Healthcare Provider's Manual for
Basic Life Support

American Heart Association

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Preface

This manual is provided as a reference resource and textbook for the American Heart Association's "Course C: Basic Life Support for Healthcare Providers." Healthcare providers include physicians, nurses, EMTs and allied health personnel. This manual is adapted from the *Instructor's Manual for Basic Life Support.*

Chapters 1 and 2 of the manual are devoted to background — the history and relevance of CPR, the role of the American Heart Association, and other general topics. A detailed presentation of cardiorespiratory anatomy and function is also included, along with a review of the causes of cardiovascular disease and cardiac arrest. Special interest information such as that on epilepsy and stroke is provided but is not a requirement for BLS courses.

Chapters 3–9 provide detailed explanations of the technical aspects of CPR, with separate chapters devoted to each recue situation — adult one-rescuer CPR, foreign body airway obstruction management, pediatric CPR, etc. Chapter 9 deals with special situations, special techniques, and complications in the delivery of CPR.

Chapter 10 is about safety in CPR. It includes information on avoiding cross contamination in manikin practice and rescuer safety in the actual performance of CPR.

Finally, support materials are provided in three appendices, with the course curriculum and the written test and skills performance requirements for course completion outlined in Appendix B.

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History, Concepts, and Systems of Emergency Cardiac Care

Chapter 1

One of the most startling ideas of modern medicine is that "sudden death" can be reversed. Perhaps more astonishing is the realization that this miracle of science can be brought about by *any of us, anywhere,* using only our hands, our lungs, and our brains. Cardiopulmonary resuscitation (CPR) that is performed properly and promptly — i.e., before "sudden death" has resulted in final, biological death — can give victims the time to receive treatment by advanced medical techniques.

In 1984 cardiovascular disease accounted for 986,400 deaths, including 540,400 due to heart attacks, most of which were sudden deaths.[1] Communities with large numbers of laypersons trained in basic life support (BLS) and with a rapid response system of well-trained paramedical persons have demonstrated that more than 40% of patients with documented, out-of-hospital ventricular fibrillation (a chaotic, uncoordinated quivering of the heart muscle) can be successfully resuscitated if cardiopulmonary resuscitation (CPR) is provided promptly and followed by advanced cardiac life support.[2] Successful resuscitation in selected subgroups of patients with documented cardiac arrest can be accomplished in 60–80% of cases.[3, 4] In the absence of prompt bystander CPR, though, successful resuscitation of the out-of-hospital cardiac arrest victim may be less than half as likely, despite the availability of a well-trained paramedical team with a rapid response time.[5] Thus, the role of a bystander is indispensable for optimal resuscitative efforts on behalf of the out-of-hospital cardiac arrest victim.[5] Full implementation of community lifesaving systems might save between 100,000 and 200,000 lives each year in the United States.

This chapter presents the historical background for CPR, the philosophy of the current BLS standards, the role of the American Heart Association (AHA) in emergency cardiac care, the structure of AHA training systems in BLS, and the rationale for widespread CPR training. It should provide information for a better understanding of the current AHA position on CPR. The healthcare provider in a BLS course will not be tested on the information in this chapter.

("BLS" and "CPR" are often used interchangeably; however, CPR is a component of emergency cardiac care that may be required in *advanced* cardiac life support as well as in *basic* life support, which are the two levels of emergency cardiac care.)

Historical Perspective

Twenty-five years have passed since the introduction of external chest compressions[6] provided real hope for preventing a substantial number of the nearly 1,000 prehospital sudden deaths occurring each day in the United States. In 1966 a National Academy of Sciences–National Research Council (NAS–NRC) conference on CPR recommended that medical and allied health professionals be trained in the external chest compression and exhaled air ventilation (e.g., mouth-to-mouth resuscitation) techniques according to the standards of the AHA.[7, 8] That resulted in widespread acceptance of CPR among healthcare professionals. Nevertheless, training was not prevalent in most parts of the country, and laypersons were usually limited to involvement on a supervised trial basis. During the period 1966–1973, advances toward implementation were made by the AHA through its training materials and programs,[9–15] by the NAS–NRC through its publications,[7, 8, 16–21] by the reports of the Inter-Society Commission for Heart Disease Resources,[22–28] and by the recommendations and evaluations of governmental agencies,[29–34] professional medical societies,[35–39] and private groups.[40–46]

1973 National Conference Recommendations

In 1973 a national conference on standards for CPR and emergency cardiac care (ECC), cosponsored by the AHA and the NAS–NRC, made the following recommendations:

1. Cardiopulmonary resuscitation training programs must be extended to the general public.
2. Training in CPR and ECC must be in accordance with the standards of the AHA, and the AHA should continue to review scientific data and clinical experience and revise and update the standards on those bases.
3. Course completion at various levels of life support must be based on nationally standardized curricula that include written and performance (skills) tests.
4. Delivery of basic and advanced life support by highly trained personnel must be required for all life support units and hospitals on an integrated, stratified, community-wide basis.
5. These goals must be implemented, by legislation and medicolegal action where needed, to ensure the delivery of effective CPR and ECC to the entire population.
6. Recognition of early warning signs of a heart attack and emphasis on prompt access to the emergency medical services (EMS) system should be included in the definition of ECC.

