THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

JADA

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J Am Dent Assoc 2001;132;171-176

Heart murmurs: are older male dental patients aware of their existence?

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The American Heart Association, or AHA, updated its recommendations for the prevention of bacterial endocarditis, or BE, in 1997.[1] The recommendations separate people with heart conditions into the categories of high, moderate and low risk of developing BE. People at high risk include those with prosthetic cardiac valves or a history of BE. Those at moderate risk include people who have mitral valve prolapse with valvular regurgitation and/or thickened leaflets or rheumatic heart disease. People at negligible risk—in other words, those who are at no greater risk than the general population—include those with physiological, functional or "innocent" heart murmurs. A complete list of cardiac conditions associated with endocarditis is presented in the box, "Cardiac Conditions Associated With Bacterial Endocarditis as Reported by the American Heart Association." The AHA recommends that people at a high or moderate risk of developing BE take antibiotic prophylaxis for certain dental and other procedures. The AHA and others also have emphasized the need for a high level of oral hygiene among such patients, because poor oral hygiene can lead to bacteremia even in the absence of invasive dental procedures.[2-5] Even simple actions such as chewing and brushing one's teeth have been associated with bacteremia[6]; thus, the AHA recommends that "individuals who are at risk [of] developing bacterial endocarditis should establish and maintain the best

Dental health care providers should consider that a patient's self-report may not be a reliable indicator of cardiac status.

ABSTRACT

Background. The American Heart Association recommends that patients with certain abnormal and prosthetic heart valves receive antibiotic prophylaxis before undergoing invasive dental treatment, owing to the risk of bacterial endocarditis, or BE. However, it is not known how many patients are aware that they have such conditions and understand such recommendations.

Methods. The authors conducted a study to determine how many male users of three U.S. Department of Veterans' Affairs ambulatory medical care centers denied having a heart murmur, even though a murmur was noted in their medical record. The authors asked 637 potential subjects a series of questions to identify those who had a heart murmur that might place them at risk of developing BE. The authors then reviewed each subject's medical records for documentation of a heart murmur.

Results. Four hundred ninety-seven dentate men (mean age: 61.0 years) denied having a heart murmur. Seventy (14.1 percent) of these men had documentation of a heart murmur in their medical records, and 13 (2.6 percent) had murmurs that were likely to be pathological. The failure to accurately report having a heart murmur and having a potentially pathological heart murmur were positively related to age ($P = .001$). Failure to accurately report having a heart murmur also was related to lower educational levels.

Conclusions. These results indicate that a substantially larger number of older men than younger men were unaware that they had a heart murmur. Since some of these murmurs necessitate administration of antibiotic prophylaxis before dental procedures, this failure to communicate their correct medical status may put them at risk of developing BE.

Clinical Implications. Dental health care providers should be aware that patient self-report may not be a reliable indicator of cardiac status, particularly in older patients.

CARDIAC CONDITIONS ASSOCIATED WITH BACTERIAL ENDOCARDITIS AS REPORTED BY THE AMERICAN HEART ASSOCIATION.

High-Risk Category—endocarditis prophylaxis recommended

- Prosthetic cardiac valves, including bioprosthetic and homograft valves
- Previous bacterial endocarditis
- complex cyanotic congenital heart disease (e.g., single ventrical states, transposition of the great arteries, tetralogy of Fallot)
- Surgically constructed systemic pulmonary shunts or conduits

Moderate-Risk Category—endocarditis prophylaxis recommended

- Most other congenital cardiac malformations (other than above and below)
- Acquired valvar dysfunction (e.g., rheumatic heart disease)
- Hypertrophic cardiomyopathy
- Mitral valve prolapse with valvar regurgitation and/or thickened leaflets

Negligible-Risk Category—no greater risk than the general population)—endocarditis prophylaxis not recommended

- Isolated secundum atrial septal defect
- Surgical repair of atrial septal defect, ventricular septal defect or patent ductus arteriosus (without residua beyond six months)
- Previous coronary artery bypass graft surgery
- Mitral valve prolapse without valvar regurgitation
- Physiological functional or innocent heart murmers
- Previous Kawasaki disease without valvar dysfunction
- Previous rheumatic fever without valvar dysfunction
- Cardiac pacemakers (intravascular and epicardial) and implanted defibrillators

* As reported in Dajani and colleagues.[1] Reprinted with permission of the publisher.

possible oral health to reduce potential sources of bacterial seeding."[1]

Previous research has determined that the risk of developing BE is increased in older men. Devereux and colleagues[7] found that the risk of developing complications among people who have a regurgitant mitral murmur is positively associated with older age and male sex. Werner and colleagues[8] demonstrated that BE can cause less severe symptoms in older men, delaying diagnosis and, therefore, treatment of the disease. Thus, the identification of BE appears to be especially important among older men.

