

7 Ways Dentists Can Act Against Antibiotic Resistance



Dentists are uniquely positioned to play a role in preventing the spread of antibiotic resistance. Here are seven simple “how-tos” for safe, appropriate antibiotic prescribing and use when treating dental infections.



1. **MAKE** an accurate diagnosis.



2. When prescribing an antibiotic, **CHOOSE** the right drug for the right dose and duration.



3. **USE** narrow-spectrum antibiotics for simple infections and preserve broad-spectrum drugs for more complex infections.



4. **AVOID** prescribing antibiotics for viral infections.



5. For empiric treatment, **REVISE** treatment regimen based on patient progress and/or test results.



6. **KNOW** the side effects and drug interactions of an antibiotic before prescribing.



7. **TEACH** your patients about appropriate antibiotic use and emphasize the importance of taking antibiotics exactly as prescribed.



**BE
ANTIBIOTICS
AWARE**
SMART USE, BEST CARE

www.cdc.gov/antibiotic-use



ANTIBIOTIC SAFETY



ANTIBIOTICS ARE RESPONSIBLE
FOR ALMOST

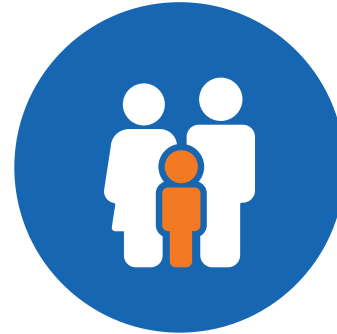
1 OUT OF 5

EMERGENCY DEPARTMENT VISITS
FOR ADVERSE DRUG EVENTS



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE



ANTIBIOTICS ARE **THE MOST
COMMON CAUSE** OF EMERGENCY
DEPARTMENT VISITS FOR
ADVERSE DRUG EVENTS
IN CHILDREN UNDER
18 YEARS OF AGE.



www.cdc.gov/antibiotic-use

HOSPITAL PHARMACISTS:
BE ANTIBIOTICS AWARE

Reassess Antibiotic Therapy



SCENARIO

You are following up on a pharmacy kinetic consult for a patient who has received intravenous vancomycin empirically for three days for the treatment of hospital-acquired pneumonia.

Reassessment of antibiotic therapy evaluates the continued need for and choice of antibiotics when the clinical picture is clearer and more diagnostic information is available.¹ Anti-MRSA coverage is a practical target for reassessment based on the patient's microbiology results.¹ Exceptions to de-escalating anti-MRSA coverage may include purulent skin and soft tissue infections, prosthetic joint/orthopedic surgical infections, osteomyelitis, septic arthritis, and abscesses.²

Pharmacists can help reassess antibiotic therapy by:



1. Reviewing the patient's microbiology results, including rapid diagnostic tests and clinically relevant cultures.^{1,2}



2. Prompting the provider to consider discontinuation of anti-MRSA therapy if there is no microbiological evidence of MRSA, if appropriate.

The scenarios and recommendations discussed are applicable to most immunocompetent adult patients. Prior to making interventions, always assess the individual patient and use your clinical judgment. Follow your institution's treatment guidelines when applicable.

References:

1. Core Elements of Hospital Antibiotic Stewardship Programs. Centers for Disease Control and Prevention, 23 Feb. 2017. www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements.html.

2. Liu C, Bayer A, Cosgrove SE, et al. Clinical practice guidelines by the Infectious Diseases Society of America for the treatment of methicillin-resistant *Staphylococcus aureus* infections in adults and children. Clin Infect Dis. 2011 Feb 1;52(3):e18-55. <https://academic.oup.com/cid/article/52/3/e18/306145>.



www.cdc.gov/antibiotic-use

HOSPITAL PHARMACISTS:
BE ANTIBIOTICS AWARE

Avoid Treatment of Asymptomatic Bacteriuria



SCENARIO

A medical resident calls you asking for your recommendation on antibiotic choice based on a patient's urine culture report.