In addition, the national conference defined 1) the role of the American Red Cross (ARC) and other agencies in training the lay public, 2) the role of life support units, or emergency care units, in stratified systems providing ECC, and 3) possible approaches to problems in medicolegal aspects of CPR and ECC.

The recommendations and specific standards for both basic and advanced cardiac life support were published as a supplement to *The Journal of the American Medical Association (JAMA)*[46] in February 1974. Subsequently, materials for teaching CPR to laypersons and medical professionals, developed primarily by the AHA and the ARC, were widely distributed. As a result, public awareness of CPR was heightened, and interest in CPR training surged. By 1977, 66% of American adults knew of the existence of CPR procedures.[47]

Two national conferences cosponsored by the AHA — Medicolegal Implications of Emergency Medical Care (1975)[48] and Emergency Airway Management (1976)[49] — emphasized CPR training further.

1979 National Conference Recommendations

The charges to the 1979 National Conference to review and revise the 1974 standards for both BLS and advanced cardiac life support (ACLS) involved consideration of 1) then-present recommendations for each level of advanced cardiac life support CPR-ECC (as applied to both children and adults) and the validity of those recommendations based on both clinical experience and scientific data, 2) new scientific data for its potential contribution, 3) areas of promising research in CPR-ECC, and 4) development of state-of-the-art standards and guidelines for the performance of CPR-ECC.

The conference was aware that its first responsibility to the worldwide enthusiasm for and growing success of CPR-ECC was to do no harm. The conference also realized that any substantive change in BLS would require several years to implement. At the same time, the conference recognized its responsibility to recommend new techniques parallel with present BLS teaching if such techniques promised advances in lifesaving potential.

Accordingly, the attitude of the 1979 conference, especially for performance of BLS, was as follows: 1) No changes should be recommended unless unequivocal advantages had been documented. 2) In view of the success of layperson CPR, any new technique offering additional lifesaving potential should be introduced parallel with present recommendations as an alternative technique. 3) If scientific support for any currently recommended procedure is meager, this reality should be cited, recommendations by the conference should be made accordingly, and recommendations for development of a solid data base should be made along with performance recommendations.

As a result of this process, the 1979 conference did not recommend major changes but redefined some terms and expanded certain BLS procedures, particularly for airway management, pediatric resuscitation, and foreign body airway obstruction.[50]

1985 National Conference Recommendations

The objectives of the 1985 National Conference[51, 52] were 1) to review and revise past conference recommendations in light of new scientific and clinical data, 2) to provide prevention recommendations for CPR-ECC programs, 3) to make recommendations regarding education and evaluation needs, including the effectiveness of teaching and the target population for CPR-ECC programs, 4) to provide guidelines for evaluating CPR-ECC outcome, 5) to identify needed CPR-ECC research, and 6) to identify mechanisms by which CPR-ECC can be withheld and/or ACLS withdrawn in appropriate circumstances.

The conference recognized a responsibility to make recommendations based on science and/or clinical data accumulated since 1979. In some subject areas sound data had accumulated, and changes were recommended on that basis. In other areas, while the experimental data were not conclusive, changes were recommended on the basis of clinical evidence or to improve educational efficacy. In still other areas the indications for change were equivocal, and no changes were made. Finally, because of accumulated field and teaching experience, a logical transition was made from some parallel recommendations of 1979 to single therapeutic modalities or treatments in 1985.

The scientist and educator participants of the Conference subjected each proposed change to the above criteria prior to reaching a consensus. Final decisions took into account not only which technique or adjunct or therapy was the most correct but also how the public could best be served, which brought into the decision-making such factors as safety, effectiveness, teachability, and ease of sequencing into related maneuvers. In addition, some recommendations, though remaining basically intact, have since been modified slightly by the peer review process and by integration with other panel recommendations.

Standards and Successful Course Completion in Basic Life Support

Standards and Guidelines

The importance of clarifying what "standards" and "guidelines" are intended to mean was recognized as an important responsibility for the 1979 conference. The term "standards" had been used to apply to the contents of the *JAMA* supplement "Standards for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiac Care (ECC)," published in 1974. The term was employed at that time to introduce the first standardized body of information on the state of the art in BLS and ACLS. Virtually complete acceptance of the recommendations and conceptual material contained within the 1974 standards resulted in the development of teaching materials by different agencies, particularly the ARC and the AHA, which were for the most part consistent, thus minimizing the possibility of public confusion.

