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Appendix 1. Author Relationships With Industry and Others

Name	Consultant	Research Grant	Scientific Advisory Board	Speakers' Bureau
Dr. N. A. Mark Estes III	• Guidant • Medtronic	• Guidant • Medtronic	• Guidant (Executive Committee)	None
Dr. Robert Kloner	• Bayer GSK • Lilly ICOS • Pfizer • Schering Plough	• CV Therapeutics • Lilly ICOS • McNeill	• Bayer GSK • Lilly ICOS • Pfizer	• Bayer GSK • Lilly ICOS • Pfizer
Dr. Brian Olshansky	• Guidant • Medicorp	• Medtronic	None	• Astra Zeneca • Baxter • Bayer GSK • Reliant Pharmaceutical
Dr. Renu Virmani	None	None	None	None

Task Force 10: Automated External Defibrillators

Robert J. Myerburg, MD, FACC, *Chair*
N. A. Mark Estes III, MD, FACC, John M. Fontaine, MD, FACC, Mark S. Link, MD, FACC, Douglas P. Zipes, MD, MACC

GENERAL CONSIDERATIONS OF CARDIAC ARREST RISK AMONG ATHLETES

The incidence of out-of-hospital cardiac arrest among the general population of adults is 1 to 2 deaths per 1,000 subjects per year; a figure that represents 50% of all cardiovascular deaths (1). For the adolescent and young adult subgroups, the estimated incidence is 1 per 100,000 per year or less. Available data suggest that among the younger population, competitive athletes account for a disproportionately higher-risk subset, compared to the general population in a comparable age group (2–4). In addition, among the adult population performing conditioning activities in health clubs, the probability of cardiac arrest during exertion appears higher than the expected rate for comparable groups generally, especially among persons who exercise despite being habitually sedentary (5).

Within the subgroup of the population age 35 years and older, coronary heart disease accounts for approximately 80% of all sudden cardiac deaths (SCDs), with the cardiomyopathies accounting for another 10% to 15%. In the younger age groups, hypertrophic cardiomyopathy, anoma-

lous coronary arteries, myocarditis, and various other inherited disorders that are associated with arrhythmic risk dominate the etiologies (1). Although the absolute risk for the young athlete remains low, the excess compared to the general population in their age group and the life expectancy associated with the underlying diseases in the absence of a cardiac arrest, suggests the need for aggressive approaches to the recognition of individuals at risk, and for systems to respond to unexpected events.

ROLE OF AUTOMATED EXTERNAL DEFIBRILLATORS IN RESPONSE TO CARDIAC ARREST

In attacking the problem of SCD, it is unrealistic to assume that any single approach—epidemiological surveillance, primary prevention of disease states, clinical interventions of established diseases, or community-based response systems—will have a major impact alone. Each strategy has a role, in part because a large majority of events occur unexpectedly in the out-of-hospital environment and are not predictable with great accuracy by risk profiling in most clinical circumstances (6).

Because the majority of out-of-hospital cardiac arrests occur by the initial mechanism of ventricular fibrillation, community-based defibrillation strategies have emerged as one approach to the SCD problem. Time to defibrillation is the most important factor in survival from out-of-hospital cardiac arrest due to ventricular fibrillation (7). Thus, community deployment of rapid access systems has been evolving since the late 1960s, when portable defibrillators initially became available. The first systems were fire department-based paramedical programs, and were followed years later by the placement of automated external defibrillators (AEDs) in the hands of non-conventional trained responders, such as security guards, police, and flight attendants (8–15). Most recently, defibrillators were made available to minimally trained or untrained lay responders in public locations such as airports, commercial aircraft, supermarkets, stadiums, and hospitals (14–17), and have also been suggested for private residences or neighborhoods (18).

