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# Antibiotic stewardship

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# Antibiotic stewardship

## Abstract

The inappropriate use of antibiotics has been associated with adverse events that have short- and long-term effects on the patient and society. These adverse events have the potential to burden the health-care system and negatively impact current and future generations. Dentists contribute to more than 10% of all antibiotic prescriptions. Antibiotic stewardship is defined as “the optimal selection, dosage, and duration of antimicrobial treatment that results in the best clinical outcome for the treatment or prevention of infection, with minimal toxicity to the patient and minimal impact on subsequent resistance.”<sup>1</sup> The practice of antibiotic stewardship will help dentists prescribe the appropriate antibiotic with correct dose, duration, and timing for the patient diagnosis. Dentists and dental offices nationwide will benefit from the practice of antibiotic stewardship, and the implementation of these practices will likely improve patient outcomes. This continuing education program will provide an understanding of antibiotic stewardship, direct dental teams to the information they need to evaluate their current protocols, and inspire dental teams to practice antibiotic stewardship.

## Educational objectives

At the conclusion of this educational activity, participants will be able to:

1. Review the current status of public health problems that result from the inappropriate use of antibiotics
2. Define and explore the concept of antibiotic stewardship
3. Explore existing national trainings, state toolkits, and practice guidelines in general dentistry
4. Apply and evaluate the practice of stewardship to their private practices



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This course was written for dentists, dental hygienists, and dental assistants, from novice to skilled.

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**Requirements for successful completion:** To obtain three CE credits for this educational activity, you must pay the required fee, review the material, complete the course evaluation, and obtain a score of at least 70%.

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## Public health problem

As unfavorable patient outcomes continue to climb in the United States, the demand for antibiotic stewardship in inpatient and outpatient settings increases. Some adverse patient outcomes associated with inappropriate antibiotic use include allergic reactions, antibiotic resistance, *Clostridioides difficile* infections (CDI), and disruption of normal flora. As clinicians practicing evidence-based dentistry (EBD), we are called to evaluate each case with the latest evidence and our own personal expertise, while accounting for patient needs, desires, and values. Understanding the risks and benefits associated with the use of antibiotics will help our practice of EBD for preventing and treating oral infections.<sup>1</sup>

An example of a short-term adverse event associated with systemic antibiotic use is an allergic reaction. Data from 2011–2015 demonstrated adults age 20 and older had an estimated 145,490 emergency department visits for adverse events associated with antibiotic use.<sup>2</sup> Studies estimate 74–78% of antibiotic-associated adverse events are allergic reactions.<sup>2,3</sup> The most common antibiotic classes that resulted in adverse events included sulfonamides, penicillins, and quinolones.<sup>2</sup> Among general dentists, these three antibiotic classes account for the majority of commonly prescribed antibiotics for prevention and treatment of oral infections.<sup>4</sup>

In addition to allergic drug reactions, aspects of the microbiome that are beneficial to the body's homeostasis can be altered by antibiotics. Antibiotics benefit the host by treating the infection and benefit the community by preventing the spread of infection. However, one of the consequences associated with antibiotics is the disruption of normal flora.<sup>5</sup> The human microbiome encompasses the organisms, genes, metabolites, and the host, as well as their intimate and collective interactions. Alteration of the human microbiome or normal flora can compromise our individual health in many ways, such as antibiotic-resistant and opportunistic infections. Once the antibiotic treatment has stopped, the microbiota experiences a degree of resilience, meaning they work to return to their preexposure state. However, the microbiota often does not fully recover, and the compromised

state can last for years.<sup>5</sup> Some of the gut microbiota functions include influencing the function of other cells, signaling and systems, biosynthesis, and metabolism.<sup>6</sup> Disruption of the microbiota can alter these functions and/or result in disease.

A long-term complication of inappropriate antibiotic use is the rise and spread of antibiotic-resistant infections. According to the Centers for Disease Control and Prevention (CDC), antibiotic resistance is a national urgent public health threat causing at least 2,049,442 illnesses per year and claiming at least 23,000 lives.<sup>7</sup> Antimicrobial-resistant strains of bacteria or fungi arise when antibiotics kill some of the good bacteria along with most of the organisms causing an infection or illness. However, the antibiotics may not kill all the bacteria or fungi, leaving dangerous drug-resistant organisms to grow and multiply. This gives rise to strains of bacteria or fungi that are less susceptible or no longer susceptible to current therapies.