As in other fields needing quality control, in BLS training there are "strict constructionists" and "loose constructionists." Strict constructionists require rigid standards for teaching, testing, performance, successful course completion, and renewal, insisting that only in this manner can quality be maintained. Loose constructionists, while realizing the need for uniformity and consistency of content and method in teaching and testing, believe that more flexibility is needed — for two principal reasons: 1) New knowledge and innovation are ongoing, and failure to permit flexibility could result in delay of potentially lifesaving advances. 2) The physician prerogative for discretionary action may be threatened by overly rigid standards, particularly because the term "standards" has important legal as well as medical overtones.

With an eye to maintaining continuity, and because of what is intended and what is not intended by "standards" in BLS and ACLS, the 1980 and 1986 *JAMA* publications were titled "Standards and Guidelines."[50, 51] "Standards" now clearly applies to BLS teaching, especially with regard to laypersons, while "standards" or "guidelines" may be used interchangeably with reference to ACLS, possibly depending on whether one is a strict or loose constructionist.

The 1980 standards and guidelines are intended to

1. Identify the knowledge and performance skills that are commonly necessary for the successful treatment of cardiac arrest victims or the victims of serious or life-threatening cardiac or pulmonary disturbances
2. Indicate that the knowledge and skills recommended or defined do not represent the only medically or legally acceptable approach to a designated problem but an approach that is generally regarded as having the best likelihood of success in view of present knowledge
3. Provide a uniform basis for teaching, testing, and maintaining quality control in BLS and ACLS on the local and national levels
4. Stimulate the widest possible dissemination of not only the knowledge and skills of CPR but also the knowledge of risk reduction and primary prevention, to the largest number of persons possible
5. Provide to the public, to the extent possible, a single approach to the performance of CPR

The standards and guidelines are not intended to imply that 1) justifiable deviations from suggested standards by physicians qualified and experienced in CPR and ECC under appropriate circumstances represent a breach of a medical standard of care, or that 2) new knowledge, new techniques, clinical or research data, clinical experience, or clinical circumstances may not provide sound reasons for alternative approaches to CPR and ECC before the next definition of national standards.

Successful Course Completion

The words "certified" or "certification" are not used to describe completion of the BLS course or the document issued for successful completion of the course. The American Heart Association does not purport to warrant future BLS performance by a Provider or to provide a license of any type for completion of the course.

Because misunderstanding has resulted in some quarters from the use of the term "certified" as it has been applied to BLS, the expression "successfully completed" should be used. It should be understood that the cognitive and performance (skills) testing requirement is the same for each designation.

The Ultimate Coronary Care Unit

Approximately 60% of deaths due to acute myocardial infarction (heart attack) take place outside of the hospital and usually occur within two hours after the onset of symptoms.[54-61] Thus, "sudden death" from coronary heart disease is the most prominent medical emergency today. It is possible that a large number of these deaths can be prevented by prompt, appropriate treatment, which may provide either early entry into the EMS system or cardiopulmonary support using CPR.[4, 62-66]

It has been suggested that the community has the potential for being recognized as the ultimate coronary care unit.[50] With the current interest in CPR, the community may be the ideal mechanism for the control of coronary heart disease (CHD) morbidity and mortality. According to a 1983 Gallup poll, an estimated two thirds of the adult population indicated an interest in being trained in CPR. The proportion of those adults who knew about CPR increased from 66% in 1977 to 87% in 1983, "an extraordinarily high awareness figure."[67] CPR classes should incorporate education in primary prevention (preventing the development of coronary artery disease by, for example, risk factor detection and modification) and secondary prevention (preventing sudden death and myocardial infarction in patients known to have CHD), along with ECC education and training. It is becoming increasingly evident that coronary artery disease (CAD) is born in the community and then nurtured there, beginning with the nutritional patterns of the very young, the pro-smoking messages to teenagers, and the cultural and social pressures that mold unhealthy behaviors. While controversy continues as to the potential impact of risk factor reduction on CHD incidence, there are persuasive data in support of aggressive community action. It is clear, for example, that young and middle-aged men who stop smoking have a major reduction in rates of CHD as compared with those who continue to smoke.[68, 69]

By providing, through education, a mechanism for unprecedented community penetration, CPR may serve as a means of shifting the responsibility for CHD from health-care providers and discrete centers to the community, where CHD is nurtured and where myocardial infarction and sudden death occur with the greatest frequency.

Since one aspect of the ultimate coronary care unit, i.e., layperson CPR, has grown with increasing success, aspects that optimize *preventive* efforts may profitably be coupled with CPR training efforts. Such an ultimate coronary care unit may then include the following: 1) the ability of many laypersons in the community to recognize symptoms of possible myocardial infarction and to develop mechanisms to assure the victim of suspected myocardial infarction the benefits of timely monitoring and treatment, 2) broad capability among laypersons to support the life of the cardiac arrest victim until ACLS becomes available, 3) a mechanism for the recognition of persons at high risk for myocardial infarction and sudden cardiac death by virtue of established diagnosis of CHD, so that effective control programs (secondary prevention) might then be implemented, and 4) recognition, reduction, and control of risk factors for CAD in persons free of clinical manifestations of CAD, especially the young (primary prevention).