Asymptomatic bacteriuria refers to the isolation of bacteria in urine culture from a patient without signs or symptoms of urinary tract infection (UTI). A positive urine culture result (with or without pyuria) alone does not meet criteria for initiation of antibiotics according to infectious diseases guidelines. Exceptions include pregnancy and invasive genitourinary procedures.¹

Pharmacists can help avoid unnecessary treatment of asymptomatic bacteriuria by:



1. Prompting the provider to consider if the patient has signs and symptoms consistent with UTI prior to making a recommendation for treatment. Signs and symptoms may include:^{1,2}

- ✓ urinary urgency
- ✓ urinary frequency
- ✓ dysuria
- ✓ suprapubic pain
- ✓ flank pain
- ✓ pelvic discomfort
- ✓ acute hematuria
- ✓ fever

Note: Delirium or nausea/vomiting should be interpreted with caution as, by themselves, they have a low specificity for UTI.¹



2. Discussing the potential for avoiding antibiotic use with the provider if the patient has asymptomatic bacteriuria.

The scenarios and recommendations discussed are applicable to most immunocompetent adult patients. Prior to making interventions, always assess the individual patient and use your clinical judgment. Follow your institution's treatment guidelines when applicable.

References:

1. Nicolle LE, Gupta K, Bradley SF, et al. Clinical Practice Guideline for the Management of Asymptomatic Bacteriuria: 2019 Update by the Infectious Diseases Society of America. Clin Infect Dis. 2019 March 21 [Epub] <https://academic.oup.com/cid/article/68/10/e83/5407612>.
2. Implementation of Antibiotic Stewardship Core Elements at Small and Critical Access Hospitals. Centers for Disease Control and Prevention, www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements-small-critical.html.



**BE
ANTIBIOTICS
AWARE**
SMART USE, BEST CARE



www.cdc.gov/antibiotic-use

Viruses or Bacteria

What's got you sick?



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE

Common Condition	Common Cause			Are Antibiotics Needed?
	Bacteria	Bacteria or Virus	Virus	
Strep throat	✓			Yes
Whooping cough	✓			Yes
Urinary tract infection	✓			Yes
Sinus infection		✓		Maybe
Middle ear infection		✓		Maybe
Bronchitis/chest cold (in otherwise healthy children and adults)*		✓		No*
Common cold/runny nose			✓	No
Sore throat (except strep)			✓	No
Flu			✓	No

* Studies show that in otherwise healthy children and adults, antibiotics for bronchitis won't help you feel better.

Checklist for Antibiotic Prescribing in Dentistry



Pretreatment

- Correctly diagnose an oral bacterial infection.
- Consider therapeutic management interventions, which may be sufficient to control a localized oral bacterial infection.
- Weigh potential benefits and risks (i.e., toxicity, allergy, adverse effects, *Clostridium difficile* infection) of antibiotics before prescribing.
- Prescribe antibiotics only for patients of record and only for bacterial infections you have been trained to treat. **Do not** prescribe antibiotics for oral viral infections, fungal infections, or ulcerations related to trauma or aphthae.
- Implement national antibiotic prophylaxis recommendations for the medical concerns for which guidelines exist (e.g., cardiac defects).
- Assess patients' medical history and conditions, pregnancy status, drug allergies, and potential for drug-drug interactions and adverse events, any of which may impact antibiotic selection.

Prescribing

- Ensure evidence-based antibiotic references are readily available during patient visits. **Avoid** prescribing based on non-evidence-based historical practices, patient demand, convenience, or pressure from colleagues.
- Make and document the diagnosis, treatment steps, and rationale for antibiotic use (if prescribed) in the patient chart.
- Prescribe only when clinical signs and symptoms of a bacterial infection suggest systemic immune response, such as fever or malaise along with local oral swelling.
- Revise empiric antibiotic regimens on the basis of patient progress and, if needed, culture results.
- Use the most targeted (narrow-spectrum) antibiotic for the shortest duration possible (2-3 days after the clinical signs and symptoms subside) for otherwise healthy patients.
- Discuss antibiotic use and prescribing protocols with referring specialists.

Patient Education

- Educate your patients to take antibiotics exactly as prescribed, take antibiotics prescribed only for them, and not to save antibiotics for future illness.

Staff Education

- Ensure staff members are trained in order to improve the probability of patient adherence to antibiotic prescriptions.

HOSPITAL PHARMACISTS:
BE ANTIBIOTICS AWARE

Avoid Duplicative Anaerobic Coverage



SCENARIO

The pharmacy receives medication orders for piperacillin/tazobactam AND metronidazole for the same patient.

CDC's *Core Elements of Hospital Antibiotic Stewardship Programs* suggests that pharmacists review antibiotic therapy that is unnecessarily duplicative, including the use of agents with overlapping spectra. The combination of two agents with anaerobic activity is unnecessary in most cases.^{1,2} Exceptions may include *Clostridioides difficile* infection, necrotizing fasciitis, and certain biliary infections.³

Pharmacists can help avoid unnecessary duplicative anaerobic coverage by:



1. Alerting the provider that the antibiotics ordered have overlapping spectra of activity.



2. Discussing the clinical case with the provider and consider recommending discontinuation of metronidazole to avoid duplicative therapy, when appropriate.