Health-care facilities often administer antibiotics to treat infections that can result in resistant and infectious organisms. These resistant organisms can spread through contaminated objects or unclean hands in a hospital environment. Those who come into contact with the microbes can then transfer them to patients in the community. Patients who are most at risk of antibiotic resistance include those who receive treatment for end-stage renal disease, transplants, chemotherapy, complex surgery, or patients with inflammatory arthritis.<sup>7</sup>

A costly adverse outcome associated with the use of antibiotics is *Clostridioides difficile* (*C. diff*) infection. *C. diff* is an anaerobic, gram-positive, spore-forming bacillus that induces pseudomembranous colitis. Strains of *C. diff* can become drug resistant, and they are increasing in prevalence and severity. Complications from *C. diff* infection (CDI) are costly and range in severity from diarrhea to severe complications such as toxic megacolon, sepsis, colectomy, and death.<sup>8</sup> In 2015, over a half million cases of CDI occurred among patients in the United States, and an estimated 15,000 of these infections resulted in death.<sup>7</sup> Like antibiotic resistance, the CDC has classified *C. diff* as an urgent public health threat.<sup>7</sup> Antibiotics commonly used in dentistry and frequently associated with CDI include

clindamycin, penicillins (including ampicillin and amoxicillin), and cephalosporins.<sup>9,10</sup> It is important to note that *C. diff* is found at low levels among normal flora, but antibiotics are associated with disruption of this flora, often leading to antibiotic-resistant organisms and the potential for CDI.<sup>11</sup>

## Antibiotic prescribing patterns

Short-term and long-term adverse events can result from clinical scenarios in which antibiotics are used inappropriately. Antibiotic stewardship has the ability to reduce, not eliminate, the patient risks for these adverse events. In 2017, Durkin et al. examined outpatient antibiotic claims data for the 2015 calendar year.<sup>4</sup> All dentists, including specialists, were ranked third by count of antibiotics prescribed. General dentists ranked first when ranked by count of prescriptions. Dentists accounted for 17.93% of all prescribers, and 13.17% of all prescriptions during this one-year period. Antibiotics were typically prescribed for seven to 10 days, with few prescriptions shorter than five days. The number of prescriptions written to treat infections was highest in the Southern and Northeastern regions of the United States. Although antibiotics are frequently needed to prevent and treat oral infections, often antibiotics are used inappropriately.

## Practical implementation

Outpatient settings, including dental offices, are the sites for the majority of antibiotic prescribing. The CDC shares and explains the common reasons for the inappropriate use of antibiotics.<sup>12</sup>

- Unnecessary antibiotic use is a situation in which a provider prescribes an antibiotic when it is not indicated. A possible example of unnecessary antibiotic use in dentistry is prescribing a systemic antibiotic for a healthy patient presenting with irreversible pulpitis.<sup>13</sup> In this case, definitive dental treatment is recommended.
- Improper antibiotic selection is when the wrong antibiotic is prescribed for a specific diagnostic condition.
- Errors in antibiotic dosing occur when the proper antibiotic is selected for the correct duration, but the dosing is too frequent, or infrequent, or the individual doses are too high or too low. An

example would be prescribing a pediatric dose of amoxicillin for an adult with pericoronitis.

- Errors in antibiotic duration result in inappropriate dosing. For example, if a patient with dental cellulitis is given only one dose of amoxicillin, 2 g would be incorrect. That dosage is used for prophylaxis when needed. A longer duration of antibiotics based on the case-specific details would be recommended to treat the condition adequately.

In dentistry, there are challenges in quantifying the inappropriate use of antibiotics. Specifically, we do not have diagnostic codes that are associated with dental visits or prescriptions; therefore, we are unable to track and link a diagnosis to the drug, dose, duration, and timing on the prescription, making assessment of appropriateness of use unclear.<sup>14</sup> Despite these challenges, over a three-year period, Durkin et al. estimated 14% of antibiotics prescribed by dentists were inappropriate. Lack of awareness and slow adoption of current guidelines for cardiovascular and prosthetic joint prophylaxis have been indicated as reasons for nonadherence and altered prescribing patterns among dentists.<sup>15,16</sup> A survey among Canadian dentists also reported explanations for unnecessary antibiotic prescriptions that included: unnecessary treatment for periapical abscess and irreversible pulpitis; prescribing patterns associated with dental implant surgery and further complications; and palliative care for uninsured patients seeking a substitute for definitive care, among others.<sup>15</sup> Additionally, it has been noted that diagnostic uncertainty, the fear of adverse outcomes and medicolegal liability, pressure for patient satisfaction, and decision fatigue have been associated with the unnecessary use of antibiotics by medical and dental providers.<sup>12</sup>

Patients may find it difficult to understand why they no longer need prophylactic antibiotics when they have been previously told that it was necessary. It is essential to an evidence-based practice and protocols to ensure providers properly educate and communicate with patients on their risks. Adhering to the new guidelines will assist in reducing the risk of an adverse event as a result of inappropriate antibiotic use.