Efforts to accomplish these goals are already under way in many areas. Scientific knowledge of the cause of CAD and the mechanisms of sudden cardiac death has greatly increased in recent years. Encouraging evidence suggests that mass media educational campaigns directed at an entire community may be effective in reducing the risk of cardiovascular disease.[70] CPR-ECC education is only a part of the strategy. It is now appropriate for the community to use its energy in parallel efforts for primary and secondary prevention of CHD.

Prevention of Cardiovascular Disease: A Proven Approach

Mortality from coronary heart disease, stroke, and other cardiovascular diseases (CVD) declined, respectively, 39%, 54%, and 19% between 1964 and 1984, contrasting with a decline of only 12% in mortality from noncardiovascular diseases.[1, 71] Among these declines, that of CHD mortality has had the greatest impact on overall life expectancy. Had the death rate due to CHD remained at the level observed in 1964, there would have been 400,000 more deaths due to CHD in 1984.

A number of factors have undoubtedly contributed to the decline in CVD mortality outlined above, i.e., improved approaches to CVD diagnosis and therapy, use of drugs that have a "cardio protective" effect on high-risk individuals, improved surgical techniques, improved ECC, and modification of CVD risk factors in the population.

The reduction of risk factors can reduce CVD mortality and morbidity, and successful intervention at a young age is the approach likely to have the greatest impact. At the same time, intervention later in life, e.g., middle age, cannot be ignored since prevention may slow the progression of arterial disease and can be expected to reduce mortality and morbidity as well. An understanding of the relation of individual risk factors to cardiovascular disease and an enthusiasm for modifying or eliminating risk factors remain the critical determinants in efforts to reduce cardiovascular morbidity and mortality.

Emergency Cardiac Care

Emergency cardiac care (ECC) includes all of the following elements: 1) recognizing early warning signs of heart attack, efforts to prevent complications, reassurance of the victim, and prompt availability of monitoring and treatment aspects of life support, 2) providing immediate BLS at the scene, when needed, 3) providing ACLS at the scene as quickly as possible to stabilize the victim before transportation, and 4) transferring the stabilized victim to an appropriate hospital where definitive medical care can be provided.

Emergency transportation alone, without life support, does not constitute ECC. Although transportation is an important aspect, the major emphasis of ECC is the stabilization of a victim of the life-threatening emergency.

Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS)

Within the definition of ECC, two important aspects — BLS and ACLS — need to be distinguished because the responsibility for making each aspect work rests with a different group, the strategy for developing each capability differs, and the execution of each involves a different population within the community.

Basic life support is that particular phase of ECC that either 1) prevents circulatory or respiratory arrest (or insufficiency) through prompt recognition and intervention, early entry into the EMS system, or both, or 2) externally supports the circulation and respiration of a victim of cardiac or respiratory arrest through CPR.[72] BLS can and should be initiated by any person present when cardiac or respiratory arrest occurs. The most important link in the CPR-ECC system in the community is the layperson. The BLS aspect of ECC is dependent for its success on the layperson's willingness to initiate CPR promptly and his or her ability to provide it effectively. Accordingly, responsibility for providing lifesaving BLS at this level can be considered primarily a public, community responsibility. It is the responsibility of the medical community, however, to educate the public to this responsibility and to provide support for community education and training. BLS also includes the teaching of risk factors and prevention through "prudent heart living" (see Chapter 2).

Advanced cardiac life support includes BLS plus the use of adjunctive equipment, the establishment of an intravenous line, the administration of fluids and drugs, cardiac monitoring, defibrillation, the control of arrhythmias, and postresuscitation care. It also includes establishing the communications necessary to ensure continuing care. Advanced cardiac life support requires the supervision of a physician in person at the scene, directing activities remotely, or directing activities by some other mechanism previously defined by the physician — such as standing orders.

To be effective, ECC should be an integral part of a community-wide emergency medical services (EMS) system. The system should be based on local community needs in terms of patient care and available resources and should be consistent with regional, state, and national guidelines. There is little question that EMS systems have had a positive impact on mortality and morbidity from out-of-hospital cardiac arrests.

Education and Communication

Components such as public education, professional education, and emergency medical communication are essential parts of the total emergency system.

The greatest risk of death from heart attack is in the first two hours after the onset of symptoms.[61, 64] Laypersons, particularly those recognized to be at high risk, must first be educated to recognize the usual manifestations of heart attack. They then must know how to gain access to the EMS system. The fastest way for an emergency medical team to respond is through the use of a universal emergency telephone number, such as 911. Once this number is established, it must be promoted through an educational program so that it will be identified in the minds of as many as possible within the community as the mechanism for immediate access to emergency care. If 911 is not available, education should include the appropriate local emergency number(s).

Each person should have a well-formulated plan of action for use in an emergency. This plan should be based on the best plan of action for the community. When symptoms suggest a heart attack, it is recommended that a mobile life support unit be summoned to reduce the elapsed time from the onset of symptoms to entry into an EMS system. In the absence of such a system, the victim should be taken without delay to an emergency department or other facility with 24-hour life support capability.