You can apply this action plan to other combinations of agents that have duplicative anaerobic coverage (e.g., metronidazole and a carbapenem).

The scenarios and recommendations discussed are applicable to most immunocompetent adult patients. Prior to making interventions, always assess the individual patient and use your clinical judgment. Follow your institution's treatment guidelines when applicable.

References:

1. Implementation of Antibiotic Stewardship Core Elements at Small and Critical Access Hospitals. Centers for Disease Control and Prevention, www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements-small-critical.html.
2. Core Elements of Hospital Antibiotic Stewardship Programs. Centers for Disease Control and Prevention, www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements.html.
3. Huttner B, Jones M, Rubin MA, et al. Double trouble: how big a problem is redundant anaerobic antibiotic coverage in Veterans Affairs medical centers. *J Antimicrob Chemother.* 2012;67(6):1537-9.



www.cdc.gov/antibiotic-use



5 WAYS HOSPITAL PHARMACISTS CAN BE ANTIBIOTICS AWARE



1. Verify Penicillin Allergy

- Although 10% of the population in the United States reports a penicillin allergy, less than 1% of the population is truly penicillin allergic.¹
- When possible, obtain a more detailed history of the penicillin reaction and review previously prescribed antibiotics. Alert the provider of your findings if you think the patient can tolerate a beta-lactam antibiotic, when appropriate.



2. Avoid Duplicative Anaerobic Coverage

- Duplicative anaerobic coverage, such as piperacillin/tazobactam and metronidazole, is unnecessary in most cases.²
- When the pharmacy receives antibiotic orders for two or more agents with anaerobic activity, alert the provider that the antibiotics have overlapping spectra of activity.



3. Reassess Antibiotic Therapy

- Review the patient's microbiology results (e.g., rapid diagnostic tests and clinically relevant cultures).³
- Prompt the provider to consider **stopping** or **tailoring** antibiotic therapy as appropriate.



4. Avoid Treatment of Asymptomatic Bacteriuria

- Patients with asymptomatic bacteriuria should not be treated with antibiotics in most cases.⁴
- Consider the importance of signs and symptoms consistent with urinary tract infection (UTI) when reviewing positive urine cultures and/or making treatment recommendations.



5. Use the Shortest Effective Antibiotic Duration

- Guidelines for treatment duration are available for common infectious diseases such as pneumonia, UTI, and skin and soft tissue infection.^{5,6,7}
- Alert the provider if the total days of inpatient and post-discharge antibiotic therapy exceeds the recommended duration.

The scenarios and recommendations are applicable to most immunocompetent adult patients. Prior to making interventions, always assess the individual patient and use your clinical judgment. Follow your institution's treatment guidelines when applicable.

References:

1. "Is It Really a Penicillin Allergy?" Centers for Disease Control and Prevention, <https://www.cdc.gov/antibiotic-use/community/pdfs/penicillin-factsheet.pdf>.
2. *Implementation of Antibiotic Stewardship Core Elements at Small and Critical Access Hospitals*. Centers for Disease Control and Prevention, www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements-small-critical.html.
3. *Core Elements of Hospital Antibiotic Stewardship Programs*. Centers for Disease Control and Prevention, www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements.html.
4. Nicolle LE, Gupta K, Bradley SF, et al. Clinical Practice Guideline for the Management of Asymptomatic Bacteriuria: 2019 Update by the Infectious Diseases Society of America. *Clin Infect Dis*. 2019 March 21 [Epub]. <https://academic.oup.com/cid/article/68/10/e83/5407612>.
5. Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. *Clin Infect Dis*. 2007;44 Suppl 2:S27-72. https://academic.oup.com/cid/article/44/Supplement_2/S27/372079.
6. Gupta K, Hooton TM, Naber KG, et al. International clinical practice guidelines for the treatment of acute uncomplicated cystitis and pyelonephritis in women: A 2010 update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. *Clin Infect Dis*. 2011;52(5):e103-120. <https://academic.oup.com/cid/article/52/5/e103/388285>.
7. Stevens DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. *Clin Infect Dis*. 2014;59(2):e10-52. <https://academic.oup.com/cid/article/52/5/e103/388285>.



www.cdc.gov/antibiotic-use



5 WAYS HOSPITAL PHARMACISTS CAN BE ANTIBIOTICS AWARE



1. Verify Penicillin Allergy

- Although 10% of the population in the United States reports a penicillin allergy, less than 1% of the population is truly penicillin allergic.¹
- When possible, obtain a more detailed history of the penicillin reaction and review previously prescribed antibiotics. Alert the provider of your findings if you think the patient can tolerate a beta-lactam antibiotic, when appropriate.