Other studies have assessed subjects who are aware of having a cardiac condition regarding their knowledge of antibiotic prophylaxis. Cetta and colleagues[9] found that none of 45 subjects with a need for antibiotic administration before dental treatment knew how to prevent BE, and 31 percent did not know the name of their cardiac condition. Van der Meer and colleagues[10] reported on 371 subjects with conditions requiring antibiotic prophylaxis; 30 percent of them did not remember having received advice about premedication. In a six-month period, these subjects underwent 139 procedures for which antibiotic prophylaxis was either possibly or clearly indicated, and only 31 subjects (22 percent) received antibiotics. Guggenheimer and colleagues[11] further showed that self-report is not a reliable source of information: 73 percent of their subjects who self-reported a pathological heart murmur had no evidence of one on physical examination, while one subject denied having a heart murmur and, on later physical examination, was found to have one.

Patients' knowledge of having a heart murmur has not been widely studied, especially among older adults. In light of the literature suggesting that BE is a potential problem, it is important to determine if people who deny having a cardiac condition have correct information. We studied the accuracy of patients' self-reported denial of a heart murmur by comparing their responses to medical record documentation. Further, we examined sociodemographic characteristics associated with accurate denial of having a murmur.

SUBJECTS AND METHODS

Sample. We drew subjects for this study, the Veterans Dental Study, or VDS, from the Veterans Health Study, or VHS, an ongoing longitudinal study of health and quality of life begun in 1993. The sample is described in detail elsewhere.[12-14] Briefly, we asked all VHS participants returning for a follow-up examination during an 18-month period if they would be willing to participate in a dental study. Of the 2,228 VHS participants approached, 637 agreed to take part in the VDS and became eligible by twice responding negatively to screening questions, including one four-part question designed to exclude patients at risk of developing BE: "Have you ever had rheumatic fever; a heart murmur; endocarditis or a heart infection; or an artificial heart valve?"

The 637 potential subjects had a mean age of 61.0 years. Of these, 535 (84.0 percent) were dentate, and of the dentate subjects, 506 (94.6 percent) had medical records available for review. As the examination included periodontal probing and the study protocol did not allow prescription of antibiotics for any subjects, we excluded at the time of the dental examination nine subjects who self-reported having prosthetic joints or a history of endocarditis. Thus, our total sample consisted of 497 subjects.

Procedures. The subjects who responded negatively to the screening questions were asked the same questions again when they were called to schedule their dental examinations. After scheduling, we reviewed each subject's complete Veterans Affairs, or VA, medical record using a specific, written protocol (Figure 1). The reviewers (C.W.R., J.A.J., R.I.G. and dentists at affiliated medical centers) searched for any cardiac condition that would predispose a patient to develop BE: a heart murmur or mitral valve prolapse with regurgitation; prosthetic cardiac valves; or a history of BE or rheumatic fever. We noted the type of murmur exactly as it was specified in the medical record. This is important, as it has been documented that certain types of heart murmurs are most likely to be pathological, including systolic murmur of grade 3/6 or higher; pre-, pan- and holosystolic murmurs; diastolic murmurs[1,15-18]; and systolic murmurs with suggestive mitral regurgitation. By contrast, we considered as least likely to be pathological any murmurs that were questionable or not specified as to type, as well as systolic murmurs of grade 1/6, 2/6 or 1-2/6.

Consent. The study was approved by the institutional review boards at the VA medical centers in Boston and Bedford, Mass. The research assistant or study examiner read the consent form to each subject, answered any questions about the study and secured written informed consent from each subject before he underwent the dental examination. Immediately before the periodontal probing began, the research assistant or study examiner again asked each subject the screening questions, thus giving him a third and final opportunity to self-report a reason for study exclusion.

