

ACC/AHA 2008 Guideline Update on Valvular Heart Disease: Focused Update on Infective Endocarditis

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines: *Endorsed by the Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons*

Rick A. Nishimura, MD, FACC, FAHA, Chair; Blase A. Carabello, MD, FACC, FAHA; David P. Faxon, MD, FACC, FAHA; Michael D. Freed, MD, FACC, FAHA; Bruce W. Lytle, MD, FACC, FAHA; Patrick T. O'Gara, MD, FACC, FAHA; Robert A. O'Rourke, MD, MACC, FAHA; Pravin M. Shah, MD, MACC, FAHA

2.3.1. Endocarditis Prophylaxis

Infective endocarditis is a serious illness associated with significant morbidity and mortality. Its prevention by the appropriate administration of antibiotics before a procedure expected to produce bacteremia merits serious consideration. Experimental studies have suggested that endothelial damage leads to platelet and fibrin deposition and the formation of nonbacterial thrombotic endocardial lesions. In the presence of bacteremia, organisms may adhere to these lesions and multiply within the platelet-fibrin complex, leading to an infective vegetation. Valvular and congenital abnormalities, especially those associated with high-velocity jets, can result in endothelial damage, platelet-fibrin deposition, and a predisposition to bacterial colonization. Since 1955, the AHA has made recommendations for prevention of infective endocarditis with antimicrobial prophylaxis before specific dental, gastrointestinal (GI), and genitourinary (GU) procedures in patients at risk for its development. However, many authorities and societies, as well as the conclusions of published studies, have questioned the efficacy of antimicrobial prophylaxis in most situations.

On the basis of these concerns, a writing group was appointed by the AHA for their expertise in prevention and treatment of infective endocarditis, with liaison members representing the American Dental Association, the Infectious Disease Society of America, and the American Academy of Pediatrics. The writing group reviewed the relevant literature regarding procedure-related bacteremia and infective endocarditis, in vitro susceptibility data of the most common organisms that cause infective endocarditis, results of prophylactic studies of animal models of infective endocarditis, and both retrospective and prospective studies of prevention of infective endocarditis. As a result, major changes were made in the recommendations for prophylaxis against infective endocarditis.

The major changes in the updated recommendations included the following:

- The committee concluded that only an extremely small number of cases of infective endocarditis may be prevented by antibiotic prophylaxis for dental procedures even if such prophylactic therapy were 100 percent effective.
- 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.
- For patients with these underlying cardiac conditions, prophylaxis is reasonable for all dental procedures that involve manipulation of either gingival tissue or the periapical region of teeth or perforation of oral mucosa.
- Prophylaxis is not recommended solely on the basis of an increased lifetime risk of acquisition of infective endocarditis.
- Administration of antibiotics solely to prevent endocarditis is not recommended for patients who undergo a GU or GI tract procedure.

The rationale for these revisions is based on the following:

- Infective endocarditis is 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 procedure.
- Prophylaxis may prevent an exceedingly small number of cases of infective endocarditis (if any) in individuals who undergo a dental, GI tract, or GU procedure.
- The risk of antibiotic-associated adverse effects 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 infective endocarditis.

The AHA Prevention of Infective Endocarditis Committee recommended that prophylaxis be given only to a high-risk group of patients before dental procedures that involve manipulation of either gingival tissue or the periapical region of the teeth or perforation of oral mucosa ([Tables 2 to 4](#)♦♦). High-risk patients were defined as those patients with underlying cardiac conditions associated with the highest risk of adverse outcome from infective endocarditis, not necessarily those with an increased lifetime risk of acquisition of infective endocarditis. Prophylaxis is no longer recommended for prevention of endocarditis for procedures that involve the respiratory

tract unless the procedure is performed in a high-risk patient and involves incision of the respiratory tract mucosa, such as tonsillectomy and adenoidectomy. Prophylaxis is no longer recommended for prevention of infective endocarditis for GI or GU procedures, including diagnostic esophagogastroduodenoscopy or colonoscopy (Table 2). However, in high-risk patients with infections of the GI or GU tract, it is reasonable to administer antibiotic therapy to prevent wound infection or sepsis. For high-risk patients undergoing elective cystoscopy or other urinary tract manipulation who have enterococcal urinary tract infection or colonization, antibiotic therapy to eradicate enterococci from the urine before the procedure is reasonable.