2. Avoid Duplicative Anaerobic Coverage

- Duplicative anaerobic coverage, such as piperacillin/tazobactam and metronidazole, is unnecessary in most cases.²
- When the pharmacy receives antibiotic orders for two or more agents with anaerobic activity, alert the provider that the antibiotics have overlapping spectra of activity.



3. Reassess Antibiotic Therapy

- Review the patient's microbiology results (e.g., rapid diagnostic tests and clinically relevant cultures).³
- Prompt the provider to consider **stopping** or **tailoring** antibiotic therapy as appropriate.



4. Avoid Treatment of Asymptomatic Bacteriuria

- Patients with asymptomatic bacteriuria should not be treated with antibiotics in most cases.⁴
- Consider the importance of signs and symptoms consistent with urinary tract infection (UTI) when reviewing positive urine cultures and/or making treatment recommendations.



5. Use the Shortest Effective Antibiotic Duration

- Guidelines for treatment duration are available for common infectious diseases such as pneumonia, UTI, and skin and soft tissue infection.^{5,6,7}
- Alert the provider if the total days of inpatient and post-discharge antibiotic therapy exceeds the recommended duration.

The scenarios and recommendations are applicable to most immunocompetent adult patients. Prior to making interventions, always assess the individual patient and use your clinical judgment. Follow your institution's treatment guidelines when applicable.

References:

1. "Is It Really a Penicillin Allergy?" Centers for Disease Control and Prevention, <https://www.cdc.gov/antibiotic-use/community/pdfs/penicillin-factsheet.pdf>.
2. *Implementation of Antibiotic Stewardship Core Elements at Small and Critical Access Hospitals*. Centers for Disease Control and Prevention, www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements-small-critical.html.
3. *Core Elements of Hospital Antibiotic Stewardship Programs*. Centers for Disease Control and Prevention, www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements.html.
4. Nicolle LE, Gupta K, Bradley SF, et al. Clinical Practice Guideline for the Management of Asymptomatic Bacteriuria: 2019 Update by the Infectious Diseases Society of America. *Clin Infect Dis*. 2019 March 21 [Epub]. <https://academic.oup.com/cid/article/68/10/e83/5407612>.
5. Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. *Clin Infect Dis*. 2007;44 Suppl 2:S27-72. https://academic.oup.com/cid/article/44/Supplement_2/S27/372079.
6. Gupta K, Hooton TM, Naber KG, et al. International clinical practice guidelines for the treatment of acute uncomplicated cystitis and pyelonephritis in women: A 2010 update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. *Clin Infect Dis*. 2011;52(5):e103-120. <https://academic.oup.com/cid/article/52/5/e103/388285>.
7. Stevens DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. *Clin Infect Dis*. 2014;59(2):e10-52. <https://academic.oup.com/cid/article/52/5/e103/388285>.



www.cdc.gov/antibiotic-use

HOSPITAL PHARMACISTS:
BE ANTIBIOTICS AWARE

Verify Penicillin Allergy



SCENARIO

You are verifying an aztreonam order for a patient who has a penicillin allergy listed in his medical chart.

Although 10% of the population in the U.S. reports a penicillin allergy, less than 1% of the population is truly penicillin allergic. Correctly identifying if your patient is penicillin allergic can decrease the unnecessary use of broad spectrum antibiotics.^{1,2,3}

Pharmacists can help verify penicillin allergy by:



1. Asking questions to evaluate if the patient is truly penicillin allergic.

- ✓ What medication(s) were you taking when the reaction occurred?
- ✓ Can you describe the symptoms you experienced?
- ✓ How long ago did the reaction occur?
- ✓ How was the reaction managed? What was the outcome?
- ✓ Have you been prescribed amoxicillin or another penicillin since your reaction? Did you tolerate the antibiotic?



2. Reviewing the patient's health record to obtain previous prescription history.

If the patient has tolerated a penicillin or cephalosporin in the past, aztreonam may not be necessary.



3. Discussing your findings with the ordering provider.

Consider preparing a list of alternative agents to discuss with the provider. Refer to your facility's penicillin allergy evaluation protocol, if applicable.

You can apply this action plan to other antibiotics that are initiated for penicillin allergy (e.g., fluoroquinolones, clindamycin).

