

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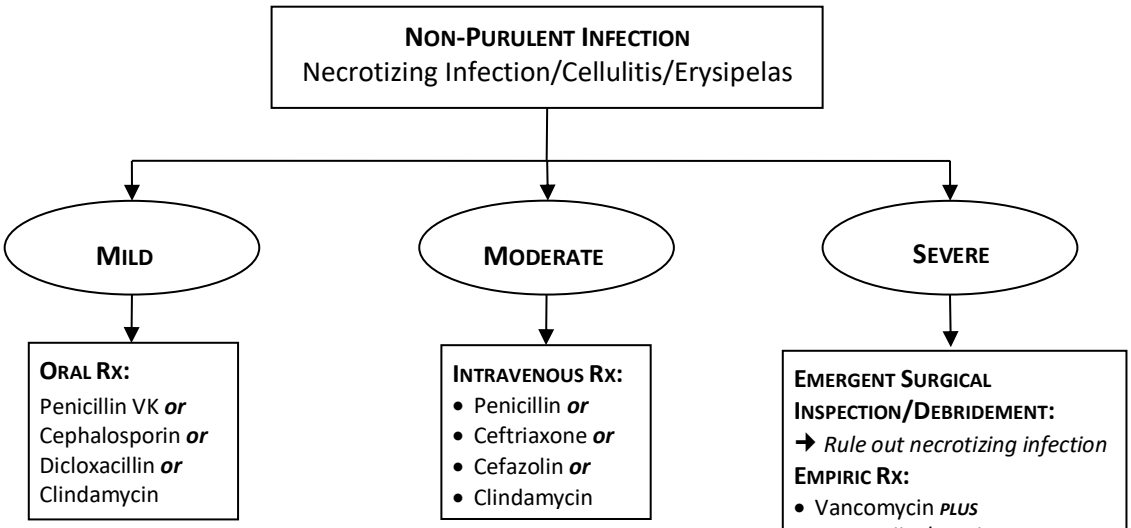
C. Algorithm: Treatment of Non-Purulent SSTIs



DEFINITIONS:
MILD: Typical cellulitis/erysipelas without systemic signs of infection
MODERATE: Typical cellulitis/erysipelas with systemic signs of infection.
SEVERE: Patients who have failed oral antibiotic treatment; or who have systemic signs of infection; or who are immunocompromised; or who have clinical signs of deeper infection such as bullae, skin sloughing, hypotension, or evidence or organ dysfunction.
C&S: Culture and sensitivity.
Adapted from: *Figure 1* in
http://cid.oxfordjournals.org/content/early/2014/06/14/cid.ciu296.full.pdf+html

9. *CLOSTRIDIUM DIFFICILE* INFECTION

CONTENTS

A. Key Points

- ***CLOSTRIDIUM DIFFICILE* (*C. DIFFICILE*)** is a non-invasive, Gram-positive, spore-forming bacterium that causes disease through production of toxins A and B. Disease severity ranges from asymptomatic carriage to pseudomembranous colitis.
- ***C. DIFFICILE* INFECTION (CDI)** is manifested as acute onset diarrhea resulting from toxigenic *C. difficile*.
- **PRIMARY RISK FACTORS** for CDI include the following:
  - **Antibiotic exposure:** Especially to clindamycin, fluoroquinolones, and second- or higher-generation cephalosporins; to a lesser extent, penicillins, macrolides (i.e., azithromycin, clarithromycin), medications with beta lactamase inhibitors (i.e., amoxicillin/clavulanic acid, piperacillin/tazobactam), and carbapenems.
    - ★ *If CDI is suspected or diagnosed, any antibiotics potentially contributing to the development of CDI should be discontinued unless they are absolutely indicated.*
  - **Exposure to the organism itself**
  - **Other notable risk factors:** Use of acid-lowering medications (e.g., omeprazole, ranitidine, etc.), gastrointestinal tract manipulation, comorbid conditions (e.g., inflammatory bowel disease, immunosuppression, cirrhosis, pregnancy), age >65, hospital admission, and duration of stay in hospital or long-term care facility.
- **EMPIRIC CDI TREATMENT may be considered**, regardless of laboratory test result, in the context of high clinical suspicion—due to risk of a false negative.
- **SYMPTOMATIC TREATMENT with anti-peristaltic medications (e.g., loperamide) and opiates should be avoided**, as they can precipitate severe disease and potentially mask symptoms, thereby interfering with the monitoring of CDI resolution.
- **LABORATORY CONFIRMATION of cure should NOT be performed.** False positives are common, complicating care and contributing to inappropriate antibiotic use.
- **RECURRENT *C. DIFFICILE* INFECTION (RCDI)** is thought to be largely linked to altered colonic microbiota. 10–20% of patients with CDI will suffer RCDI within 8 weeks of completing the initial CDI treatment regimen. Of these patients, the rates of further recurrence range from 40–65%. Identification of RCDI is necessary to select appropriate treatment, particularly beyond the first recurrence. (See more information in the table under *Treatment* - Section D.)
- **USE OF PROBIOTICS** is discussed in *Chapter 10* of the *Antimicrobial Stewardship Clinical Guidance*.