In order to combat these effects, the CDC encourages antibiotic stewardship to reduce adverse patient outcomes (including the ones described previously), and decrease the cost burden on the health-care system.<sup>17</sup> Antimicrobial stewardship is defined by the Association for Professionals in Infection Control and Epidemiology (APIC) as “a coordinated program that promotes the appropriate use of antimicrobials (including antibiotics), improves patient outcomes, reduces microbial resistance, and decreases the spread of infections caused by multidrug-resistant organisms.”<sup>18</sup> The CDC has created a framework to help providers, such as dentists, to implement these principles, called the Core Elements of Outpatient Antibiotic Stewardship.<sup>19</sup> The four core elements include a commitment to judicious prescribing and patient safety; implementing at least one policy or new clinical practice to improve antibiotic stewardship; tracking and reporting prescribing practices; and offering education for patients, staff, and clinicians.<sup>19</sup> Following are practical ways to implement the four core elements.

### **Tips for antibiotic stewardship implementation in private practice dental offices**

#### **MAKE A COMMITMENT**

Practicing antibiotic stewardship starts with the clinician’s commitment to safe and responsible prescribing. Making a commitment may be different for each provider. The CDC recommends that a “stewardship champion” is identified in the office to coordinate and execute stewardship protocol.<sup>19</sup> One of the best ways that you can support the role of a stewardship champion in your practice is to include these responsibilities in job descriptions. For example, you may choose to have your lead assistant, hygienist, office manager, or associate dentist hold the role of stewardship champion. Expectations and duties should be clear. In the Antibiotic Stewardship Toolkit in Massachusetts, you will see sample job descriptions.<sup>20</sup>

The antibiotic stewardship champion can have a few roles that will help implement the CDC Core Elements of Outpatient Antibiotic Stewardship. The stewardship champion can help others make a

commitment, schedule trainings and/or train team members on antibiotic stewardship, conduct and summarize audit reports, and promote provider, staff, and patient education throughout the office and social media platforms. Additionally, it’s important that auxiliary staff be trained to adequately communicate with patients about the office protocol and clinicians’ practice standards of antibiotic use.

#### **IMPLEMENT NEW POLICIES OR PRACTICES**

Tools exist to help you as a practitioner prescribe responsibly. The CDC has developed a checklist for prescribing antibiotics specifically for dentists. It addresses decisions that a dentist makes while prescribing and educating the patient.<sup>21</sup> Hanging this checklist in your operatories or office where you frequently write your prescriptions will help you develop a protocol and resource for safe prescribing. As noted on the checklist, one of the keys to responsible prescribing is accurate diagnosis.

It is important to remember that the dentist doesn’t have to prescribe alone. Not only is it important to have a stewardship champion, but it is also important to work collaboratively with health-care providers in the community. Interdisciplinary care centered on the patient can help the dentist practice evidenced-based dentistry. A report published by the Veterans Association (VA) demonstrated a 12% decrease in inpatient prescribing of antibiotics over the course of seven years when primary care providers, pharmacists, and dentists worked together to provide interdisciplinary care.<sup>22</sup> In addition to interdisciplinary care, it is important to support antibiotic stewardship within our discipline or profession. Once you make a commitment to antibiotic stewardship, it may be helpful to share this with your local study club or other dentists within your community. You can use some of your study club time to discuss cases, share stories about the impact in your community, or help one another make better clinical decisions.

#### **TRACK AND REPORT**

Each oral health professional must remain accountable for his or her own prescribing patterns. One way to stay accountable



is conducting a self-audit. An example of an audit tool that you can use in your office is located in the Massachusetts State Toolkit.<sup>20</sup> This toolkit is a comprehensive resource that is easy to follow and divided into five indicator factors that help clinicians identify how they are prescribing. Through the use of the Antibiotic Stewardship Chart Audit Tool,<sup>20</sup> the clinician can determine his or her own prescribing patterns and determine what changes need to be implemented to be a more effective steward of antibiotics.

The first section is the informed consent and medical history. This section prompts the prescriber to obtain a thorough, up-to-date medical history and review if there was a recent medical or dental treatment that required antibiotics.

Second is the diagnostic indicator, which helps the prescriber collect all the information necessary to make a proper assessment of the patient's presenting condition. For example, this segment looks at intraoral and extraoral findings, radiographic evaluation, and the pulpal and periapical diagnoses of symptomatic teeth. This diagnosis segment reinforces the need for diagnostic testing such as percussion, palpation, probing depths, hot and cold testing, and the electronic pulp testing for accurate diagnosis prior to prescribing.

The third element of the assessment tool reviews the indications for antibiotic use. These symptoms include, but are not limited to, prophylaxis procedures, localized fluctuant swelling, elevated temperature, inability to remove the drain or source of infection, and delayed treatment or specialty referral. Additionally, patient expectation is listed under this indication. Although evidence-based practice is ideal, if you find that patients are influencing your practice, you can use this data to create specific role plays to train staff or to create office policies concerning antibiotic prescribing to guide your patient base.

The fourth indicator on the Antibiotic Stewardship Chart Audit Tool is the stewardship review. The review assesses each case, stewardship guidelines, and drugs prescribed within the current recommendations. This stewardship review aims to determine if the dosage, duration, and

frequency of the antibiotic prescription is in alignment with the diagnosis, evidence, and treatment plan. The review offers an opportunity for a prescriber to adjust how he or she will treat a case in the future.

