Complete Summary

GUIDELINE TITLE

Recommendations and considerations related to preparticipation screening for cardiovascular abnormalities in competitive athletes: 2007 update. A scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism: endorsed by the American College of Cardiology Foundation.

BIBLIOGRAPHIC SOURCE(S)

Maron BJ, Thompson PD, Ackerman MJ, Balady G, Berger S, Cohen D, Dimeff R, Douglas PS, Glover DW, Hutter AM Jr, Krauss MD, Maron MS, Mitten MJ, Roberts WO, Puffer JC, American Heart Association Council on Nutrition, Physical Activity, and Metabolism. Recommendations and considerations related to preparticipation screening for cardiovascular abnormalities in competitive athletes: 2007 update. Circulation 2007 Mar 27;115(12):1643-55. [61 references] PubMed

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
RECOMMENDATIONS
EVIDENCE SUPPORTING THE RECOMMENDATIONS
BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS
IMPLEMENTATION OF THE GUIDELINE
INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES
IDENTIFYING INFORMATION AND AVAILABILITY
DISCLAIMER

SCOPE

DISEASE/CONDITION(S)

Cardiovascular abnormalities in competitive athletes including:

- Hypertrophic cardiomyopathy
- Coronary artery anomalies
- Myocarditis
- Arrhythmogenic right ventricular cardiomyopathy
- Mitral valve prolapse

- Other cardiovascular diseases and disorders

GUIDELINE CATEGORY

Screening

CLINICAL SPECIALTY

Cardiology
Family Practice
Internal Medicine
Pediatrics
Sports Medicine

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

To provide recommendations related to preparticipation screening for cardiovascular abnormalities in competitive athletes

Note: *Competitive athletes* are defined as those who participate in an organized team or individual sport (e.g., middle school, high school, college, or professional) that requires systematic training and regular competition against others and places a high premium on athletic excellence and achievement

TARGET POPULATION

- High school and collegiate student-athletes of all races and both genders
- May also include athletes in youth ($\leq$ 12 years of age) or masters ($\geq$ 30 years of age) sports

INTERVENTIONS AND PRACTICES CONSIDERED

1. Preparticipation cardiovascular screening including medical history, family history and physical examination
2. Prophylactic prevention of cardiac events during sports by selective disqualification
3. Echocardiograms and/or electrocardiogram (ECG), optional

MAJOR OUTCOMES CONSIDERED

Cardiovascular events associated with organized sports

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The panel addressed the benefits and limitations of the screening process for early detection of cardiovascular abnormalities in competitive athletes, cost-effectiveness, feasibility issues, and relevant medical-legal implications. The results of these deliberations constitute the consensus recommendations and guidelines presented here, which we believe outline the most prudent, practical, and effective screening strategies for competitive athletes in the United States.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

Given the theoretical cost of a mass cardiovascular screening program of $2 billion per year, the dollar amount attached to detecting each athlete with the suspected relevant cardiac diseases would be $330,000. Assuming that

approximately 10% of these 9000 athletes with cardiac disease (1800) would harbor evidence of increased risk for sudden death, then the cost of preventing each theoretical death would be $3.4 million. The guideline developers recognize that some may not regard these estimated costs per athlete as excessive for detecting potentially lethal cardiovascular disease in young people; however, the fundamental issue defined by these calculations concerns the practicality and feasibility of establishing a continuous annual national program for many years at a cost of approximately $2 billion per year.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

This statement was approved by the American Heart Association (AHA) Science Advisory and Coordinating Committee on January 3, 2007. Expert peer review of AHA Scientific Statements is conducted at the AHA National Center.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The present 2007 American Heart Association (AHA) recommendations for personal and family history and physical examination are promoted by the panel as a potentially effective strategy to raise the suspicion of cardiovascular disease in both large and small screening populations of high school and college student-athletes. These recommendations were initially proposed in the 1996 AHA Scientific Statement and appear here virtually unaltered. The 2007 AHA recommendations consist of 12 items (8 for personal and family history and 4 for physical examination). At the discretion of the examiner, a positive response or finding in any 1 or more of the 12 items may be judged sufficient to trigger a referral for cardiovascular evaluation. Parental verification of the responses is regarded as essential for high school (and middle school) students.

The 12-Element AHA Recommendations for Preparticipation Cardiovascular Screening of Competitive Athletes

Medical history*

Personal history

1. Exertional chest pain/discomfort
2. Unexplained syncope/near-syncope†
3. Excessive exertional and unexplained dyspnea/fatigue, associated with exercise
4. Prior recognition of a heart murmur
5. Elevated systemic blood pressure

Family history

6. Premature death (sudden and unexpected, or otherwise) before age 50 years due to heart disease, in ≥1 relative
7. Disability from heart disease in a close relative <50 years of age
8. Specific knowledge of certain cardiac conditions in family members: hypertrophic or dilated cardiomyopathy, long-QT syndrome or other ion channelopathies, Marfan syndrome, or clinically important arrhythmias

Physical examination

9. Heart murmur‡
10. Femoral pulses to exclude aortic coarctation
11. Physical stigmata of Marfan syndrome
12. Brachial artery blood pressure (sitting position)§

*Parental verification is recommended for high school and middle school athletes.

†Judged not to be neurocardiogenic (vasovagal); of particular concern when related to exertion.

‡Auscultation should be performed in both supine and standing positions (or with Valsalva maneuver), specifically to identify murmurs of dynamic left ventricular outflow tract obstruction.

§Preferably taken in both arms.

Advisability

The AHA continues to support preparticipation cardiovascular screening for student-athletes and other participants in organized competitive sports as justifiable, necessary, and compelling on the basis of ethical, legal, and medical grounds. Indeed, preparticipation screening for athletes is viewed as an important public health issue. Noninvasive testing can enhance the diagnostic power of the standard history and physical examination. However, the AHA panel does not believe it to be either prudent or practical to recommend the routine use of tests such as 12-lead electrocardiogram (ECG) or echocardiography in the context of mass, universal screening. This view is based on the substantial size of the athlete cohort to be screened, the relatively low prevalence of cardiovascular conditions responsible for sports-related deaths, the limited resources presently available for allocation (and other cost-efficacy considerations), but particularly the absence of a physician-examiner cadre prepared and available to perform and interpret these examinations. Notably, the latter does not currently exist within the United States (US) healthcare system, and therefore, the addition of such a screening program to preexisting resources would impose a significant and unrealistic manpower burden. In addition, significant concern exists that the widespread application of noninvasive testing to athletic populations would undoubtedly result in false-positive results well in excess of the number of true-positives, thereby creating unnecessary anxiety among substantial numbers of athletes and their families, as well as the potential for unjustified exclusion from competition. However, this view represents a perspective on large-scale national screening programs and is not intended to actively discourage individual local efforts.

The panel concluded that complete and targeted personal and family history and physical examination (including brachial artery blood pressure measurement) designed to identify or raise the suspicion of those cardiovascular diseases known to cause sudden cardiac death or disease progression in young athletes represent the most practical screening strategy for implementation in large populations of young competitive sports participants in the United States. This medical evaluation should be performed by a qualified examiner and include the 12 key AHA-recommended elements for personal and family history-taking and physical examination, as well as parental verification of the medical history for high school and middle school student-athletes. Examinations should be conducted in a physical environment conducive to optimal auscultation of the heart. Obtaining echocardiograms and/or electrocardiograms as part of preparticipation screening remains optional.

Such an approach is an obtainable objective and should be mandatory for all competitive athletes before their initial engagement in organized sports. Comprehensive screening evaluations should be administered again after 2 years for high school athletes. College student-athletes should be evaluated with a complete history and physical examination on matriculation to the institution before they begin training and competition, and thereafter, an interim history (with blood pressure measurement) should be administered in each of the subsequent 3 years. Important changes in medical status detected during the solicitation of interim annual histories for college athletes may constitute evidence that another physical examination and possible further testing should be performed.

The panel recommends the development of a national standard for cardiovascular medical evaluations that could be used in the systematic assessment of all high school and college-aged student-athletes, although the guideline developers are cognizant that this aspiration would require the cooperation and input of many organizations and interested parties. The official recommendations and requirements of athletic governing bodies with regard to the nature and scope of preparticipation medical evaluations are now heterogeneous in design and content, lacking in standardization, and often inconsistent among the states (for high school athletes) or colleges and universities. In many cases, such recommendations cannot be viewed as medically sufficient. Adherence to uniform guidelines would result in the identification of many more athletes with cardiac disease and thereby positively impact the health of student-athletes by enhancing the safety of competitive sports.

For older competitive athletes (~35 to 40 years of age or older), knowledge of a personal history of coronary artery disease risk factors and/or familial occurrence of premature atherosclerotic heart disease is useful in screening for underlying cardiac disease. In addition, it may be useful to selectively perform medically supervised exercise stress testing in men >40 years of age (women >55 years of age) who wish to engage in habitual vigorous training and competitive sports and who have $\geq$2 coronary risk factors (other than age and gender), or possibly a single risk factor if it is markedly abnormal. Older athletes should also be specifically cautioned with regard to the potential significance of prodromal cardiac symptoms, such as exertional chest pain.

Certain insights offered here with regard to screening should not promulgate a false sense of security on the part of medical practitioners or the general public. The standard history and physical examination implicitly lack the power to reliably raise the suspicion of (or identify) certain potentially lethal cardiovascular abnormalities. Indeed, it is unrealistic to expect that standard large-scale athletic screening examinations can exclude all clinically relevant diseases.

Methodology

Preparticipation sports examinations in young athletes are presently performed by a variety of individuals, including physicians (compensated or volunteer) or nonphysician healthcare workers with varying degrees of training or experience. Examiners may be associated with or administratively independent of the concerned institutions, schools, or teams. The panel harbors particular concern about the current practice of 18 states that have legislated for chiropractors or naturopathic clinicians to perform preparticipation high school clearance examinations, despite their lack of formal professional training for such activities. Consequently, we strongly recommend that cardiovascular athletic screening with history and physical examination be performed only by physicians or other healthcare workers with requisite training, medical skills, and background to reliably recognize or raise reasonable suspicion of heart disease. Although it is preferable that such individuals be licensed physicians, this is not always feasible, and therefore, it is acceptable for nurse practitioners or physician-assistants formally trained in physical examination techniques to perform athletic screening evaluations. Nevertheless, the panel recommends the establishment of a standardized certification process for designated nonphysician examiners to ensure an acceptable level of expertise in performing screening evaluations in young athletes.

We recognize that the accuracy of some responses elicited by history-taking from young sports participants may depend on a level of personal compliance and their depth of medical knowledge, and this issue can have a significant impact on the accuracy of the screening process. Therefore, parents should be responsible for completing the history form for minors. Preparticipation screening is, however, only the first opportunity for recognition of cardiovascular disease. When abnormalities are identified (or suspected) on mass screening, athletes should be referred to a cardiovascular specialist for further evaluation and confirmation.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence supporting the recommendations is not specifically stated for each recommendation.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- Appropriate preparticipation screening for cardiovascular abnormalities in competitive athletes
- Early detection of clinically significant cardiovascular disease through preparticipation screening will, in some cases, permit timely therapeutic interventions that may alter clinical course and significantly prolong life.

POTENTIAL HARMS

Screening could also be potentially deleterious to many athletes by virtue of false-positive test results that would lead to unnecessary further evaluations and testing, anxiety, and possibly to disqualification without merit.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Staying Healthy

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Maron BJ, Thompson PD, Ackerman MJ, Balady G, Berger S, Cohen D, Dimeff R, Douglas PS, Glover DW, Hutter AM Jr, Krauss MD, Maron MS, Mitten MJ, Roberts WO, Puffer JC, American Heart Association Council on Nutrition, Physical Activity, and Metabolism. Recommendations and considerations related to preparticipation screening for cardiovascular abnormalities in competitive athletes: 2007 update. Circulation 2007 Mar 27;115(12):1643-55. [61 references] PubMed

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2007 Mar

GUIDELINE DEVELOPER(S)

American Heart Association - Professional Association

SOURCE(S) OF FUNDING

American Heart Association

GUIDELINE COMMITTEE

Council on Nutrition, Physical Activity, and Metabolism

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Council Members: Barry J. Maron, MD, *Chair*; Paul D. Thompson, MD, FAHA, *Co-Chair*; Michael J. Ackerman, MD, PhD; Gary Balady, MD, FAHA; Stuart Berger, MD; David Cohen, MD; Robert Dimeff, MD; Pamela S. Douglas, MD, FAHA; David W. Glover, MD; Adolph M. Hutter, Jr, MD, FAHA; Michael D. Krauss, MD; Martin S. Maron, MD; Matthew J. Mitten, JD; William O. Roberts, MD; James C. Puffer, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

Writing Group Disclosures

Writing Group Member	Employment	Research Grant	Other Research Support	Speakers' Bureau/Honoraria	Ownership Interest	Consultant/Advisory Board
Barry J. Maron	Minneapolis Heart Institute Foundation	None	None	None	None	None
Paul D. Thompson	Hartford Hospital	None	None	None	None	None
Michael J. Ackerman	Mayo Clinic	NIH-HD42569; AHA Established Investigator Award	None	None	None	PGxHealth, Medtronics, CV Therapeutics, Pfizer

Writing Group Member	Employment	Research Grant	Other Research Support	Speakers' Bureau/Honoraria	Ownership Interest	Consultant/Advisory Board
Gary Balady	Boston University	None	None	None	None	None
Stuart Berger	Medical College of Wisconsin	None	None	None	None	None
David Cohen	Beth Israel Deaconess Medical Center	None	None	None	None	None
Robert Dimeff	The Cleveland Clinic Foundation	None	None	None	None	None
Pamela S. Douglas	Duke University	None	None	None	None	None
David W. Glover	Saint Luke's Medical Group	None	None	None	None	None
Adolph M. Hutter, Jr	Massachusetts General Hospital	None	None	None	None	None
Michael D. Krauss	Purdue University	None	None	None	None	None
Martin S. Maron	Tufts University	None	None	None	None	None
Matthew J. Mitten	Marquette University Law School	None	None	None	None	None
William O. Roberts	University of Minnesota School of Medicine	None	None	None	None	None
James C. Puffer	American Board of Family Medicine	None	None	None	None	None

This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit.

Reviewer Disclosures

Reviewer	Employment	Research Grant	Other Research Support	Speakers' Bureau	Honoraria	Expert Witness	Ownership Interest	Consult
Sana Al-Khatib	Duke University	Medtronic†	None	None	Medtronic†	None	None	
Barbara Bentz	Penn State University	None	None	None	None	None	None	

Reviewer	Employment	Research Grant	Other Research Support	Speakers' Bureau	Honoraria	Expert Witness	Ownership Interest	Consult
Vera Bittner	University of Alabama at Birmingham	None	None	None	None	None	None	
David Cannom	Los Angeles Cardiology Associates	None	None	None	None	None	None	
Mark Carlson	Case Western Reserve University	None	None	Medtronic*; Biotronic*; Guidant*	None	None	Cameron Health*	St. Jud
N.A. Mark Estes	New England Medical Center	None	None	None	None	None	None	
Alan Forker	Mid America Heart Institute	None	None	None	None	None	None	
Michael Gold	MUSC Medical Center	None	None	None	Guidant*; St. Jude*	None	None	
David Haines	Beaumont Hospitals	None	None	None	None	None	None	
Bradley P. Knight	University of Chicago	Guidant†; Medtronic†; St. Jude†	None	Guidant*	None	None	None	C
Peter Kowey	Cardiovascular Associates of Southeastern Pennsylvania	None	None	None	None	None	None	
Mark Link	New England Medical Center	None	None	None	None	None	None	
Patrick E. McBride	University of Wisconsin-Madison	None	None	None	None	None	None	
Andrea Russo	University of Pennsylvania	Medtronic*; Guidant*; St. Jude*	None	None	Medtronic*; St. Jude*	None	None	
David Rosenbaum	Case Western Reserve University	St. Jude Medical†	None	None	None	None	None	Cambri
John Stephen Strobel	IMA, Inc	None	None	None	None	None	None	
Reginald Washington	Rocky Mountain Pediatric Cardiology	None	None	None	None	None	None	

This table represents the relationships of reviewers that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all reviewers are required to complete and submit. A relationship is considered to be "significant" if (1) the person

receives $10 000 or more during any 12-month period or 5% or more of the person's gross income; or (2) the person owns 5% or more of the voting stock or share of the entity or owns $10 000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

*Modest

†Significant

ENDORSER(S)

American College of Cardiology Foundation - Medical Specialty Society

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available from the American Heart Association Web site.

Print copies: Available from the American Heart Association, Public Information, 7272 Greenville Ave, Dallas, TX 75231-4596; Phone: 800-242-8721

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI Institute on July 27, 2007. The information was verified by the guideline developer on August 24, 2007.

COPYRIGHT STATEMENT

DISCLAIMER

NGC DISCLAIMER

The National Guideline Clearinghouse™ (NGC) does not develop, produce, approve, or endorse the guidelines represented on this site.

All guidelines summarized by NGC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public or private organizations, other government agencies, health care organizations or plans, and similar entities.

Guidelines represented on the NGC Web site are submitted by guideline developers, and are screened solely to determine that they meet the NGC Inclusion Criteria which may be found at http://www.guideline.gov/about/inclusion.aspx .

NGC, AHRQ, and its contractor ECRI Institute make no warranties concerning the content or clinical efficacy or effectiveness of the clinical practice guidelines and related materials represented on this site. Moreover, the views and opinions of developers or authors of guidelines represented on this site do not necessarily state or reflect those of NGC, AHRQ, or its contractor ECRI Institute, and inclusion or hosting of guidelines in NGC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding guideline content are directed to contact the guideline developer.

Date Modified: 10/6/2008