Analysis. We grouped subjects according to sociodemographic characteristics—including education, income, type of health care facility at which he normally received his care, number of medical visits in the past three months, and satisfaction with health care—to determine what factors are associated with having correct knowledge of the absence of heart murmurs. We performed statistical analysis using the χ^2 test, the Mantel-Haenszel test and Student *t*-test procedures and general linear modeling using the Duncan multiple range test.

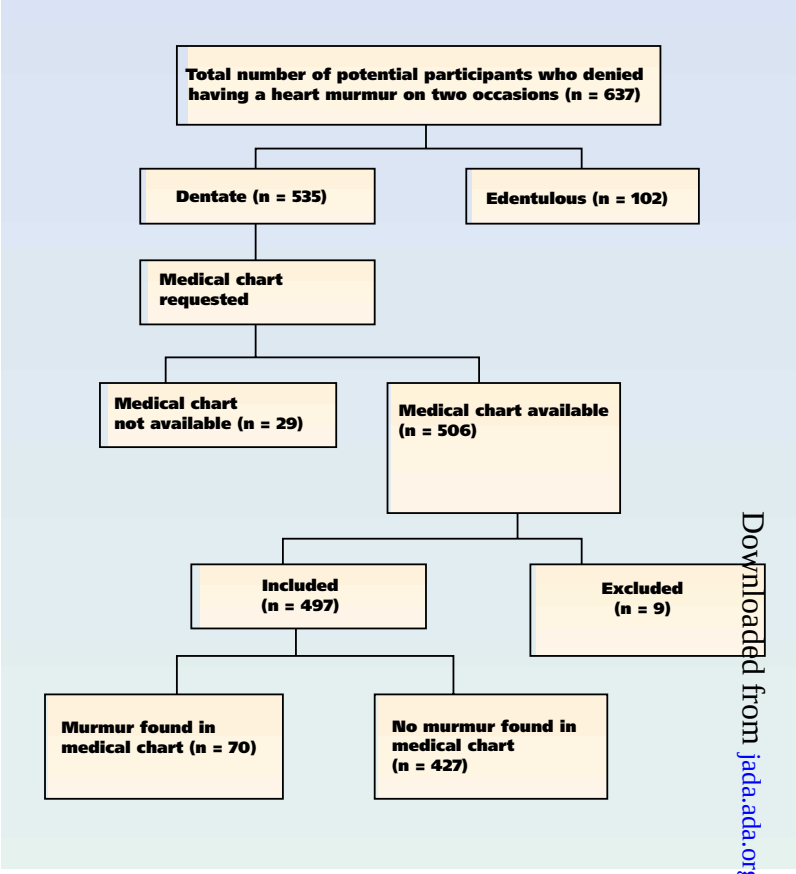

Figure 1. Process of study inclusion and chart review.

RESULTS

Seventy subjects (14.1 percent) had documentation of heart murmurs in their medical records. Of the 70 subjects, 13 (18.6 percent, 2.6 percent of the total sample) had murmurs more likely to be pathological—that is, systolic murmurs of grade 3/6 or higher; pre-, pan- and holosystolic murmurs; diastolic murmurs; and systolic murmurs with suggestive mitral regurgitation (Table). Medical records typically did not specify whether health care providers had discussed the murmurs with patients.

The failure to accurately report any type of heart murmur was positively related to age,

TABLE

BREAKDOWN OF HEART MURMUR TYPES AMONG SUBJECTS (N = 70).*

TYPE OF HEART MURMUR	N (%)	
Not Specified or Questionable	7 (10.0)	Murmurs least likely to be pathological: n = 57 (81.4%)
1/6 Systolic	23 (32.9)	
2/6 Systolic	22 (31.4)	
1-2/6 Systolic†	5 (7.1)	
1-3/6 Systolic†	1 (1.4)	Murmurs most likely to be pathological: n = 13 (18.6%)
2-3/6 Systolic†	3 (4.3)	
3/6 Systolic	1 (1.4)	
Systolic, Suggestive of Regurgitation	2 (2.9)	
Holosystolic, Presystolic or Pansystolic	5 (7.1)	
Diastolic	1 (1.4)	

* Shaded areas indicate murmurs most likely to be pathological.
† Murmurs notesd with a range of grade—such as "2-3/6"—were taken directly from patient records.