Teaching CPR

During the past 15 years a significant portion of the adult population of the United States has been trained in the techniques of CPR. In some areas more than one third of the adult nonmedical population has some information or training in CPR. However, in the majority of cases CPR has been initiated by healthcare providers and not by lay individuals. In addition, only a minority of physicians have become involved in delivering CPR/ACLS. Educational methods must be developed that will enhance the use of emergency rescue skills by both laypersons and healthcare providers and, thus, improve the outcome of cardiac emergencies.

There are many reasons why lay individuals do not become involved in performing CPR: lack of motivation, fear of doing harm, inability to remember exact sequences, and poor retention of psychomotor skills. Thus, a major goal is for laypersons to learn and retain information concerning CPR and to be sufficiently motivated to become involved. In an effort to enhance learning, several changes in education should be instituted.

A particular area of concern is the selection of students. Usually, the majority of lay individuals taking CPR are young adults who are not often exposed to high-risk individuals. An emphasis must be placed on the need to train families, neighbors, and co-workers of high-risk individuals. Guidelines to assist CPR-teaching organizations in identifying these groups should be developed. Modular courses should be used increasingly, making it possible for students to concentrate on that particular aspect of BLS most applicable to their situation. For example, the families of patients with heart disease could be taught one-rescuer CPR for adults, whereas young parents might wish to take a course in which only infant resuscitation is taught.

Emphasis should be placed on teaching one-rescuer CPR to laypersons. Two-rescuer CPR is seldom, if ever, used by lay rescuers — when help is summoned it most often comes in the form of EMS personnel, who then relieve the lay rescuer. Teaching the additional sequences and skills of two-rescuer CPR adds complexity, likely leading to decreased retention of the main techniques of single-rescuer CPR.

Role of the American Heart Association

The American Heart Association is a nonprofit voluntary health agency supported solely by private contributors, not government tax dollars, whose mission is "to reduce disability and death from cardiovascular diseases and stroke." It does so by supporting research, professional and public education, and community service programs.

Scientists supported by AHA research programs seek to understand the different forms of cardiovascular diseases. Scientific councils of the AHA look for ways to improve patient care and treatment. Education and community service programs of the AHA promote a healthful lifestyle for Americans.

Emergency cardiac care will continue to be a responsibility of the AHA as long as sudden cardiac death continues to be a problem. Emergency cardiac care should be interpreted as including the three accepted areas of AHA programs:

1. Public education
2. Professional education
3. Community programs

The role of the AHA in ECC was defined by the 1973 and 1979 conferences and modified by the 1985 conference.[46, 50, 51] The charges outlined in the 1986 *JAMA* supplement can be summarized as follows:

1. Establish and revise standards, and develop and distribute materials.
2. Develop community resources for training, and act as a catalyst in the community to develop a stratified emergency medical services system.
3. Direct professional and public education efforts.

Since the AHA has both the expertise and community involvement to effectively evaluate such programs, it must continue to bear the ultimate responsibility for monitoring and evaluating teaching and performance standards in ECC.

In 1963 the AHA established the Subcommittee on Cardiopulmonary Resuscitation. This was expanded in 1971 to the Subcommittee on Cardiopulmonary Resuscitation and Emergency Cardiac Care and subsequently renamed the Committee on Emergency Cardiac Care.

The American Heart Association Training Network

The training network, represented by a pyramid structure (Figure 1), provides a systematic mechanism for long-range strategic planning and training in BLS. It offers a means of involving more people in the program in an orderly way, which more equitably distributes the work load. The responsibilities of faculty members and instructors are discussed below. Information on appointment criteria, successful course completion, renewal, and reciprocity is presented in Chapter 16.

AHA Training Network

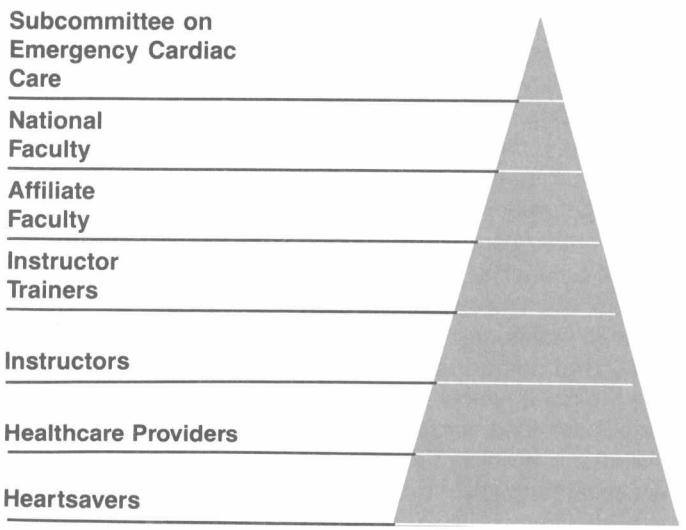

Figure 1. Structure of the AHA training network pyramid.