We recommend training all team members on how to use the Antibiotic Stewardship Chart Audit Tool and to review as a team quarterly. Each team member assists in the collection of data; therefore, it is essential to train staff on essential chart information for evaluating antibiotic stewardship practices. Broadly, a quarterly report of all prescriptions—including the name of the antibiotic, dosage, and duration of each prescription that was written by each practitioner in the practice—should be recorded. Regularly reviewing these reports can help your team identify any prescribing patterns that can be improved.

#### PATIENT AND STAFF EDUCATION

Prescribers are accountable to the patient and the community at large to practice antibiotic stewardship. One way to help your office be accountable is to provide patients and clinicians with educational resources on current antibiotic guidelines. Each dentist, dental assistant, and dental hygienist should have access to the American Dental Association Chairside Clinical Guide, an example of effective education materials.<sup>23</sup> This guide reviews the protocol for patients with prosthetic joints in relation to the use of antibiotics prior to a prophylaxis.

The American Dental Association's Center for Evidence-based Dentistry also released a new clinical practice guideline titled "Evidence-based clinical practice guideline on the antibiotic use for the urgent management of pulpal- and periapical-related dental pain and intraoral swelling."<sup>26</sup> Accompanying this guideline are two additional chairside guides that help clinicians make decisions for the use of antibiotics to treat tooth pain and intraoral swelling when dental care is and is not available in adults who are not immunocompromised.<sup>27</sup>

Printing these guides and laminating the document for chairside use is an effective communication tool and will help support the commitment that the prescribers have made. Many patients who have taken

antibiotics for years prior to preventive procedures no longer need them. These patients are often hesitant when informed they no longer need to take premedication. It is our job to communicate our commitment to antibiotic stewardship and prevent the inappropriate use of antibiotics.

The impact of providing patient materials is often underestimated. Meeker et al. explored the relationship of a low-cost behavioral intervention (a personalized poster) that demonstrated a public commitment to stewardship concerning acute respiratory infections. They found that a commitment poster with clinician photographs and signatures, when displayed in the examination room for 12 weeks, showed a significant decrease in unnecessary antibiotic prescribing for those with the poster compared to the control with no poster.<sup>24</sup> It is important to note that the study mentions that unnecessary prescribing patterns were still high, greater than 30%, even after the poster intervention. This supports the idea that continual education and implementation of a stewardship program is still needed.

Hanging posters throughout the office in locations such as treatment rooms, restrooms, and waiting rooms is another way for the dental team to demonstrate that they are making a commitment to antibiotic stewardship. Signage and educational materials can supplement and reinforce information offered by dental team members.

Sharing informational content through social media accounts prior to the appointment prepares the patient to better understand dental team members during their appointment. Informational content is easy to implement through social media accounts. Offering written content is also important so caretakers are informed. Simple, yet influential, studies conducted by Moerenhout et al. found that "... 94% of respondents stated they read [posters and leaflets provided in medical and dental offices], 45% took the leaflets home, and 78% indicated they understood the content of the leaflets. Nineteen percent of respondents reportedly discussed the content of the leaflets with their physician and 26% indicated that leaflets allowed them to ask fewer questions of their physician."<sup>25</sup>

Educational infographics can enhance the patient's knowledge and reinforce the information shared by the dental team.

Suggestions for using patient educational material on social media platforms in dental offices can be found in the Massachusetts State Toolkit for Antibiotic Stewardship for Oral Health Clinicians.<sup>20</sup> Additionally, using technology to provide patients with information in person, or using visual aids or videos, can assist in their comprehension of the theory of antibiotic stewardship. Audio and video content can be highlighted through office newsletters, emails, patient reminder systems, and social media accounts. The CDC and some state toolkits provide audio and video resources to assist the dental team in educating patients on the risks and benefits of taking antibiotics, the expectations for use, and the role of stewardship in good practice.<sup>12</sup>

In order to effectively achieve antibiotic stewardship, it is essential to conduct regular team meetings. This allows the team to evaluate the current science, train staff on protocol, reinforce the practice's stewardship commitment, and review patient cases. Updates on antibiotic stewardship can be incorporated into the existing monthly or biweekly meetings. The collaborative meetings become a valuable resource for the entire team when conducted effectively. All team members need to practice communicating with patients about the science and recommendations of antibiotic stewardship. Communication can be challenging, but when updating the science, phrases such as "we now know," "current research demonstrates," and "the benefits of the antibiotic do not outweigh the risks" can increase patient confidence.

A key aspect to clear communication is unified messaging among team members. Team meetings allow for all members to present questions and review the office policy concerning antibiotic stewardship. Empowering each team member to represent the commitment will increase their credibility with patients and will reinforce the importance of antibiotic stewardship for the patient and the community.

There are multiple resources that can be reviewed during team meetings. The CDC provides valuable online CE courses. The online antibiotic stewardship course reviews the history of antibiotic use, the process of antibiotic resistance, and practical steps to implement to encourage responsible prescribing.<sup>12</sup> This course includes four sections that inform health-care professionals about proper prescribing and aims to promote conversations between clinicians and patients. As a dental team, it may be useful to work through these online resources at regular team meetings or attend training in your state. When onboarding new employees, providing training on the practice's commitment to stewardship is essential so that the team shares uniform information with the patients.

### Conclusion

We hope that this course provided an introduction to the impact you can make for your patients and community by practicing antibiotic stewardship in your office. We hope that you take the first step today by committing to one aspect of stewardship by writing it down and sharing it with your team. We encourage you to explore the resources through the CDC and professional

dental organizations and reach out to your state's department of public health. This network will help you identify resources with regard to antibiotic stewardship for dental health-care workers and help you start your own journey in stewardship.

### REFERENCES

1. Gerding DN. The search for good antimicrobial stewardship. *Jt Comm J Qual Improv.* 2001;27(8):403-404.
2. Geller AI, Lovegrove MC, Shehab N, et al. National estimates of emergency department visits for antibiotic adverse events among adults—United States, 2011–2015. *J Gen Intern Med.* 2018 Jul;33(7):1060–8. <http://link.springer.com/10.1007/s11606-018-4430-x>. Accessed Jan. 21, 2019.
3. Shehab N, Patel PR, Srinivasan A, Budnitz DS. Emergency department visits for antibiotic-associated adverse events. *Clin Infect Dis.* 2018;47(6):735-743.
4. Durkin MJ, Hsueh K, Sallah YH, et al. An evaluation of dental antibiotic prescribing practices in the United States. *J Am Dent Assoc.* 2017 Dec;148(12):878-886.e1. <https://linkinghub.elsevier.com/retrieve/pii/S0002817717306542>. Accessed Jan. 20, 2019.
5. Blaser MJ. Antibiotic use and its consequences for the normal microbiome. *Science.* 2016 Apr 29;352(6285):544–5. <http://www.sciencemag.org/lookup/doi/10.1126/science.aad9358>. Accessed Jan. 22, 2019.
6. Lynch SV, Pedersen O. The human intestinal microbiome in health and disease. *N Engl J Med.* 2016 Dec;15;375(24):2369-2379. Accessed Jan. 23, 2019.
7. Centers for Disease Control and Prevention. Antibiotic resistance threats in the United States, 2013. <https://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf>. Accessed Jan. 21, 2019.
8. Lessa FC, Mu Y, Bamberg WM, et al. Burden of *Clostridium difficile* infection in the United States. *N Engl J Med.* 2015 Feb 26;372(9):825–34. <http://www.nejm.org/doi/10.1056/NEJMoa1408913>. Accessed Jan. 18, 2019.

### Notes

9. ADA Council on Scientific Affairs. Combating antibiotic resistance. *J Am Dent Assoc.* 2004 Apr;135(4):484–7. <https://linkinghub.elsevier.com/retrieve/pii/S0002817714612344>. Accessed Jan. 21, 2019.
10. Leffler DA, Lamont JT. *Clostridium difficile* infection. *N Engl J Med.* 2015 Apr 16;372(16):1539–48. <http://www.nejm.org/doi/10.1056/NEJMra1403772>. Accessed Jan. 22, 2019.
11. Kamada N, Chen GY, Inohara N, Núñez G. Control of pathogens and pathobionts by the gut microbiota. *Nat Immunol.* 2013 Jun 18;14(7):685–690. <http://www.nature.com/doi/10.1038/ni.2608>. Accessed Jan. 22, 2019.
12. Centers for Disease Control and Prevention. Antibiotic prescribing and use in doctor's offices. <https://www.cdc.gov/antibiotic-use/community/materials-references/video-audio.html>. Accessed Mar. 9, 2019.
13. Nagle D, Reader A, Beck M, Weaver J. Effect of systemic penicillin on pain in untreated irreversible pulpitis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endodontology.* 2000 Nov;90(5):636–640. <http://linkinghub.elsevier.com/retrieve/pii/S1079210400544333>. Accessed Feb. 4, 2019.
14. Fluent MT, Jacobsen PL, Hicks LA. Considerations for responsible antibiotic use in dentistry. *J Am Dent Assoc.* 2016 Aug;147(8):683–686. <https://linkinghub.elsevier.com/retrieve/pii/S0002817716304093>. Accessed Jan. 22, 2019.
15. Marra F, George D, Chong M, et al. Antibiotic prescribing by dentists has increased. *J Am Dent Assoc.* 2016 May;147(5):320–327. <https://linkinghub.elsevier.com/retrieve/pii/S0002817715012131>. Accessed Jan. 20, 2019.
16. Roberts RM, Bartoces M, Thompson SE, Hicks LA. Antibiotic prescribing by general dentists in the United States, 2013. *J Am Dent Assoc.* 2017 Mar;148(3):172–178.e1. <https://linkinghub.elsevier.com/retrieve/pii/S0002817716309424>. Accessed Jan. 22, 2019.
17. Centers for Disease Control and Prevention. Antibiotic use in the United States, 2017: progress and opportunities. Atlanta, GA: US Department of Health and Human Services, CDC; 2017.
18. Association for Professionals in Infection Control and Epidemiology. Antimicrobial stewardship. <https://apic.org/Professional-Practice/Practice-Resources/Antimicrobial-Stewardship>. Accessed Jan. 21, 2019.
19. Centers for Disease Control and Prevention. The core elements of outpatient antibiotic stewardship. [https://www.cdc.gov/antibiotic-use/community/pdfs/16\\_268900-A\\_CoreElementsOutpatient\\_508.pdf](https://www.cdc.gov/antibiotic-use/community/pdfs/16_268900-A_CoreElementsOutpatient_508.pdf).
20. Massachusetts Department of Public Health, Bureau of Infectious Disease and Laboratory Sciences. Antibiotic Stewardship Toolkit Oral Health Clinicians. <https://mdphgis.maps.arcgis.com/apps/Cascade/index.html?appid=d719c2ecbe1149cfc7c85fe373f2cd7>. Accessed Mar. 29, 2019.
21. Centers for Disease Control and Prevention. Checklist for antibiotic prescribing in dentistry. <https://www.cdc.gov/antibiotic-use/community/downloads/dental-fact-sheet-FINAL.pdf>. Accessed Mar. 9, 2019.
22. Kelly AA, Jones MM, Echevarria KL, et al. A report of the efforts of the Veterans Health Administration National Antimicrobial Stewardship Initiative. *Infect Control Hosp Epidemiol.* 2017 May;38(5):513–520.
23. American Dental Association. Center for Evidence-Based Dentistry. Chairside guide: Management of patients with prosthetic joints undergoing dental procedures. [https://www.ada.org/~media/EBD/Files/ADA\\_Chairside\\_Guide\\_Prosthetics.pdf?la=en](https://www.ada.org/~media/EBD/Files/ADA_Chairside_Guide_Prosthetics.pdf?la=en).
24. Meeker D, Knight TK, Friedberg MW, et al. Nudging guideline-concordant antibiotic prescribing: a randomized clinical trial. *JAMA Intern Med.* 2014 Mar;174(3):425–431. doi:10.1001/jamainternmed.2013.14191
25. Moerenhout T, Borgermans L, Schol S, et al. Patient health information materials in waiting rooms of family physicians: do patients care? *Patient Preference and Adherence.* 2013 Jun;7:489–497. doi:10.2147/PPA.S45777
26. Lockhart P, Tampi M, Abt E, et al. Evidence-Based Clinical Practice Guideline on Antibiotic Use for the Urgent Management of Pulpal- and Periapical-Related Dental Pain and Intraoral Swelling. *J Am Dent Assoc.* 2019;150(11). doi:10.1016/j.adaj.2019.08.020
27. American Dental Association. Center for Evidence-Based Dentistry. Chairside guide: Dental treatment is immediately available. [https://ebd.ada.org/~media/EBD/Files/ADA\\_Chairside\\_Guide\\_Antibiotics\\_TA.pdf?la=en](https://ebd.ada.org/~media/EBD/Files/ADA_Chairside_Guide_Antibiotics_TA.pdf?la=en).



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**ERINNE KENNEDY, DMD, MMSc, MPH**, graduated from Nova Southeastern College of Dental Medicine in 2015. She completed a one-year general practice residency at a Veterans Affairs hospital in 2016, and her dental public health residency in 2018. She graduated as an inaugural

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## Notes

## ONLINE COMPLETION

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## QUESTIONS

- Which of the following is not an adverse outcome of antibiotic use?
  - Allergic reaction
  - Antibiotic resistance
  - Clostridioides difficile* infections (CDI)
  - Resolution of an infection
- Which best describes evidenced-based dentistry (EBD)?
  - Personal expertise, patient needs, anecdotal evidence
  - Personal expertise, patient needs, latest evidence
  - Personal expertise, provider needs, anecdotal evidence
  - None of the above
- Among emergency department visits for adults in the US, what estimated percentage is associated with allergic reactions?
  - ~ 25%
  - ~ 50%
  - ~ 75%
  - ~100%
- What are the top three antibiotics classes that result in allergic reactions leading to emergency department visits?
  - Macrolides, penicillins, and quinolones
  - Sulfonamides, macrolides, and quinolones
  - Penicillins, macrolides, and quinolones
  - Sulfonamides, penicillins, and quinolones
- Antibiotics are known to disrupt the normal flora of the microbiome. The compromised state of the gut microbiota can last for how long?
  - Minutes
  - Days
  - Months
  - Years
- According to the CDC, antibiotic resistance is classified as which level of public health threat?
  - Mild
  - Concerning
  - Serious
  - Urgent
- Which of the following conditions result in an increased susceptibility of developing an antibiotic-resistant infection?
  - End-stage renal disease
  - Chemotherapy
  - Inflammatory arthritis
  - All of the above
- Which of the following classes of antibiotics are commonly used in dentistry and frequently associated with *Clostridioides difficile* infections?
  - Clindamycin
  - Vancomycin
  - Cephalosporins
  - A and C
- According to the CDC, *Clostridioides difficile* is classified as which level of public health threat?
  - Mild
  - Concerning
  - Serious
  - Urgent
- According to a 2017 study by Durkin et al., how do general dentists rank by count of prescriptions of all providers?
  - First
  - Second
  - Third
  - Last
- According to a 2017 study by Durkin et al., in which regions of the United States were the number of prescriptions written by dentists the highest?
  - Northeast and South
  - Northwest and Midwest
  - Midwest and Southwest
  - None of the above
- According to a 2017 study by Durkin et al., of all prescriptions written during this one-year period, what estimated percentage was attributed to dentists?
  - 10%
  - 11%
  - 12%
  - 13%
- Which of the following are reasons for the inappropriate use of antibiotics?
  - Improper antibiotic selection
  - Errors in dose
  - Errors in duration
  - All of the above
- An adult patient presents with a diffuse odontogenic infection associated with tooth No. 1. You prescribe a pediatric dose of amoxicillin. How would you classify this error?
  - Unnecessary use
  - Improper antibiotic selection
  - Error in dose
  - Error in duration
- In 2015, how many cases of *Clostridioides difficile* occurred among patients in the United States?
  - 100,000
  - 200,000
  - 300,000
  - 500,000
- In 2015, how many cases of *Clostridioides difficile* resulted in death among patients in the United States?
  - 10,000
  - 13,000
  - 15,000
  - 22,000



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## QUESTIONS

17. In addition to patients with end-stage renal disease, transplants, chemotherapy, and complex surgery, which of the following conditions puts patients most at risk of antibiotic resistance?
- High blood pressure
  - Asthma
  - Inflammatory arthritis
  - All the above
18. Prescribing a systemic antibiotic for a patient presenting with a condition that does not warrant antibiotic use is an example of:
- Antibiotic stewardship
  - Improper antibiotic selection
  - Error in dosing
  - Unnecessary antibiotics
19. What is the term for prescribing the wrong antibiotic for a specific diagnostic condition?
- Antibiotic stewardship
  - Improper antibiotic selection
  - Error in dosing
  - Unnecessary antibiotics
20. What is the term for prescribing a pediatric dose of amoxicillin for an adult with a dental infection?
- Antibiotic stewardship
  - Improper antibiotic selection
  - Error in dosing
  - Unnecessary antibiotics
21. What percentage of inappropriate antibiotics was prescribed over a three-year period according to a study by Durkin et al.?
- 5 %
  - 9 %
  - 13 %
  - 25 %
22. The CDC has created a framework to help providers, such as dentists, implement antibiotic stewardship. What is it called?
- Core Elements of Outpatient Antibiotic Stewardship
  - Elements of Outpatient Antibiotic Stewardship
  - Comprehensive Elements of Outpatient Stewardship
  - Core Elements of Antimicrobial Stewardship in Outpatients
23. What are the four core elements of outpatient antibiotic stewardship?
- Commitment; action for policy and practice; monitoring; education and expertise
  - Contribution; action for policy and practice; tracking and reporting; education and expertise
  - Commitment; support for policy and practice; tracking and reporting; education and expertise
  - Commitment; action for policy and practice; tracking and reporting; education and expertise
24. What does APIC stand for?
- Association for Professionals in Infection Control and Epidemiology
  - American Professionals in CDC
  - American Professors in CDC
  - Association of Professionals in Infection Cases
25. The CDC recommends that a person be responsible for helping other team members be trained and evaluated on the importance of antibiotic stewardship, organize reports, and organize provider, staff, and patient education. What is the role of this person called?
- Lead assistant
  - Lead RDH
  - Office manager
  - Stewardship champion
26. What tool can help the dental team keep track of cases in which antibiotics are used so they can review and adapt practices?
- Self-audit reports
  - Educational posters
  - Case review
  - All of the above
27. According to a survey of Canadian dentists, what were possible explanations for unnecessary antibiotic prescriptions?
- Unnecessary treatment for periapical abscess
  - Irreversible pulpitis
  - Prescribing patterns associated with dental implants
  - All of the above
28. What percentage of respondents stated they read posters and leaflets provided in medical and dental offices?
- 87 %
  - 75 %
  - 68 %
  - 54 %
29. The CDC has developed a checklist for prescribing antibiotics specifically for dentists. Where is the best place to place this checklist?
- Top drawer of the treatment room cabinet
  - Reception area
  - Lunch room
  - Where you prescribe antibiotics most frequently
30. How can dental professionals demonstrate their commitment to antibiotic stewardship?
- Customized poster in the reception area
  - Social media content
  - Patient pamphlets
  - All of the above

# Antibiotic stewardship

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_ SPECIALTY: \_\_\_\_\_

ADDRESS: \_\_\_\_\_ EMAIL: \_\_\_\_\_ AGD MEMBER ID (IF APPLIES): \_\_\_\_\_

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ ZIP: \_\_\_\_\_ COUNTRY: \_\_\_\_\_

TELEPHONE: PRIMARY ( ) \_\_\_\_\_ OFFICE ( ) \_\_\_\_\_ LICENSE RENEWAL DATE: \_\_\_\_\_

**REQUIREMENTS FOR OBTAINING CE CREDITS BY MAIL/FAX:** 1) Read entire course. 2) Complete info above. 3) Complete test by marking one answer per question. 4) Complete course evaluation. 5) Complete credit card info or write check payable to Endeavor Business Media. 6) Mail/fax this page to DACE. A score of 70% is required for CE credit. **FOR QUESTIONS, CALL (800) 633-1681. COURSE MAY ALSO BE COMPLETED AT DENTALACADEMYOFCE.COM.**

## Educational Objectives

- Review the current status of public health problems that result from the inappropriate use of antibiotics
- Define and explore the concept of antibiotic stewardship
- Explore existing national trainings, state toolkits, and practice guidelines in general dentistry
- Apply and evaluate the practice of stewardship to their private practices

## Course Evaluation

- Were the individual course objectives met?

Objective #1: Yes No      Objective #3: Yes No  
 Objective #2: Yes No      Objective #4: Yes No

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

- |   |       |    |   |   |   |   |
|---|-------|----|---|---|---|---|
| 2. To what extent were the course objectives accomplished overall?                            | 5     | 4  | 3 | 2 | 1 | 0 |
| 3. Please rate your personal mastery of the course objectives.                                | 5     | 4  | 3 | 2 | 1 | 0 |
| 4. How would you rate the objectives and educational methods?                                 | 5     | 4  | 3 | 2 | 1 | 0 |
| 5. How do you rate the author's grasp of the topic?   | 5     | 4  | 3 | 2 | 1 | 0 |
| 6. Please rate the instructor's effectiveness.  | 5     | 4  | 3 | 2 | 1 | 0 |
| 7. Was the overall administration of the course effective?                                    | 5     | 4  | 3 | 2 | 1 | 0 |
| 8. Please rate the usefulness and clinical applicability of this course.                      | 5     | 4  | 3 | 2 | 1 | 0 |
| 9. Please rate the usefulness of the supplemental web bibliography.                           | 5     | 4  | 3 | 2 | 1 | 0 |
| 10. Do you feel that the references were adequate?  | Yes   | No |   |   |   |   |
| 11. Would you participate in a similar program on a different topic?                          | Yes   | No |   |   |   |   |
| 12. If any of the continuing education questions were unclear or ambiguous, please list them. | _____ |    |   |   |   |   |
| 13. Was there any subject matter you found confusing? Please describe.                        | _____ |    |   |   |   |   |
| 14. How long did it take you to complete this course?   | _____ |    |   |   |   |   |
| 15. What additional continuing dental education topics would you like to see?                 | _____ |    |   |   |   |   |

Mail/fax completed answer sheet to:

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| 10. (A) (B) (C) (D) | 25. (A) (B) (C) (D) |
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| 13. (A) (B) (C) (D) | 28. (A) (B) (C) (D) |
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| 15. (A) (B) (C) (D) | 30. (A) (B) (C) (D) |

AGD Code 730

PLEASE PHOTOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.

#### INSTRUCTIONS

All questions have only one answer. Grading of this examination is done manually. Participants will receive confirmation of passing by receipt of a verification form. Verification of Participation forms will be mailed within two weeks after taking an examination.

#### COURSE EVALUATION AND FEEDBACK

We encourage participant feedback. Complete the survey above and e-mail feedback to Aileen Gunter (agunter@endeavor2b.com) and Laura Winfield (lwinfield@endeavor2b.com).

#### COURSE CREDITS AND COST

All participants scoring at least 70% on the examination will receive a verification form for three CE credits. The formal CE program of this sponsor is accepted by the AGD for fellowship and mastership credit. Please contact Endeavor for current term of acceptance. Participants are urged to contact their state dental boards for continuing education requirements. Endeavor is a California CE provider. The California provider number is 4527. The cost for courses ranges from \$20 to \$110.

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#### RECORD KEEPING

Endeavor maintains records of your successful completion of any exam for a minimum of six years. Please contact our offices for a copy of your CE credits report. This report, which will list all credits earned to date, will be generated and mailed to you within five business days of receipt.

#### EDUCATIONAL DISCLAIMER

Completing a single CE course should not provide enough information to give participants the feeling that they are experts in the field related to the course topic. It is a combination of many educational courses and clinical experience that allows the participant to develop skills and expertise.

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