$\chi^2 = 19.45$, $P = .001$ (Figure 2). Only 1.7 percent (two of 115) of men younger than 50 years of age who denied having a murmur had documentation of murmurs in their medical records, compared with 16.1 percent (25 of 155) of men aged 50 to 64 years and 18.9 percent (43 of 227) of men aged 65 years and older. Results from the general linear models analysis of the percentage of the population with a heart murmur by age group indicated significant differences in having an unreported murmur between the men younger than 50 years of age and the groups of men 50 years of age and older, $F(2,496) = 10.06$, $P < .0001$.

We then used a χ^2 test to evaluate whether there were differences by age group in the frequency of failure to report a potentially pathological heart murmur. Ten of the 227 men (4.4 percent) aged 65 years and older had murmurs that were likely to be pathological on chart review, vs. only three of the 270 men (1.1 percent) in the younger age groups, $\chi^2 = 5.25$, $P = .022$. We found no statistically significant difference in age group when comparing men who had any kind of murmur (n = 70) with men who had no murmur (n = 427).

We further divided the men in the oldest age category (those 65 years of age or older) into five-year intervals to determine if among the oldest members of the sample there continued to be an age-related increase in having an unreported heart murmur. We found a trend in the expected direction using a Mantel-Haenszel test; older men were less frequently aware of having a heart murmur. However, this finding was only marginally significant, $\chi^2 = 3.810$, $P = .051$.

We also examined the association between the frequency of accurate denial of having a murmur and education, income, type of health care facility at which he normally received his care, number of medical visits in the past three months and satisfaction with health care. Subjects who inaccurately denied having murmurs had less education (12.3 years) than did subjects who accurately denied having murmurs (13.0 years), $t = 2.09$, $P = .0394$. We found no other significant relationships.

DISCUSSION

The purpose of this study was to determine the accuracy of patients' self-reported absence of a heart murmur by comparing their responses to medical record documentation. Furthermore, we examined sociodemographic characteristics associated with accurately reporting a murmur.

Fourteen percent of the subjects in our study had a heart murmur of which they were unaware, and more than 18 percent of these murmurs were likely to be pathological (2.6 percent of the total sample). The results indicate that accurately reporting having a murmur varied by age: only 1.7 percent of men younger than 50 years of age had a murmur they did not report, while more than 16 percent of those between 50 and 64 years of age and nearly 19 percent of those aged 65 years and older had an unreported murmur. While these figures are lower than those cited by Bates and colleagues,[15] who reported that one-third to one-half of older people have systolic murmurs, our results still suggest an important lack of knowledge about murmurs or an unwillingness to report having one.

The AHA suggests that, in older people, echocardiography may be used to determine if a murmur detected by auscultation is potentially threatening.[1] It is possible that some of the murmurs noted in these medical records could be of the type to place these subjects at risk of developing BE and that these subjects may benefit from further tests to determine their level of risk.

However, we did not review medical records for the presence or results of echocardiograms in patients with documented murmurs.

Our findings are in agreement with those of other studies documenting the fact that even when people are aware of their cardiac condition, they may have incorrect or incomplete information about the steps necessary to prevent health complications from BE.[9,19-22] The importance of communicating information about a heart murmur to the patient is great.[3,23] Our findings support the suggestion by Buckingham and colleagues[10] that this information is potentially important and that it should be presented clearly and in a format that patients can both understand and retain.

There are several possible explanations for this lack of awareness. A person may choose not to disclose the existence of a murmur in a dental setting, incorrectly reasoning that this finding has no effect on oral health and vice versa. Second, recall bias may be a problem, and some patients may not remember being told of a murmur. Others may not understand the importance of this finding and disregard the information. Finally, primary care providers might choose not to inform a patient about a murmur or may downplay its importance to avoid alarming the patient unnecessarily, based on an assumption that the murmur is innocent.

One approach in addressing this problem would be to provide patients who have heart murmurs with a wallet-sized card to carry with them. Such a system would make clear the diagnosis as well as the patient's need for antibiotic prophylaxis. This would be of assistance to dental personnel who need such information and would eliminate problems with self-reporting. Such a card has been developed by the AHA. (Authors' note: The cards are available from the American Heart Association, 7272 Greenville Ave., Dallas, Texas 75231-4596, telephone 1-800-AHA-USA1, World Wide Web "www.americanheart.org".)