Although survival rates from out-of-hospital cardiac arrest remain far lower than desirable, the various out-of-hospital response strategies have improved the survival rates, largely based on more rapid response times. Those settings and strategies that provide response times from witnessed onset to initial defibrillation of less than 2 to 3 min can provide survival outcomes hovering about 50% (16); but rates fall sharply with each passing minute thereafter. By 4 to 5 min, survival is 25% or less, and less than 10% after 10 min (19). As a consequence, despite the apparent value of conventional emergency medical systems and other vehicle-based systems such as police responders, additional public access systems are anticipated to provide even faster access to defibrillation. Such systems are being deployed and tested (20,21). Each has potential or demonstrates added benefit to survival rates.

AEDs AT SITES OF TRAINING AND COMPETITION

Among young athletes, cardiac arrests generally occur during or shortly after intense training sessions or competition. Although the incidence of cardiac arrest is extremely low (approximately 1% of that reported in middle-age and older adult populations), the value of prompt and successful resuscitation and long-term survival is enhanced by the potential of extended life over many decades (i.e., much longer than is the case for older adults, among whom the extent of underlying disease results in substantial risk over shorter time periods). Thus, it is considered reasonable to have an AED available for use at educational facilities, training centers, and sports arenas and stadiums, in addition to trained responders among the staff at each (5,21). The AEDs should be deployed in a distribution that can achieve an anticipated response time of 5 min or less (22). When the time from loss of consciousness to availability of an AED is 5 min or longer, 30 to 60 s of CPR prior to the first attempt to defibrillate has been shown to provide a survival benefit (23).

Although there are only anecdotal observations supporting the feasibility and impact of this strategy, the rationale is clear and should be promoted. In addition, it should be recognized that the availability of AEDs during competitive sporting events also provides the potential for life-saving support to spectators and other bystanders. Nonetheless, the availability of an AED at a sporting event should not be construed as absolute protection against a fatal outcome from a cardiac arrest. Neither should it supersede restrictions against participation in competitive sports, based upon underlying cardiac abnormalities, as defined in this document.

Recommendations:

1. **The AEDs should be available at educational facilities that have competitive athletic programs (including intramural sports and conditioning classes), stadiums, arenas, and training sites, with trained responders identified among the permanent staff. Devices should be deployed so as to provide a response time of less than 5 min.**
2. **The initial response to a suspected or identified cardiac arrest should be to contact emergency medical services (e.g., 9-1-1), followed immediately by, or concomitant with, initiating CPR and deploying the AED.**

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Appendix 1. Author Relationships With Industry and Others

Name	Consultant	Research Grant	Scientific Advisory Board	Stock Holder	Expert Witness Testimony
Dr. N. A. Mark Estes III	• Guidant • Medtronic	• Guidant • Medtronic	• Guidant (Executive Committee)	None	None
Dr. John M. Fontaine	None	None	None	None	None
Dr. Mark S. Link	None	• Guidant • Medtronic	None	None	None
Dr. Robert J. Myerburg	• Guidant • Procter & Gamble	None	• Procter & Gamble • Reliant Pharmaceutical	None	• 2000, Defense, Lewis vs. Mudge • 2002, Defense, Weiner vs. Vitello • 2005, Defense, Ephedra Multi-District Litigation
Dr. Douglas P. Zipes	• Cardiofocus • Janssen • Medtronic	• Medtronic	• Medtronic	• MVMD	• 1996, Defense, Knapp vs. Northwestern

Task Force 11: Commotio Cordis

Barry J. Maron, MD, FACC, *Chair*
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GENERAL CONSIDERATIONS

Sudden and unexpected deaths of young athletes are most frequently the consequence of unsuspected cardiovascular diseases (1). However, participants in organized sports are also subject to another risk for sudden death that occurs in the absence of cardiovascular disease—namely, blunt, nonpenetrating, and usually innocent-appearing chest blows, triggering ventricular fibrillation unassociated with structural damage to the ribs, sternum, or heart itself (*commotio cordis*) (2,3). Although the precise incidence during competitive