The scenarios and recommendations discussed are applicable to most immunocompetent adult patients. Prior to making interventions, always assess the individual patient and use your clinical judgment. Follow your institution's treatment guidelines when applicable.

References:

1. "Is It Really a Penicillin Allergy," Centers for Disease Control and Prevention, <https://www.cdc.gov/antibiotic-use/community/pdfs/penicillin-factsheet.pdf>.
2. Trubiano J, Phillips E. Antimicrobial stewardship's new weapon? A review of antibiotic allergy and pathways to 'de-labeling'. *Curr Opin Infect Dis.* 2013;26(6):526-37.
3. Swearingen SM, White C, Weidert S, Hinds M, Narro JP, Guarascio AJ. A multidimensional antimicrobial stewardship intervention targeting aztreonam use in patients with a reported penicillin allergy. *Int J Clin Pharm.* 2016;38(2):213-7.



**BE
ANTIBIOTICS
AWARE**
SMART USE, BEST CARE



www.cdc.gov/antibiotic-use

HOSPITAL PHARMACISTS:
BE ANTIBIOTICS AWARE

Use the Shortest Effective Antibiotic Duration



SCENARIO

You are performing medication reconciliation and reviewing discharge antibiotic orders for a patient.

Antibiotic stewardship programs are targeting interventions to reduce unnecessarily long durations of antibiotic treatment. In adult patients who have a timely clinical response, guidelines suggest the following durations for uncomplicated cases of these infections:

- **Community-Acquired Pneumonia:** Five days¹
- **Hospital-Acquired Pneumonia:** Seven days²
- **Non-purulent Cellulitis:** Five days³

Pharmacists can help optimize antibiotic duration by:



1. Adding the total number of days of uninterrupted inpatient antibiotic therapy to planned post-discharge antibiotic duration.



2. Alerting the provider if the total duration of inpatient and post-discharge antibiotic therapy exceeds the recommended duration according to treatment guidelines.



3. Discussing optimizing the duration of post-discharge antibiotic therapy with the provider if the patient had an uncomplicated clinical course and has responded appropriately to treatment.

The scenarios and recommendations discussed are applicable to most immunocompetent adult patients. Prior to making interventions, always assess the individual patient and use your clinical judgment. Follow your institution's treatment guidelines when applicable.

References:

1. Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. *Clin Infect Dis.* 2007;44 Suppl 2:S27-72. https://academic.oup.com/cid/article/44/Supplement_2/S27/372079.
2. 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 and the American Thoracic Society. *Clin Infect Dis.* 2016. https://www.idsociety.org/practice-guideline/hap_vap.
3. Stevens DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 Update by the Infectious Diseases Society of America. *Clin Infect Dis.* 2014;59(2):e10-52. <https://academic.oup.com/cid/article/52/5/e103/388285>.



**BE
ANTIBIOTICS
AWARE**
SMART USE, BEST CARE



www.cdc.gov/antibiotic-use



BE ANTIBIOTICS AWARE

SMART USE, BEST CARE

**Antibiotics aren't always the answer when you're sick.
Ask your doctor how you can feel better.**

For more information on antibiotic prescribing and use,
visit **www.cdc.gov/antibiotic-use**.



BE ANTIBIOTICS AWARE

SMART USE, BEST CARE

**Antibiotics aren't always the answer when you're sick.
Ask your doctor how you can feel better.**

For more information on antibiotic prescribing and use, visit
www.cdc.gov/antibiotic-use.



Our Commitment to Antibiotic Stewardship

Antibiotics save lives, but are frequently prescribed unnecessarily. Harms from antibiotic overuse can be significant, especially for frail older adults. Potential harms include adverse drug events, drug interactions, and antibiotic-resistant and *Clostridioides difficile* infections.

As part of our continuing commitment to provide the best quality care to our residents, we are dedicated to improving antibiotic use through antibiotic stewardship implementation. **Antibiotic stewardship** refers to a set of commitments and activities designed to “optimize the treatment of infections while reducing the adverse events associated with antibiotic use.”

We are committed to improving antibiotic prescribing practices. We will provide staff and resources to support antibiotic stewardship implementation. We are confident that with the support of front-line staff, prescribing clinicians, and residents and families, we will continue to provide residents with the best quality care by improving antibiotic use, and protecting them from the unintended harms of inappropriate antibiotic use.

Sincerely,

To learn more about appropriate antibiotic prescribing and use, visit www.cdc.gov/antibiotic-use.



CS 294480



Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE