

Guideline on Antibiotic Prophylaxis for Dental Patients at Risk for Infection

Originating Committee

Clinical Affairs Committee

Review Council

Council on Clinical Affairs

Adopted

1990

Revised

1991, 1997, 1999, 2002, 2005, 2007, 2008, 2011

Purpose

The American Academy of Pediatric Dentistry (AAPD) recognizes that numerous medical conditions predispose patients to bacteremia-induced infections. Because it is not possible to predict when a susceptible patient will develop an infection, prophylactic antibiotics are recommended when these patients undergo procedures that are at risk for producing bacteremia. This guideline is intended to help practitioners make decisions regarding antibiotic prophylaxis for dental patients at risk.

Methods

This guideline is an update of the previous document adopted in 1990 and last revised in 2008. It is based on a review of current dental and medical literature pertaining to post procedural bacteremia-induced infections. The update included a systematic literature search of the PubMed® electronic database with the following parameters: Terms: "infective endocarditis" (IE), "bacteremia", "antibiotic prophylaxis", AND and "dental infection"; Fields: all; Limits: within the last 15 years, humans, clinical trials, and birth through age 18. One hundred thirteen articles matched these criteria. Papers for review were chosen from this list and from the references within selected articles. When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians. In addition, "Prevention of infective endocarditis: Guidelines from the American Heart Association"^{1,2} was reviewed.

Background

Bacteremia, bacteria in the bloodstream, is anticipated following invasive dental procedures.^{3,4} Infective endocarditis is an uncommon but life-threatening complication resulting from bacteremia. The incidence of infections such as IE ranges from 5.0 to 7.9 per 100,000 person-years with a significant increasing trend among women.⁵ Only a limited number of bacterial species have been implicated in resultant postoperative infections. *Streptococcus viridans*, *staphylococcus aureus*,

enterococcus, pseudomonas, serratia, and candida are some of the microorganisms implicated with IE.^{1,2} The vast majority of cases of IE caused by oral microflora can result from bacteremia associated with routine daily activities such as toothbrushing, flossing, and chewing.^{1,2} However, antibiotic prophylaxis is recommended with certain dental procedures.¹⁻⁴ An effective antibiotic regimen should be directed against the most likely infecting organism, with antibiotics administered shortly before the procedure. When procedures involve infected tissues or are performed on a patient with a compromised host response, additional doses or a prescribed postoperative regimen of antibiotics may be necessary.

Antibiotic usage may result in the development of resistant organisms.^{1-4,6,7} Utilization of antibiotic prophylaxis for patients at risk does not provide absolute prevention of infection. Post-procedural symptoms of acute infection (eg, fever, malaise, weakness, lethargy) may indicate antibiotic failure and need for further medical evaluation.

The decision to use antibiotic prophylaxis should be made on an individual basis. Some medical conditions that may predispose patients to post-procedural infections are discussed below. This is not intended to be an exhaustive list; rather, the categorization should help practitioners identify children who may be at increased risk. If a patient reports a syndrome or medical condition with which the practitioner is not familiar, it is appropriate to contact the child's physician to determine susceptibility to bacteremia-induced infections.

In 2007, the American Heart Association (AHA) released its newly revised guidelines for the prevention of IE and reducing the risk for producing resistant strains of bacteria.^{1,2} The AAPD, acknowledging the AHA's expertise and efforts to produce evidenced-based recommendations, continues to endorse the AHA guideline for antibiotic prophylaxis, entitled "Prevention of Infective Endocarditis".

The significant reasons for the revision include^{1,2}:

- "IE is much more likely to result from frequent exposure to random bacteremias associated with daily activities

than from bacteremia caused by a dental, GI tract, or GU tract procedure."¹ (Daily activities would include tooth brushing, flossing, chewing, using toothpicks, using water irrigation devices, and other activities.)

- "Prophylaxis may prevent an exceedingly small number of cases of IE, if any, in individuals who undergo a dental, GI tract, or GU tract procedure.
- The risk of antibiotic-associated adverse events exceeds the benefit, if any, from prophylactic antibiotic therapy.
- Maintenance of optimal oral health and hygiene may reduce the incidence of bacteremia from daily activities and is more important than prophylactic antibiotics for a dental procedure to reduce the risk of IE."¹

The recent AHA revision was intended to clarify when antibiotic prophylaxis is/is not recommended and to provide more uniform global recommendations. Major changes from the 1997 version^{1,2,6} include:

- (1) "The Committee concluded that only an extremely small number of cases of infective endocarditis might be prevented by antibiotic prophylaxis for dental procedures even if such prophylactic therapy were 100% effective.
- (2) Infective endocarditis prophylaxis for dental procedures is reasonable only for patients with underlying cardiac conditions associated with the highest risk of adverse outcome from infective endocarditis.
- (3) For patients with these underlying cardiac conditions, prophylaxis is reasonable for all dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa.
- (4) Prophylaxis is not recommended based solely on an increased lifetime risk of acquisition of infective endocarditis."¹

Recommendations

The conservative use of antibiotics is indicated to minimize the risk of developing resistance to current antibiotic regimens.^{1-4,7,8} Given the increasing number of organisms that have developed resistance to current antibiotic regimens, as well as the potential for an adverse anaphylactic reaction to the drug administered, it is best to be judicious in the use of antibiotics for the prevention of IE^{1,2} and other distant-site infections.⁹

Patients with cardiac conditions

Dental practitioners should consider prophylactic measures to minimize the risk of IE in patients with underlying cardiac conditions. The risk of developing IE can arise from a combination of high-risk patients and dental procedures. However, at-risk patients with poor oral hygiene and gingival bleeding after routine activities (eg, toothbrushing) also have shown an increased potential for developing complications of IE.^{1,2,10,11} It, therefore, is recommended to encourage daily good oral hygiene practices to reduce gingivitis as part of the prophylactic regimen.^{1,2,9,10} These patients and/or parents need to be educated and motivated to maintain personal oral hygiene through daily plaque removal, including flossing.^{1,2} Greater emphasis should be placed on improved access to dental care and oral health in patients with underlying cardiac conditions at high risk for

IE and less focus on a dental procedure and antibiotic coverage.^{1,2,8-10} Professional prevention strategies should be based upon the individual's assessed risk for caries and periodontal disease.

Specific recommendations from the latest AHA guideline on prevention of IE are included in the following tables. The AHA recommends antibiotic prophylaxis only for those whose underlying cardiac conditions are associated with the highest risk of adverse outcome^{1,2} (see Table 1). Such conditions include prosthetic heart valves, previous history of IE, unrepaired or incompletely repaired cyanotic congenital heart disease (CHD), completely repaired congenital heart defect with prosthetic material or device during the first 6 months after the procedure, repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or device, and cardiac transplantation recipients who develop cardiac valvulopathy.^{1,2} In addition to those diagnoses listed in the AHA guidelines, patients with a reported history of injection drug use may be considered at risk for developing IE in the absence of cardiac anomalies.¹¹ Although quite rare, complications from intraoral tongue piercing can include IE among patients with a pre-existing cardiac valvular condition and/or history of injection drug use.¹²⁻¹⁴ Consultation with the patient's physician may be necessary to determine susceptibility to bacteremia-induced infections.

Antibiotics are recommended for all dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa^{1,2} (see Table 2). Specific antibiotic regimens can be found in Table 3. Practitioners and patients/parents can review the entire AHA guidelines in the AHA Circulation Journal archives, "<http://circ.ahajournals.org/cgi/content/full/116/15/1736>" for additional background information as well as discussion of special circumstances (eg, patients already receiving antibiotic therapy, patients on anticoagulant therapy).

Patients with compromised immunity

Patients with a compromised immune system may not be able to tolerate a transient bacteremia following invasive dental procedures.⁸ These non-cardiac factors can place a patient with compromised immunity at risk for distant-site infection from a dental procedure.⁸ This category includes, but is not limited to, patients with the following medical conditions⁸:

1. immunosuppression secondary to:
 - A. human immunodeficiency virus (HIV);
 - B. severe combined immunodeficiency (SCIDS);
 - C. neutropenia;
 - D. cancer chemotherapy;
 - E. hematopoietic stem cell or solid organ transplantation
2. head and neck radiotherapy
3. autoimmune disease (eg, juvenile arthritis, systemic lupus erythematosus)
4. sickle cell anemia;
5. asplenism or status post splenectomy;
6. chronic steroid usage;
7. diabetes;
8. bisphosphonate therapy^{16,17}.

Table 1. CARDIAC CONDITIONS ASSOCIATED WITH THE HIGHEST RISK OF ADVERSE OUTCOME FROM ENDOCARDITIS FOR WHICH PROPHYLAXIS WITH DENTAL PROCEDURES IS REASONABLE

Prosthetic cardiac valve or prosthetic material used for cardiac valve repair
Previous infective endocarditis
Congenital heart disease (CHD)*
Unrepaired cyanotic CHD, including palliative shunts and conduits
Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure †
Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialization)
Cardiac transplantation recipients who develop cardiac valvulopathy

* Except for the conditions listed above, antibiotic prophylaxis is no longer recommended for any other form of CHD.

† Prophylaxis is reasonable because endothelialization of prosthetic material occurs within 6 months after the procedure.

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Table 2. DENTAL PROCEDURES FOR WHICH ENDOCARDITIS PROPHYLAXIS IS REASONABLE FOR PATIENTS IN TABLE 1

All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa**

* The following procedures and events do not need prophylaxis: routine anesthetic injections through non-infected tissue, taking dental radiographs, placement of removable prosthodontic or orthodontic appliances, adjustment of orthodontic appliances, placement of orthodontic brackets, shedding of deciduous teeth, and bleeding from trauma to the lips or oral mucosa.

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Table 3. REGIMENS FOR A DENTAL PROCEDURE

Situation	Agent	Regimen: Single Dose 30 to 60 min Before Procedure	
		Adults	Children
Oral	Amoxicillin	2 g	50 mg/kg
Unable to take oral medication	Ampicillin	2 g IM or IV	50 mg/kg IM or IV
	OR Cefazolin or ceftriaxone	1 g IM or IV	50 mg/kg IM or IV
Allergic to penicillins or ampicillin—oral	Cephalexin**	2 g	50 mg/kg
	OR Clindamycin	600 mg	20 mg/kg
	OR Azithromycin or clarithromycin	500 mg	15 mg/kg
Allergic to penicillin or ampicillin and unable to take oral medication	Cefazolin or ceftriaxone†	1 g IM or IV	50 mg/kg IM or IV
	OR Clindamycin	600 mg IM or IV	20 mg/kg IM or IV

IM indicates intramuscular; IV, intravenous.

* Or other first- or second-generation oral cephalosporin in equivalent adult or pediatric dosage.

† Cephalosporins should not be used in an individual with a history of anaphylaxis, angioedema, or urticaria with penicillins or ampicillin.

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Consultation with the child's physician is recommended for management of patients with a compromised immune system. Discussion of antibiotic prophylaxis for patients undergoing chemotherapy, irradiation, and hematopoietic cell transplantation appears in a separate AAPD guideline.¹⁸

Patients with shunts, indwelling vascular catheters, or medical devices

The AHA recommends that antibiotic prophylaxis for nonvalvular devices, including indwelling vascular catheters (central lines) and cardiovascular implantable electronic devices (CIED), is indicated only at the time of placement of these devices in order to prevent surgical site infection.^{8,19-21} The AHA found no convincing evidence that microorganisms associated with dental procedures cause infection of CIED and nonvalvular devices at any time after implantation.^{8,19-21} The infections occurring after device implantation most often are caused by *Staphylococcus aureus* and coagulase negative staphylococci or other microorganisms that are non-oral in origin but are associated with surgical implantation or other active infections.²⁰⁻²² The AHA further states that immunosuppression is not an independent risk factor for nonvalvular device infections; immunocompromised hosts who have those devices should receive antibiotic prophylaxis as advocated for immunocompetent hosts.^{8,19-21} Consultation with the child's physician is recommended for management of patients with nonvalvular devices.

Ventriculoatrial (VA), ventriculocardiac (VC), or ventriculovenous (VV) shunts for hydrocephalus are at risk of bacteremia-induced infections due to their vascular access.^{8,19} In contrast, ventriculoperitoneal (VP) shunts do not involve any vascular structures and, consequently, do not require antibiotic prophylaxis.^{8,19} Consultation with the child's physician is recommended for management of patients with vascular shunts.

Patients with prosthetic joints

For patients with a history of total joint arthroplasty, deep hematogenous infections can lead to life threatening complications such as a loss of the prosthetic joint or even increased morbidity and mortality.²³⁻²⁵ A 2009 information statement published by the American Academy of Orthopaedic Surgeons (AAOS) recommends that dentists consider antibiotic prophylaxis for at-risk joint replacement patients who are undergoing an invasive procedure.²⁵ Patients with an increased risk of hematogenous total joint infection are all patients with a prosthetic joint replacement, previous prosthetic joint infection, inflammatory arthropathies (eg, rheumatoid arthritis, systemic lupus erythematosus), megaprosthesis, hemophilia, malnourishment, and compromised immunity (see examples in previous section).²⁵ However, AAOS states that clinical judgment must consider the potential benefit of antibiotic prophylaxis versus the risks of adverse reactions for each patient.²⁸ The AAPD recognizes that there are varying recommendations from AAOS and the American Dental Association (ADA) with regards to antibiotic prophylaxis for patients with joint replacement.

However, the AAOS is collaborating with the ADA to develop evidence-based recommendations on antibiotic prophylaxis for patients at a high risk for hematogenous total joint infection.

Currently, the AAPD endorses 2003 the common recommendations of the ADA and the AAOS for management of patients with prosthetic joints.²³ Antibiotic prophylaxis has not shown a significant reduction in the risk of developing joint infections subsequent to dental procedures.^{24,26} Therefore, antibiotic prophylaxis is not indicated for dental patients with pins, plates, screws, or other hardware that is not within a synovial joint nor is it indicated routinely for most dental patients with total joint replacements.^{23-25,27} Antibiotics may be considered when high-risk dental procedures (Table 2) are performed for patients within 2 years following implant surgery, immunocompromised patients with total joint arthroplasty, or patients who have had previous joint infections.^{1,2,8,3,24,27}

Consultation with the child's physician may be necessary for management of at-risk patients as well as patients with other implanted devices (eg, Harrington rods, external fixation devices).^{8,23-27} In addition, as consensus may change following this review, practitioners are encouraged to follow the literature for the most current information on antibiotic prophylaxis.

References

1. Wilson W, Taubert KA, Gevitz M, et al. Prevention of infective endocarditis: Guidelines from the American Heart Association—A Guideline From the American Heart Association Rheumatic Fever, Endocarditis and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. *J Am Dent Assoc* 2007;138(6):739-45, 747-60. Erratum in: *J Am Dent Assoc* 2008;139(3):253.
2. Wilson W, Taubert KA, Gevitz M, et al. Prevention of infective endocarditis: Guidelines from the American Heart Association—A Guideline From the American Heart Association Rheumatic Fever, Endocarditis and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. *Circulation* 2007;116(15):1736-54. E-published April 19, 2007. Erratum in: *Circulation* 2007;116(15):e376-e7.
3. Lockhart PB, Brennan MT, Kent ML, Norton JH, Weinrib DA. Impact of amoxicillin prophylaxis on the incidence, nature, and duration of bacteremia in children after intubation and dental procedures. *Circulation* 2004;109(23):2878-84.
4. Roberts GJ, Jaffrey EC, Spract DA, Petrie A, Greville C, Wilson M. Duration, prevalence and intensity of bacteremia after dental extractions in children. *Heart* 2006;92(9):1274-7.

5. de Sa DD, Tleyieh IM, Anavekar NS, et al. Epidemiological trends of infective endocarditis: A population-based study in Olmsted County, Minnesota. *Mayo Clin Proc* 2010;85(5):422-6. Erratum in: *Mayo Clin Proc* 2010;85(8):722.
6. Dajani AS, Taubert KA, Wilson W, et al. Prevention of bacterial endocarditis: Recommendations by the American Heart Association. *JAMA* 1997;277(22):1794-801.
7. CDC. Antibiotic/Antimicrobial resistance. About antimicrobial resistance: A brief overview. Available at: "<http://www.cdc.gov/drugresistance/about.html>". Accessed May 30, 2011.
8. Lockhart PB, Loven B, Brennan MT, Baddour LM, Levinson M. The evidence base for the efficiency of antibiotic prophylaxis in dental practice. *J Am Dent Assoc* 2007;138(4):458-74.
9. Lockhart PB, Brennan MT, Thornhill M, et al. Poor oral hygiene as a risk factor for infective endocarditis related bacteremia. *J Am Dent Assoc* 2009;140(10):1238-44.
10. Lockhart PB, Brennan MT, Sasser HC, Fox PC, Paster BJ, Bahrani-Mougeot FK. Bacteremia associated with toothbrushing and dental extraction. *Circulation* 2008;117(24):3118-25.
11. Taubert KA, Gewitz MH. Infective endocarditis. In: Moss and Adam's Heart Disease in Infants, Children, and Adolescents: Including the Fetus and Young Adult, 7th ed. Moss AJ, ed. Wolters Kluwer Health/Lippincott Williams & Wilkins Philadelphia, Pa; 2008:1299-1311.
12. Lick SD, Edozie SN, Woodside KJ, Conti VR. *Streptococcus viridans* endocarditis from tongue piercing. *J Emerg Med* 2005;29(1):57-9.
13. Akhondi H, Rahimi AR. *Haemophilus aphrophilus* endocarditis after tongue piercing. *Emerg Infect Dis* 2002;8(8):850-1.
14. Tronel H, Chaudemanche H, Pechier N, Doutrelant L, Hoen B. Endocarditis due to *Neisseria mucosa* after tongue piercing. *Clin Microbiol Infect* 2001;7:275-6.
15. Tate AR, Norris CK, Minniti CP. Antibiotic prophylaxis for children with sickle cell disease: A survey of pediatric dentistry residency program directors and pediatric hematologists. *Pediatr Dent* 2006;28(3):332-5.
16. Montefusco V, Gay F, Spina F, et al. Antibiotic prophylaxis before dental procedures may reduce the incidence of osteonecrosis of the jaw in patients with multiple myeloma treated with bisphosphonates. *Leuk Lymphoma* 2008;49(11):2156-62.
17. Rogers SN, Hung J, Barber AJ, Lowe D. A survey of consultant members of the British Association of Oral and Maxillofacial Surgeons regarding bisphosphonate-induced osteonecrosis of the jaws. *Br J Oral Maxillofac Surg* 2009;47(8):598-601.
18. American Academy of Pediatric Dentistry. Guideline on dental management of pediatric patients receiving chemotherapy, hematopoietic cell transplantation, and/or radiation. *Pediatr Dent* 2010;33(suppl):253-9.
19. Baddour LM, Bettman MA, Bolger AF, Bolger A, Ferrieri P. Nonvalvular cardiovascular device-related infections. *Circulation* 2003;108(16):2015-31.
20. Baddour LM, Epstein AE, Erickson CC, et al. Update on cardiovascular implantable electronic device infections and their management. *Circulation* 2010;121(3):458-77.
21. Baddour LM, Epstein AE, Erickson CC, et al on behalf of the American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee of the Council on Cardiovascular Disease in the Young; Council on Cardiovascular Surgery and Anesthesia; Council on Cardiovascular Nursing; Council on Clinical Cardiology; and the Interdisciplinary Council on Quality of Care and Outcomes Research. A summary of the update on cardiovascular implantable electronic device infections and their management. *J Am Dent Assoc* 2011;142(2):159-65.
22. Hong CHL, Allred R, Napenas JJ, Brennan MT, Baddour LM, Lockhart PB. Antibiotic prophylaxis for dental procedures to prevent indwelling venous catheter-related infections. *Am J Med* 2010;123(12):1128-33.
23. American Dental Association, American Academy of Orthopedic Surgeons. Advisory Statement: Antibiotic prophylaxis for dental patients with total joint replacements. *J Am Dent Assoc* 2003;134(7):895-9.
24. Aminoshariae A, Kulild J. Premedication of patients undergoing dental procedures causing bacteremia after total joint arthroplasty. *J Endod* 2010;36(6):974-7.
25. American Academy of Orthopaedic Surgeons. Information statement: Antibiotic prophylaxis for bacteremia in patients with joint replacements. Available at: "<http://www.aaos.org/about/papers/advismt/1033.asp>". Accessed May 30, 2011.
26. Berbari EF, Osmon DR, Carr A, et al. Dental procedures as risk factors for prosthetic hip or knee infection: A hospital-based prospective case-control study. *Clin Infect Dis* 2010;50(1):8-16. Erratum in: *Clin Infect Dis* 2010;50(6):944.
27. Little JW, Jacobson JJ, Lockhart PB, American Academy of Oral Medicine. The dental treatment of patients with joint replacements: A position paper from the American Academy of Oral Medicine. *J Am Dent Assoc* 2010;141(6):667-71.

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