National Faculty

The National Faculty consists of Instructors in BLS who have been appointed by the Committee on Emergency Cardiac Care to assist in the implementation of the training network. Such appointment is valid for two years and is reviewed biennially.

The National Faculty member may serve as a special consultant to the Committee on Emergency Cardiac Care and/or as a liaison between the Committee and the affiliates. A National Faculty member must work with the affiliate and should be intimately involved as a member and/or consultant of the affiliate/component Committee on Emergency Cardiac Care. One of their responsibilities is to disseminate information through the affiliate network. The National Faculty position may also be used for those who will implement the training network within the military (both inside and outside the United States).

The responsibilities of the National Faculty may include, but are not limited to, the following:

1. Organizing and implementing national training programs for Affiliate Faculty when the need is present
2. Assisting affiliates in the organization and implementation of training programs for Affiliate Faculty and Instructor Trainers in BLS
3. Assisting Affiliate Faculty in training Instructors in BLS
4. Assisting Instructors in training Providers in BLS
5. Consulting with the AHA Committee on Emergency Cardiac Care and assisting with special projects and programs as requested
6. Becoming involved in the development and implementation of local, state, or national EMS systems
7. Assisting the affiliate/component committee responsible for planning, implementing, and evaluating their ECC programs
8. Guiding and assisting medical training institutions in integrating BLS courses into the curriculum

One BLS National Faculty member is nominated by each affiliate. The Committee on Emergency Cardiac Care reserves the right to appoint additional BLS National Faculty members as consultants.

Associate Faculty

The Associate Faculty consists of Instructors in BLS and ACLS outside of the United States who have been appointed by the Committee on Emergency Cardiac Care to assist in the implementation of the training network in their home country. This designation in the international CPR program is the equivalent of the National Faculty in the training network of the AHA. Such appointments are valid for two years.

Associate Faculty members serve as liaisons from their countries to the Committee on Emergency Cardiac Care and are responsible for organizing the training network in their respective countries.

The responsibilities of the Associate Faculty may also include, but are not limited to, the following:

1. Organizing and coordinating the training program in CPR in their country
2. Training Instructors in BLS and ACLS
3. Consulting with the AHA Committee on Emergency Cardiac Care on CPR programs or other special projects
4. Becoming involved in the development and implementation of EMS systems within their own countries
5. Assisting the AHA in the renewal of training of individuals in that country who successfully completed courses in the United States
6. Assisting the AHA in the translation of teaching material from English to the local language
7. Preparing an annual report to the AHA National Center, including the number of BLS and ACLS courses given in the country and the number of individuals trained at different levels (Provider, Instructor, etc.)

Affiliate Faculty

The Affiliate Faculty consists of Instructors in BLS who have been appointed by the *affiliate committee* responsible for ECC. The affiliate committee may require attendance at an Affiliate Faculty workshop prior to appointment or reappointment. Such an appointment is valid *only* within that affiliate and is made on a yearly basis. The Affiliate Faculty is responsible for the implementation of the training network within the affiliate and, hence, should consist of experienced Instructors who are actively involved in teaching BLS.

The responsibilities of the Affiliate Faculty may include, but are not limited to, the following:

1. Training Instructors
2. Monitoring Instructors for successful course completion and renewal
3. Assisting the affiliate committee whose responsibility it is to plan, implement, and evaluate ECC programs
4. Becoming involved in the development and implementation of local and state emergency medical service systems
5. Guiding and assisting training institutions in integrating BLS into the curriculum

The Instructor

An Instructor is one who has successfully completed the AHA Instructor Course in BLS and who has received a satisfactory monitor's report while serving as an Instructor in a subsequent course. BLS Instructors must keep their BLS Provider status current during their tenure as a BLS Instructor. *Successful course completion at the Instructor level should be acknowledged by all affiliates and should not be limited to any geographic area.* For Instructors moving from one area to another, a period of orientation to local policies and procedures may be required. Successful course completion as an Instructor is valid for two years. The responsibilities of an Instructor are as follows:

1. Train Providers to successfully complete course. The Instructor may serve as Course Director in a BLS Provider Course
2. Serve, if needed and appointed, as a faculty member in a BLS Instructor Course
3. Assist the committee responsible to plan, implement, and evaluate its ECC program

The Instructor Trainer

Instructor Trainers are Instructors in BLS who have been appointed by the affiliate/component committee responsible for ECC. The appointing committee may require attendance at an Instructor Trainer workshop prior to appointment or reappointment. Such an appointment is valid only within the jurisdiction of the appointing committee and is made on a yearly basis. "Instructor Trainer" designates experienced Instructors who will be responsible for implementing the training network within the affiliate and/or component. They should assist the Affiliate Faculty, or assume their responsibilities completely when no Affiliate Faculty is available. *The designation of Instructor Trainers is optional* and is made principally by affiliates and their components when sufficient Affiliate Faculty members are not available.