B. Diagnosis

DIAGNOSIS is made after pre-screening for symptoms (unexplained and new onset of ≥3 unformed stools in 24 hours) and risk factors.

- **DIFFERENTIAL DIAGNOSIS** of *C. difficile* must be distinguished from other infectious and noninfectious causes of diarrhea (i.e., acute abdomen, shock, infectious diarrhea caused by other organisms, post-infectious irritable bowel syndrome, inflammatory bowel disease, microscopic colitis, and celiac disease).

- **TESTING** of stools (prior to initiating antibiotic therapy) from patients with diarrhea should be done by utilizing one of the following methods:
  - **NUCLEIC ACID AMPLIFICATION TEST (NAAT)** for toxigenic *C. difficile* (e.g., PCR assay)
    - ★ *Use only in the context of unexplained documented diarrhea, due to risk of unnecessary treatment of asymptomatic positives.*
  - **GLUTAMATE DEHYDROGENASE SCREENING TEST**, followed by confirmation with either NAAT or toxin A + B enzyme immunoassay (EIA)
    - ★ *NAAT may be preferred for confirmation, due to higher sensitivity than EIA.*

C. Classification of Severity

CLASSIFICATION OF SEVERITY is necessary in order to select the appropriate treatment.

- **NON-SEVERE:** Leukocytosis with—
  - WBC ≤15,000 cells/mL ***and***
  - Scr <1.5mg/dL

- **SEVERE:** Leukocytosis with—
  - WBC >15,000/ml, ***and/or***
  - Scr ≥1.5mg/dL

- **FULMINANT:** Meeting criteria for **SEVERE** ***plus*** presence or development of at least one of the following complications—
  - Hypotension (with or without vasopressors) or shock
  - Ileus
  - Megacolon

D. Treatment

Severity	Treatment	Comments
Initial episode: **NON-SEVERE**	**1ST LINE:** • Vancomycin 125mg po qid for 10 days. • If no improvement within 5–7 days with vancomycin regimen, consider change to fidaxomicin 200mg po bid for 10 days. • If above agents unavailable**:** Metronidazole 500mg po tid a day for 10 days.*****	• **If possible, STOP antibiotics that may be contributing to CDI development.**
Initial episode: **SEVERE**	• Vancomycin 125mg po qid for 10 days.******	• **If possible, STOP antibiotics that may be contributing to CDI development.**
Initial episode: **FULMINANT**	• Vancomycin 500mg po qid ***AND*** metronidazole 500mg IV every 8 hours. • **If ileus is present:** Add vancomycin 500mg in 100ml normal saline per rectum every 6 hours as a retention enema.	• Surgical consult is recommended. • **If possible, STOP antibiotics that may be contributing to CDI development.**
Initial RCDI *** (within 8 weeks of completing prior treatment)	**If standard vancomycin regimen was used for initial episode:** • Prolonged tapered/pulsed vancomycin regimen (e.g., 125 mg qid for 10–14 days, then bid for 7 days, then once per day for 7 days, and then once every 2 or 3 days for 2–8 weeks) ***OR*** • Fidaxomicin 200mg po bid for 10 days **If metronidazole was used for initial episode:** • Vancomycin 125mg po qid for 10 days	• Confirm level of severity • **If possible, STOP antibiotics that may be contributing to CDI development.**

***** Metronidazole should only be used for an initial episode of non-severe CDI, and only if vancomycin and fidaxomicin are unavailable.