One limitation of this study is that it examined only people who reported no history of a heart murmur; we did not examine people who reported having a murmur. The original intent of the VDS protocol was to exclude any patients who might be harmed by periodontal probing. Thus, our analyses are limited to our examination of the accuracy of negative self-reports and cannot determine the accuracy of positive self-reports.

Further, there are limitations to using data gathered by chart review. The chart may underreport benign murmurs, and chart information may not be as reliable as that obtained by direct examination by a calibrated examiner or by echocardiography.

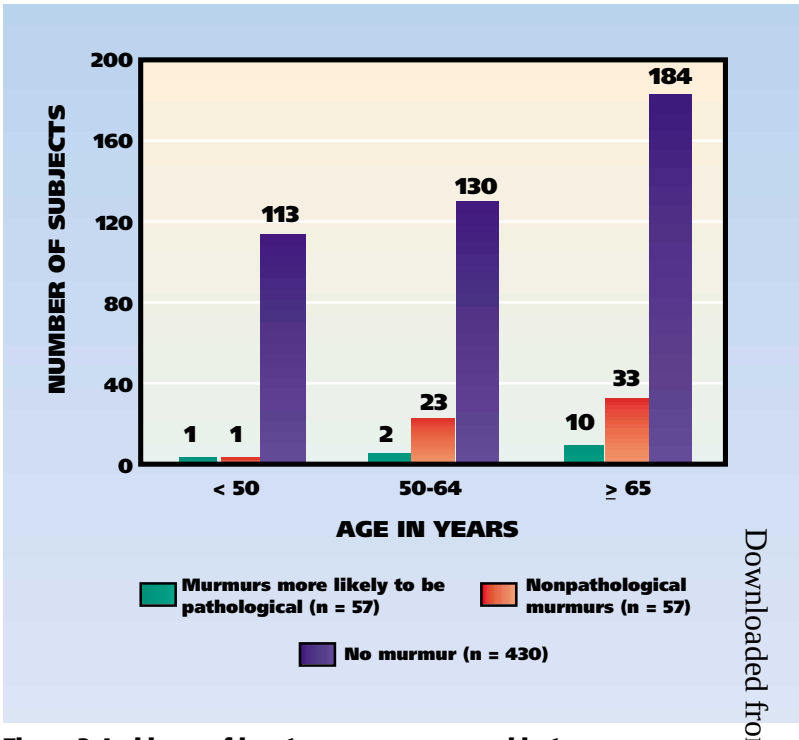

Figure 2. Incidence of heart murmurs among subjects who twice denied having a murmur.

CONCLUSIONS

This study demonstrates that a significant percentage of older men who used VA medical care in Boston and Bedford, Mass., inaccurately denied having a heart murmur. While not all heart murmurs require antibiotic prophylaxis, current AHA recommendations suggest that this lack of awareness may place these men at risk of developing BE. We recognize that the AHA recommendations are controversial[24,25]; however, until they are modified, prudence dictates adherence to them as nationally recognized regimens. To that end, dental health care providers should consider that a patient's self-report may not be a reliable indicator of cardiac status, particularly in older patients. Health care providers should make an effort to educate patients about their heart murmurs, explaining the murmur and the rationale for antibiotic prophylaxis (if it is indicated for the particular patient). Patients requiring antibiotic prophylaxis should be made aware of the exact procedures for which premedication is indicated

and the need for meticulous oral hygiene to minimize their risk of developing BE.[6]

Finally, this research indicates that patient self-report is not reliable for learning about a patient's heart murmur status in a VA patient population. Large health care systems and managed care organizations, particularly those that offer dental services, might include information about heart murmurs and the need for antibiotic prophylaxis (if indicated) in the medical alert systems of their health care records. This addition would aid caregivers within the system, such as dentists, in determining which patients require prophylaxis before undergoing invasive procedures. Developing a better method for supplying this information to health care providers should improve patient care. ■

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The authors wish to thank Usree Kirtania and Yao Meng for their statistical analyses and valuable contributions to this study.

Drs. Jones and Garcia are the recipients of Career Development Awards in Health Services Research from the Health Services Research and Development, or HSR&D, Service of the U.S. Department of Veterans Affairs. The VA Dental Longitudinal Study is a component of the Massachusetts Veterans Epidemiology Research and Information Center, supported by the VA Cooperative Studies Program. This project is supported by VA grants HSR&D IIR 93-025.B and SDR 91-006, and National Institutes of Health grant K24 DE00419.

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