The responsibilities of an Instructor Trainer are to

1. Train Instructors (they may serve as Course Directors in BLS Instructor or Provider courses)
2. Monitor Instructors for the purpose of successful course completion and renewal
3. Assist the AHA component committee whose responsibility it is to plan, implement, and evaluate ECC programs
4. Become involved in the development and implementation of local and state EMS systems
5. Guide and assist training institutions in integrating BLS into the curriculum

The Provider

A BLS Provider is one who has successfully completed the written examination and all performance (skills) testing of an AHA BLS Provider Course according to AHA requirements. Attendance at the lecture and practice sessions, although highly recommended, is not required. Successful completion at the provider level should be recognized by all affiliates and should not be limited to any geographic area. Course completion is valid for a maximum of two years. However, Providers should be encouraged to have at least annual renewal sessions to minimize the loss of psychomotor skills. Individual states, communities, hospitals, or organizations may have more stringent requirements for renewal of training for individual Providers to meet specific local needs.

CPR Training Systems

Public Education and Community Programs Target Sites

Public education and community programs are designed and developed for the individual, the family, and the community. Public education and community programs are priority health interventions, methods, or activities that are based on compelling or conclusive scientific evidence and that may also have a health or treatment benefit. They are developed, field tested, and packaged in modular form for use by affiliates. A module includes guidelines for implementation, marketing, and evaluation. Educational materials and audiovisuals are prepackaged for affiliate use. Community programs are designed to modify or change individual and/or community attitudes and practices to improve cardiovascular health and decrease morbidity and mortality from disease of the heart and blood vessels. To reach the public with authoritative information on cardiovascular health, the AHA Program Committee has selected four specific sites within the community where impact can be the greatest (referred to as target sites) — the schoolsite, the worksite,

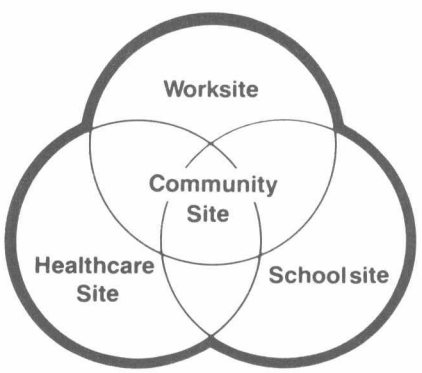

Figure 2. The interrelationship of the schoolsite, the worksite, the healthcare site, and the community site.

the healthcare site, and the community site (Figure 2). These locations offer controlled settings that can provide established networks of communication, staff for the delivery of messages or services, and independent funding mechanisms to carry out programs. The target sites further provide the ideal setting for followup and evaluation.

The ECC program package contains specific course materials, the ECC standards, and program management guidelines. Because public education in CPR is required if the AHA is to achieve its goal of reducing disability and death from cardiovascular diseases and stroke, BLS training is an essential part of community education.

It is the responsibility of the AHA to develop, maintain, and distribute the standards for emergency cardiac care. It is also the role of the AHA to assist the community in developing educational programs, to make them self-supporting where possible, and to perpetuate the skills of CPR.

Mass Training

Mass training[73] may be one answer to the growing demand for CPR. The notion of training large numbers of people in one day or one weekend is not new, but its practice on a national scale is limited. One of the original mass training programs was Project Lifesaver in the Greater Kansas City area. In 1980, 2,000 people were trained in one day in the Royals Stadium. In 1981, 13,400 people were similarly trained in a Mother's Day event. Equally impressive has been Project CPR, sponsored by the North Central Texas Council of Governments and local chapters of the American Heart Association/American Red Cross (ARC), in which 13,800 people were trained in a single weekend.

In the summer of 1981 the National Broadcasting Corporation (NBC) and the ARC conducted a national television CPR program coincident with an increased availability of CPR training in all ARC chapters. The program did not meet anticipated goals as a mass training program; however, it did create significant long-term increases in CPR class enrollments. The effort was repeated in 1982 with greater success. The NBC-ARC program and other mass training efforts such as the Texas Project CPR introduced the concept of media CPR. With increased use of television, mass training should also increase.

Hundreds of mass training events developed across the country have been successful as a result of adequate planning. Mass training procedures have been refined and programs are easier to conduct. General suggestions from previous sessions are presented for those Instructors who may wish to undertake mass training projects.