****** A 10-day course of fidaxomicin 200mg po twice a day may be considered ***INSTEAD*** of vancomycin regimen in patients with severe, uncomplicated infection who are at particularly high risk of recurrence (e.g., when causative antibiotic cannot be discontinued).

******* Discussion of patients with RCDIs beyond the initial RCDI is outside the scope of this guidance. Such cases should be managed on a case-by-case basis, and consultation with a specialist should be considered. Possible treatment may include pulsed and/or tapered regimens, with or without rifaximin or fidaxomicin "chasers," or fecal microbiota transplant.

Note: *Oral vancomycin doses may be compounded from the intravenous formulations at capable institutions at significant cost savings.*

E. Infection Control and Prevention

- Contact precautions should be maintained for all CDI patients for at least 48 hours after diarrhea has resolved.
- Gloves and gowns must be worn by all individuals entering the room of any CDI patient, and removed before exiting.
- Hand hygiene should be performed before and after caring for a patient with *C. difficile* by using soap and water. Alcohol-based and chlorhexidine-based sanitizers are **NOT** effective against *C. difficile* spores.
- Daily and terminal disinfection of environmental surfaces should be performed with a *C. difficile*-sporicidal disinfectant.
- There is not enough evidence to show that probiotics prevent CDI. See *Chapter 10* of this *Antimicrobial Stewardship Clinical Guidance* for more information on probiotics.

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10. PROBIOTICS

CONTENTS

A. Key Points

- Microbiological studies and current literature suggest an alteration or imbalance in gastrointestinal (GI) bacteria may be causative in *Clostridium difficile* (*C. difficile*) infections and may cause symptoms in individuals with inflammatory bowel disease (IBD).
- The Food and Drug Administration (FDA) classifies probiotics as supplements. As such, their content and dose vary from brand to brand. According to the FDA, "supplements are not intended to treat, diagnose, prevent, or cure diseases."[4]

C. DIFFICILE

- No current GI or infectious disease guidelines recommend routine probiotic use for prevention or treatment of *C. difficile*.
- Several studies have investigated the use of probiotics for treatment and prevention. However, current literature is inconsistent, and no strong evidence supports routine probiotic use for prevention or treatment.

INFLAMMATORY BOWEL DISEASE

- Available literature does not support probiotic supplementation for treatment of Crohn's disease at this time.
- While there are small studies that reflect that there may be a benefit with certain strains of probiotics in ulcerative colitis, the data is weak and further studies are needed prior to recommending their use.

[4] http://www.fda.gov/Food/DietarySupplements/UsingDietarySupplements/ucm109760.htm

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11. URINARY TRACT INFECTIONS

CONTENTS

A. Key Points

Bacterial presence in the genitourinary system is classified into three distinct areas:

- **ASYMPTOMATIC BACTERIURIA**
  - Asymptomatic patients with positive cultures have either asymptomatic bacteriuria or a contaminated urine specimen.
  - Cultured urine will often grow organisms in the absence of infection, since urine passes through tissue that is typically colonized with bacteria.
- **UNCOMPLICATED CYSTITIS AND PYELONEPHRITIS**
  - Uncomplicated urinary tract infection occurs in a patient who does not have an underlying condition that increases the risk of failing therapy. The infection can occur in the upper or lower urinary track.
- **CATHETER-ASSOCIATED URINARY TRACT INFECTION (CAUTI)**
  - Catheterized patients will become colonized within 48 hours of catheterization, this does not necessarily indicate infection requiring treatment.
  - CAUTI should be confirmed by the presence of bacteria *and* elevated white blood cells in the urinalysis, together with systemic signs of infection.
  - The CDC's National Healthcare Safety Network recommends that the Foley catheter be changed prior to obtaining a culture, if the Foley has been in place for 14 days or longer. (See *References*.)
  - An in-depth discussion of CAUTI is outside the scope of this guidance, but antimicrobial therapy is generally adjuvant to non-pharmacologic intervention, including catheter removal and routine reevaluation of continued need for catheter use. Consult with an infection control nurse for more information.