These changes are a significant departure from the past AHA⁷ and European Society of Cardiology⁸ recommendations for prevention of infective endocarditis and may violate longstanding expectations in practice patterns of patients and health care providers. However, the writing committee for these updated guidelines consists of experts in the field of infective endocarditis; input was also obtained from experts not affiliated with the writing group. All data to date were reviewed thoroughly, and the current recommendations reflect analysis of all relevant literature. This multidisciplinary team of experts emphasizes that previously published guidelines for the prevention of endocarditis contained ambiguities and inconsistencies and relied more on opinion than on data. The writing committee delineates the reasons with which evolutionary refinement in the approach to infective endocarditis prophylaxis can be justified. In determining which patients receive prophylaxis, there is a clear focus on the risk of adverse outcomes after infective endocarditis rather than the lifetime risk of acquisition of infective endocarditis. The current recommendations result in greater clarity for patients, health care providers, and consulting professionals.

Other international societies have published recommendations and guidelines for the prevention of infective endocarditis. New recommendations from the British Society for Antimicrobial Chemotherapy are similar to the current AHA recommendations for prophylaxis before dental procedures. The British Society for Antimicrobial Chemotherapy did differ in continuing to recommend prophylaxis for high-risk patients before GI or GU procedures associated with bacteremia or endocarditis.⁹

Therefore, Class IIa indications for prophylaxis against infective endocarditis are reasonable for VHD patients at highest risk for adverse outcomes from infective endocarditis before dental procedures that involve manipulation of either gingival tissue. This high-risk group includes: 1) patients with a prosthetic heart valve or prosthetic material used for valve repair, 2) patients with a past history of infective endocarditis, and 3) patients with cardiac valvulopathy after cardiac transplantation, as well as 4) specific patients with CHD (Table 2). Patients with innocent murmurs and those patients who have abnormal echocardiographic findings without an audible murmur should definitely not be given prophylaxis for infective endocarditis. Infective endocarditis prophylaxis is not necessary for nondental procedures that do not penetrate the mucosa, such as transesophageal echocardiography, diagnostic bronchoscopy, esophagogastrosocopy, or colonoscopy, in the absence of active infection.

The committee recognizes that decades of previous recommendations for patients with most forms of VHD and other conditions have been abruptly changed by the new AHA guidelines.⁴ Because this may cause consternation among patients, clinicians should be available to discuss the rationale for these new changes with their patients, including the lack of scientific evidence to demonstrate a proven benefit for infective endocarditis prophylaxis. In select circumstances, the committee also understands that some clinicians and some patients may still feel more comfortable continuing with prophylaxis for infective endocarditis, particularly for those with bicuspid aortic valve or coarctation of the aorta, severe mitral valve prolapse, or hypertrophic obstructive cardiomyopathy. In those settings, the clinician should determine that the risks associated with antibiotics are low before continuing a prophylaxis regimen. Over time, and with continuing education, the committee anticipates increasing acceptance of the new guidelines among both provider and patient communities.

A multicenter randomized, controlled trial has never been performed to evaluate the efficacy of infective endocarditis prophylaxis in patients who undergo dental, GI, or GU procedures. On the basis of these new recommendations, fewer patients will receive infective endocarditis prophylaxis. It is hoped that the revised recommendations will stimulate properly designed prospective studies on the prevention of infective endocarditis.