1. Preregistration is a must in planning for instructors and manikins. Course over-enrollment is good planning and should be encouraged. In Project Lifesaver the dropout rate was 30%.
2. Phone registration is usually more efficient than mail registration.
3. A central control center should be established for each training site. Responsibilities of the center include the number of instructors needed; the number of students who regist, attend, and successfully complete the course; and maintenance of manikins.
4. The number of training sites should be kept to a minimum. It is easier to monitor a few large sites than many small sites. Schools, field houses, gymnasiums, and cafeterias that can accommodate up to 200 people make ideal settings for mass training. While hospitals often supply many instructors, training at hospitals is often limited to small rooms, which is a disadvantage.
5. Sites should be available at all hours on each day the mass training is planned.
6. The subject matter portion of the course should be presented by television or videotape rather than lectures. This approach provides efficiency, consistency, and effectiveness in the short time available.
7. There must be uniformity in instruction and coordination for instructors. While national standards for CPR exist, instructors are subject to their own interpretations of the standards. With instructors from a variety of backgrounds, the situation is ripe for conflict. Conflict in concepts is a source of confusion for the student and will detract from the understanding and ability to perform CPR. All information must be compatible. Instructor orientation before the program is a necessity. Since instructor dropout can be anticipated, substitutes should be recruited.
8. Long waiting lines for manikin practice and testing can detract from the overall effectiveness of a program and may turn people away. Contributing causes may be poor allocation of equipment, insufficient equipment, too few instructors, poor design of practice and testing stations, and underestimation of the potential number of students in the program. Good planning can reduce the incidence of problems.
9. If a repair service is not available at each site, a roving repair service should be available for dispatching from a central center.
10. Records of students successfully completing the course should be maintained for future contact about renewal courses.

The Interactive CPR Learning System

In 1980 the AHA National Center and the Committee on Emergency Cardiac Care began the design of an interactive videodisc system for teaching BLS. This CPR Learning System was originally developed by the AHA as a means of significantly increasing the number of persons trained in CPR by providing a standardized course of high quality not requiring an increased number of instructors. This challenge was achieved through a blending of recent technological advances and an innovative learning theory that permits the CPR student to learn from the "victim" rather than an instructor.

It was understood that the new system must be consistent with the high standards for training that existed throughout the training network and affiliate structure. A further objective was to provide a standardized method for BLS teaching and training, as provided from the Committee on Emergency Cardiac Care.

By late 1982 a prototype system confirmed that an instructorless CPR training system was possible. The AHA obtained a patent on the system and sought a company to complete development and distribution. Actronics, Inc., was chosen after agreeing to 1) repay the AHA for all development costs, 2) provide royalties to the AHA on each sale, and 3) give total control of program content to the Committee on Emergency Cardiac Care.

In 1983 the CPR Learning System was introduced. It won two prestigious awards for the AHA, and validation studies confirmed its ability to train and test individuals in CPR competence.[74]

The technology of the CPR system includes a microcomputer interfaced with a videodisc player, an interactive audiocassette player, and a CPR manikin wired with a series of electronic sensors. The learning theory presumes that student performance can be improved by immediate feedback. Performance can be repeated until correct.

The entire CPR course is presented in this self-contained, stand-alone system, but because of its interactive nature, the system actually tailors the content of the course to respond to each student's individual needs. Like the traditional method of teaching CPR, the program consists of stimulating lectures, manikin training and testing, and a complete BLS course completion performance test at the end.

During the lectures the computer evaluates student progress through multiple-choice or fill-in-the-blank questions. Based on this evaluation, appropriate material is selected by the computer for review or more in-depth instruction. At any point the student can stop the program (restarting from that point at a later time), take a break, review specific material, request to be tested, practice on the manikin, or access a vocabulary bank (which defines a number of concepts by presenting technical information on three different levels of detail).

Adult and infant manikins, wired with electronic sensors to monitor the depth and placement of cardiac compressions, interface with the computer. In addition, the adult manikin monitors the adequacy of mouth-to-mouth ventilations and subdiaphragmatic abdominal thrusts (the Heimlich maneuver). The system provides four different types of feedback: 1) audiovisual coaching, 2) visual display on the computer monitor (indicating, for example, that hand placement is incorrect or depth of compression is too shallow), 3) audio tones to indicate the proper timing of each compression, and 4) a graphic summary on the computer monitor that details overall performance. The student receives this feedback almost simultaneously as the computer accesses the appropriate comments in response to each compression or set of compressions.

Since the CPR system is considered an extension of the training network, a national AHA-CPR course completion card is issued by the system to acknowledge that the student has met the standards of CPR performance as set by the national AHA Committee on Emergency Cardiac Care. The CPR card is valid for not more than two years, and retraining on a learning system is recommended annually.

A CPR renewal system has been developed to provide the same high testing standards as the CPR Learning System. This additional system, intended to be used as an instructor's aid, provides the same objective evaluation and performance skills in both practice and testing modes as the CPR Learning System, but without audio and video support. It can be supplemented with instructor-presented educational materials to provide the high-quality training experience of the original CPR Learning System.

Summary

Cardiovascular diseases claim almost as many American lives as all other causes of death combined. This chapter has summarized the efforts of medical and lay communities to bring together knowledge and expertise to address this significant problem. Emergency cardiac care encompasses basic life support, advanced cardiac life support, education, communications, and transport. The American Heart Association provides support for control of cardiovascular disease through research, education, and community service programs. The AHA training network is a structure for education that also incorporates quality control.