B. Culture and Urinalysis

- Urine culture must always be interpreted in the context of a urinalysis and patient symptoms.
- Urine culture should be collected prior to the initiation of antibiotic therapy, and used to narrow the empiric antimicrobial regimen
- ***Women:*** Urine culture is not required for the treatment of women with uncomplicated cystitis (i.e., absence of fever, flank pain, or other suspicion for pyelonephritis), unless the patient has recurrent urinary tract infections, is immunocompromised, or has other comorbid complications.
- ***Men:*** Culture is always warranted for the evaluation of men presenting with symptoms of cystitis.
- ***Using indwelling catheters for urine cultures:***
  - Clinical staff should aseptically utilize the collection (sampling) port.
  - ***Appropriate for:*** Local findings suggestive of CAUTI, evaluation of sepsis without a clear source, prior to certain urologic procedures, early pregnancy.
  - ***Not appropriate (due to concerns regarding urine quality) for:*** Screening patients for infection, asymptomatic elderly patients, diabetics, or documenting clearing of bacteria.
- Providers should deliver samples within the timeframe as directed by the laboratory

INDICATORS OF INFECTION ON A URINALYSIS

- ***Turbid/cloudy urine***. Only applies to non-catheterized patients.
- ***Positive leukocyte esterase:*** Indicates the presence of white blood cells in the urine.
- ***Presence of >10 WBCs:*** Upon microscopy, the presence of 10 WBCs per high-power field is equivalent to 100 cells/mm^3 of urine, which is considered the upper limit of normal.
- ***Positive nitrite test:*** indicates the presence of a nitrate-reducing microorganism such as *Escherichia coli* or any other member of the Enterobacteriaceae family.
- ***Elevated pH (6.5–8):*** May indicate the presence of organisms that produce the enzyme urease, which catalyzes the hydrolysis of urea into ammonia and carbon dioxide; some of these organisms include *Staphylococcus saprophyticus, Klebsiella pneumoniae,* and *Proteus* species.
- ***Presence of ≥10^5 colony forming units (CFU) of bacteria per milliliter of urine.***
  - ★ *Approximately one-third to one-half of young women with symptomatic lower urinary tract infections have less than 10^5 CFU/ml of urine. Thus, the presence of ≥10^2 CFU/ml should be considered in the context of the patient's characteristics and signs and symptoms.*

C. Outpatient Treatment

- ***Asymptomatic bacteriuria should not be routinely treated, with two important exceptions:*** **(1)** pregnant women and **(2)** patients scheduled for genitourinary surgical procedures.
- Empiric regimens should be guided by local resistance patterns when available.
- Antimicrobial regimens should be tailored based on Culture and Sensitivity (C&S) results.

First-Line Empiric Regimens for Women

- ***Uncomplicated cystitis*** (absence of fever, flank pain, or other suspicion for pyelonephritis):
  - Nitrofurantoin 100mg po bid for 5 days ***OR***
  - Sulfamethoxazole/trimethoprim 800mg/160mg po bid for 3 days
- ***Acute pyelonephritis*** (obtain C&S prior to initiation):
  - Ciprofloxacin 500mg po bid for 7 days ***OR***
  - Sulfamethoxazole/trimethoprim 800mg/160mg po bid for 14 days (with single loading dose of intravenous ceftriaxone or aminoglycoside if susceptibility is unknown)

First-Line Empiric Regimens for Men

- ***Acute cystitis*** (obtain C&S prior to initiation):
  - Ciprofloxacin 500mg po bid for 7 days ***OR***
  - Sulfamethoxazole/trimethoprim 800mg/160mg po bid for 7 days
- ***Acute pyelonephritis*** (obtain C&S prior to initiation):
  - Ciprofloxacin 500mg po bid for 10-14 days
  - Sulfamethoxazole/trimethoprim 800mg/160mg po bid for 10–14 days

  ★ *A 14-day duration is recommended for patients presenting with fever because febrile UTI is often associated with prostatic involvement.*

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E. Recommended Procedure for Using Urinary Catheter (Indwelling Foley) for Collecting Urine for Culture

NOTE*: *Institutions may wish to adopt the following as a local procedure.

PRINCIPLES:

- ***Procedure:*** Collection of urine for culture from a patient with a urinary catheter optimally should be performed by using the catheter sampling port. Suboptimal collection and/or transport of urine can lead to a false-positive urine culture, resulting in a misdiagnosis of urinary tract infection and unnecessary treatment with antibiotics.
- ***Timing:*** Urine samples should be plated within 2 hours of collection unless specimens are refrigerated immediately (and plated within 24 hours) or kept in a preservative tube (and plated within 48 hours).
- ***14-Day Indication:*** Patients with a suspected UTI and a Foley urinary catheter in place for 14 days or longer should have the Foley catheter replaced prior to collecting urine for culture and antimicrobial treatment. (This does not apply to supra-pubic catheters.)

  Note: The 14-day indication for a Foley catheter change prior to obtaining urine culture is indicated in the National Healthcare Safety Network (NHSN) long term care UTI protocol and has been noted by Clinical Infectious Disease research (see Hooten, T., 2010 in *References*) to hasten resolution of symptoms and to reduce the risk of subsequent CA bacteriuria.

  ➔ See http://www.cdc.gov/nhsn/PDFs/LTC/LTCF-UTI-protocol-current.pdf.

PROCEDURAL GUIDELINES:

1. Equipment:

a. Alcohol or chlorhexidine (CHG) wipes
b. Specimen C&S tube with preservative, specimen UA tube
c. Sterile Luer-Lok™ access device package
d. Biohazard bag, patient label, and lab slip
e. Sharps container
f. PPE, as appropriate (gloves, eye protection)

2. Planning and Preparation:

a. Obtain order to change the urinary catheter from the provider if the catheter has been in 14 days or longer, or if it is unknown how long the catheter has been in.
b. Change the urinary catheter per facility protocol or policy.
c. Use Standard Precautions (see Infection Control manual).
d. Explain the procedure to the patient.
e. Check that the indwelling sample port will accept the Luer-Lok access device. (The Bard E-Z Lock Sampling Port accepts a Luer-Lok or slip tip syringe).
f. Identify how the sample will get to lab to be plated in the *appropriate amount of time*.

3. Collection Procedure:

Preparation:

a. Identify the patient using two identifiers.
b. Wash hands.
c. Apply gloves and other PPE, as needed.
d. Kink drainage tubing (approximately 12 inches) below the sampling port until urine is visible under the access site.
   ★ *Urine is NEVER collected for culture from urinary drainage bags.*
e. Cleanse sampling port with alcohol or CHG; scrub for 15–20 seconds.
f. Using aseptic technique, position the Luer-Lok access device over the center of the sampling port. Push it in, and rotate the access device clockwise onto the sampling port until it fits securely.

Urine Collection:

g. Center the C&S tube over the holder portion of the access device and push it in. Once the tube is adequately filled, remove the tube from the holder.
h. Check that tube is filled to at least the minimum fill line (4ml of urine).
i. Invert the tube 8–10 times.
j. Repeat steps g–i with UA tube, if ordered.
k. Remove access device by rotating it counterclockwise.
l. Unclamp the drainage tube.
m. Discard the Luer-Lok device immediately into sharps container.

(continues on next page)

Process Specimen:

n. Label collection container(s) in front of patient with:
   1) Date/time of collection.
   2) Method of collection (and type of catheter).
   3) Note if patient is on antibiotic therapy.

o. Place specimen(s) in biohazard bag(s)

p. Remove gloves and wash hands.

q. Send specimen to lab—ideally within 15 minutes of collecting, but no later than 48 hours if in a preservative C&S tube; or no later than 24 hours if not in preservative, but immediately refrigerated ; or within 2 hours post-collection if not refrigerated and not in preservative.

4. Documentation:

In the Bureau Electronic Medical Record (BEMR), NMOS, or clinical encounter (depending on institution policy):

a. Record the reason for specimen collection.

b. Document whether collected via Foley or suprapubic catheter.

c. Document if catheter was changed immediately prior to collection of specimen.

d. Note the appearance, odor, color, or any unusual characteristics of the urine.

SOURCES FOR SECTION E:

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12. *HELICOBACTER PYLORI*

CONTENTS

A. Key Points

- *Helicobacter pylori (H. pylori)* is a common infection of the gastrointestinal (GI) tract affecting about one-third of the U.S. population. It has been associated with many conditions, including peptic ulcer disease (PUD), gastritis, and malignancy. The infection is usually acquired during childhood, and one of the most likely risk factors is having infected parents.
- *H. pylori* is a Gram-negative bacteria that colonizes the gastric epithelium and produces a pH-neutral envelope via urea-metabolism into ammonia and carbon dioxide.
- Testing and treating for *H. pylori* is indicated for all patients with active PUD or a history of PUD, for whom eradication therapy has not already been prescribed. Testing and treating may also be indicated under certain other circumstances on a case-by-case basis. A list of specific such scenarios is outside the scope of this guidance.
- Testing and treating for *H. pylori* may also be helpful in patients taking chronic NSAID therapy, and in patients who have dyspepsia without ulcer or GERD.
- If a patient is tested and found to have *H. pylori*, treatment should be given.
- Diagnosis can be made with a variety of testing methods (e.g., urea breath test, stool testing, antibody testing, and tissue sampling).
- Concern with increasing resistance to clarithromycin is growing; therefore, quadruple therapy without the use of clarithromycin is now recommended as *first-line treatment*.

B. Treatment

First-Line Treatment: Quadruple Therapy

Duration is 10-14 days:

- Omeprazole 20mg po bid
- Bismuth subsalicylate 524mg po qid
- Metronidazole 250mg po qid
- Doxycycline 100mg po bid

Alternative First-Line Treatment: Triple Therapy

★ *Triple therapy can be used If community H. pylori clarithromycin-resistance is known to be <15% AND the patient has no previous history of macrolide exposure.*

Duration of treatment is 14 days:

- Amoxicillin 1000mg po bid
  - ➤ Substitute metronidazole 500mg po bid if the patient is penicillin-allergic.
- Clarithromycin 500mg po bid
- Omeprazole 20mg po bid

Antibiotic Resistance

- Antimicrobial resistance in *H. pylori* is well-documented in the literature, particularly to metronidazole and clarithromycin, and rates do appear to be rising. For example, the clarithromycin resistance rate published by the CDC was 12.9%, based on data collected from 1998–2002. In a more recent study, resistance rates were found to be about 30% in the U.S., but varied between 23–46%, depending on region.
- The use of amoxicillin and tetracycline historically has been minimally affected by resistance.
- When re-treating (salvage therapy), the selected medications should be different from the agents used during the initial regimen, and consideration given to a bismuth-based, quadruple therapy regimen.

C. Culture and Sensitivities (C&S)

Culture-guided or PCR-guided therapy has been studied and may be useful in some cases such as in areas of known high-prevalence of resistance. However, evidence is currently lacking for universal use of these approaches.

D. References

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  ➔ *Medscape allows free access, although you must create an account and log in.*

13. DENTAL INFECTION

CONTENTS

A. Key Points

- Dental infection primarily involves pulpal and periodontal infections. Secondary infections—including those involving soft tissues, as well as sinus infections—pose special treatment challenges (see Wynn, 2015, under *References*).
- Penicillin VK is the preferred narrow spectrum antibiotic for first line treatment for simple dental infections, including those of pulpal origin; clindamycin is effective in individuals with a penicillin allergy.
- Complex infections or those of the soft tissue may require broad spectrum antibiotics, based on patient progress or test results.
- Metronidazole is a synthetic antibiotic that is effective against anaerobic bacteria. When prescribed, it should be used in combination with penicillin.
- Third generation cephalosporin antibiotics such as ceftriaxone are generally inappropriate for dental indications.
  ➔ *In the BOP, dental use of ceftriaxone requires Regional Chief Dentist approval.*
- Antibiotics should only be used in select dental situations, such as acute periodontal conditions where drainage or debridement is impossible, local spread of an infection is a concern, or there is presence of systemic signs or symptoms of infection.
  ➔ *Antibiotic usage should not be a substitute for interventional procedures.*
- Antibiotics are NOT routinely required after oral operative interventions.

B. Bacterial Resistance to Antibiotics

- Patients with an early state odontogenic infection who do not respond to penicillin VK within 24 to 36 hours, may be assumed to have resistance.
- Bacterial resistance to penicillins is predominantly a result of beta-lactamase production. As a result, providers should switch therapy to either clindamycin or amoxicillin/clavulanic acid.

C. Prophylaxis

- When indicated, antibiotic prophylaxis should cover viridans group streptococci and be given 30–60 minutes prior to all dental procedures involving manipulation of gingival tissue or the periapical region of teeth, or perforation of the oral mucosa.
- Prophylaxis is indicated to help prevent infective endocarditis (IE) in select patient populations. The American Dental Association (ADA) and the American Heart Association (AHA) recommend the use of prophylaxis to prevent IE in the following cardiac conditions:
  - **NON-CONGENITAL:** Prosthetic cardiac valve, prosthetic material used in a cardiac valve repair, history of IE, cardiac transplant that develops cardiac valvulopathy.
  - **CONGENITAL:** Unrepaired or incompletely repaired cyanotic congenital heart disease; during the first six months after a procedure to completely repair a congenital heart defect with prosthetic material or device; and repaired congenital heart defect with residual defect at the site or adjacent to the site, or a prosthetic patch or device.
- Prophylaxis for those with prosthetic joint replacements is controversial due to lack of evidence. A 2014 ADA expert panel stated that, in general, evidence DOES NOT support the use of prophylactic antibiotics prior to dental procedures to prevent prosthetic joint infections.

Dental Prophylaxis for Bacterial Endocarditis Prevention in Adult Patients

SCENARIO	ROUTE	PROPHYLACTIC REGIMEN (Administer ONE of the following medications 30–60 minutes before the procedure.)	
NOT ALLERGIC to Penicillins or Ampicillin	Oral	Amoxicillin	2 grams
	IM[1]	Ampicillin	2 grams
ALLERGIC to Penicillins or Ampicillin	Oral	Cephalexin	2 grams
		Clindamycin	600 milligrams
		Azithromycin *or* clarithromycin	500 milligrams
	IM[1]	Cefazolin or ceftriaxone[2,3]	1 gram
		Clindamycin	600 milligrams

[1] IM = Intramuscular (use if patient is unable to take oral medication).
[2] Cephalosporins should NOT be used in persons with a history of anaphylaxis, angioedema, or urticaria from use of penicillins or ampicillin.
[3] Broad spectrum antibiotics such as ceftriaxone are generally inappropriate for dental indications. In the BOP, dental use of ceftriaxone requires Regional Chief Dentist approval.

Adapted from:
Table 5 in Wilson, et al. *Prevention of Infective Endocarditis: Guidelines from the American Heart Association*. See *References* on next page.

D. References

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14. SURGICAL SITE INFECTION PROPHYLAXIS

CONTENTS

A. Key Points

- The majority of surgical procedures for BOP inmates occur at outside hospital facilities, and prophylactic regimens and routines of the outside facility should be followed to prevent infections. Recommendations that do not follow current, evidence-based practices should be discussed with an Antimicrobial Stewardship Pharmacist and/or your Regional Medical Director.
- *Staphylococcus aureus* is the most common pathogen causing surgical site infection (SSI). The universal use of intranasal mupirocin is discouraged; however, pre-operative use in specific settings (e.g., gastrointestinal, orthopedic procedures) may be indicated. The data are most compelling in cardiac and orthopedic surgery patients.
- Pre-operative use of agents such as chlorhexidine should be used in accordance with outside hospital recommendation with a non-formulary submission.

B. Common Surgical Pathogens

- *Skin and soft tissue infections* (*SSTIs*) after clean procedures are predominately caused by normal skin flora:
  - *Staphylococcus aureus*
  - Coagulase-negative staphylococci
- The predominate organism after clean-contaminated procedures (abdominal procedures; heart, kidney, and liver transplants) are Gram-negative rods and enterococci, in addition to skin flora.

C. References

- Bratzler DW, Dellinger EP, Olsen KM, et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. *Am J Health Syst Pharm*. 2013; 70(3)195–283. Available at: http://www.ajhp.org/content/ajhp/70/3/195.full.pdf