Table 2. Updates to Section 2.3.1. Endocarditis Prophylaxis

2006 VHD Guideline Recommendations	2008 VHD Focused Update Recommendations	Comments
Class I	Class IIa	
<p>1. Prophylaxis against infective endocarditis is recommended for the following patients:</p> <ul style="list-style-type: none"> • Patients with prosthetic heart valves and patients with a history of infective endocarditis. <i>(Level of Evidence: C)</i> • Patients who have complex cyanotic congenital heart disease (e.g., single-ventricle states, transposition of the great arteries, tetralogy of Fallot). <i>(Level of Evidence: C)</i> • Patients with surgically constructed systemic pulmonary shunts or conduits. <i>(Level of Evidence: C)</i> • Patients with congenital cardiac valve malformations, particularly those with bicuspid aortic valves, and patients with acquired valvular dysfunction (e.g., rheumatic heart disease). <i>(Level of Evidence: C)</i> • Patients who have undergone valve repair. <i>(Level of Evidence: C)</i> • Patients who have hypertrophic cardiomyopathy when there is latent or resting obstruction. <i>(Level of Evidence: C)</i> • Patients with MVP and auscultatory evidence of valvular regurgitation and/or thickened leaflets on echocardiography.* <i>(Level of Evidence: C)</i> 	<p>1. Prophylaxis against infective endocarditis is reasonable for the following patients at highest risk for adverse outcomes from infective endocarditis who undergo dental procedures that involve manipulation of either gingival tissue or the periapical region of teeth or perforation of the oral mucosa⁴:</p> <ul style="list-style-type: none"> • Patients with prosthetic cardiac valves or prosthetic material used for cardiac valve repair. <i>(Level of Evidence: B)</i> • Patients with previous infective endocarditis. <i>(Level of Evidence: B)</i> • Patients with CHD. <i>(Level of Evidence: B)</i> • Unrepaired cyanotic CHD, including palliative shunts and conduits. <i>(Level of Evidence: B)</i> • Completely repaired congenital heart defect repaired with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure. <i>(Level of Evidence: B)</i> • Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (both of which inhibit endothelialization). <i>(Level of Evidence: B)</i> • Cardiac transplant recipients with valve regurgitation due to a structurally abnormal valve. <i>(Level of Evidence: C)</i> 	<p>Modified recommendation (changed class of recommendation from I to IIa, changed text). There are no Class I recommendations for infective endocarditis prophylaxis.</p>
	Class III	
<p>1. Prophylaxis against infective endocarditis is not recommended for the following patients:</p> <ul style="list-style-type: none"> • Patients with isolated secundum atrial septal defect. <i>(Level of Evidence: C)</i> • Patients 6 or more months after successful surgical or percutaneous repair of atrial septal defect, ventricular septal defect, or patent ductus arteriosus. <i>(Level of Evidence: C)</i> 	<p>1. Prophylaxis against infective endocarditis is not recommended for nondental procedures (such as transesophageal echocardiogram, esophagogastroduodenoscopy, or colonoscopy) in the absence of active infection. <i>(Level of Evidence: B)⁴</i></p>	<p>Modified recommendation (changed text)</p>

• Patients with MVP without MR or thickened leaflets on echocardiography.*

(Level of Evidence: C)

• Patients with physiological, functional, or innocent heart murmurs, including patients with aortic valve sclerosis as defined by focal areas of increased echogenicity and thickening of the leaflets without restriction of motion and a peak velocity less than 2.0 m per second. *(Level of Evidence: C)*

• Patients with echocardiographic evidence of physiologic MR in the absence of a murmur and with structurally normal valves. *(Level of Evidence: C)*

• Patients with echocardiographic evidence of physiological TR and/or pulmonary regurgitation in the absence of a murmur and with structurally normal valves. *(Level of Evidence: C)*

*This footnote is obsolete. Please see 2006 VHD Guideline³ for footnote text.

MR indicates mitral regurgitation; MVP, mitral valve prolapse; and TR, tricuspid regurgitation.

Table 3. Endocarditis Prophylaxis for Dental Procedures*

Reasonable	Not Recommended
<p>Endocarditis prophylaxis is reasonable for patients with the highest risk of adverse outcomes who undergo dental procedures that involve manipulation of either gingival tissue or the periapical region of teeth or perforation of the oral mucosa.</p>	<p>Endocarditis prophylaxis is not recommended for:</p> <ul style="list-style-type: none"> • Routine anesthetic injections through noninfected tissue • Dental radiographs • Placement or removal of prosthodontic or orthodontic appliances • Adjustment of orthodontic appliances • Placement of orthodontic brackets • Shedding of deciduous teeth • Bleeding from trauma to the lips or oral mucosa

Table 4. 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		
Allergic to penicillins or ampicillin—oral	Cefazolin or ceftriaxone	1 g IM or IV	50 mg/kg IM or IV
	Cephalexin ^{†‡}	2 g	50 mg/kg
	OR		
	Clindamycin	600 mg	20 mg/kg
	OR		
Allergic to penicillins or ampicillin and unable to take oral medication	Azithromycin or clarithromycin	500 mg	15 mg/kg
	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; and IV, intravenous.

*This table corresponds to Table 7 in the 2008 Focused Update Incorporated Into the ACC/AHA 2006 Guidelines for the Management of Valvular Heart Disease.²

†Or use 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