



Complete Summary

GUIDELINE TITLE

Adult basic life support: 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations.

BIBLIOGRAPHIC SOURCE(S)

Adult basic life support. In: 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Circulation 2005 Nov 29;112(22 Suppl):III5-16. [215 references]

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
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SCOPE

DISEASE/CONDITION(S)

Cardiac arrest

GUIDELINE CATEGORY

Evaluation
Management
Treatment

CLINICAL SPECIALTY

Cardiology
Emergency Medicine
Internal Medicine
Pulmonary Medicine

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Emergency Medical Technicians/Paramedics
Health Care Providers
Hospitals
Nurses
Physician Assistants
Physicians
Public Health Departments

GUIDELINE OBJECTIVE(S)

To provide guidance for the recognition and response to cardiac arrest in adults

TARGET POPULATION

Adults experiencing cardiac arrest

INTERVENTIONS AND PRACTICES CONSIDERED

Assessment

1. Assessment of signs of cardiac arrest
2. Criteria for initiation of cardiopulmonary resuscitation (CPR)

Cardiopulmonary Resuscitation

1. Airway opening
2. Removal of foreign body airway obstruction (if necessary)
3. Ventilation technique
 - Mouth-to-nose ventilation
 - Mouth-to-tracheal stoma ventilation
 - Tidal volumes and ventilation rates
 - Mechanical ventilators and automatic transport ventilators (considered but not recommended)
4. Chest compression technique
 - Hand position
 - Compression rate, depth, decompression, and duty cycle
 - Use of firm surface for chest compressions
5. CPR in patients in prone position
6. Compression-ventilation sequence
 - Compression-ventilation ratio
 - Minimization of compression interruption
 - Chest compression-only CPR

7. Postresuscitation patient positioning
8. CPR in special circumstances
 - Cervical spine injury
 - Drowning

Management

1. Emergency Medical Services (EMS) dispatcher instruction in CPR
2. Improving EMS response time
3. Minimizing health risks to victim and responder

MAJOR OUTCOMES CONSIDERED

- Survival rate
- Quality of life
- Adverse effects of resuscitation (to patient and responder)

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

All reviewers were instructed to search their allocated questions broadly. Reviewers documented their search strategies to ensure reproducibility of the search. The minimum electronic databases searched included the Cochrane database for systematic reviews and the Central Register of Controlled Trials (<http://www.cochrane.org/>), MEDLINE (<http://www.ncbi.nlm.nih.gov/PubMed/>), EMBASE (www.embase.com), and the master reference library collated by the American Heart Association (AHA). To identify the largest possible number of relevant articles, reviewers were also encouraged to perform hand searches of journals, review articles, and books as appropriate.

The reviewers documented the mechanism by which studies relevant to the hypothesis were selected. Specific study inclusion and exclusion criteria and study limitations were documented. Inclusion of all relevant evidence (from animal and manikin/model studies as well as human studies) was encouraged.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

Level 1: Randomized clinical trials or meta-analyses of multiple clinical trials with substantial treatment effects

Level 2: Randomized clinical trials with smaller or less significant treatment effects

Level 3: Prospective, controlled, nonrandomized cohort studies

Level 4: Historic, nonrandomized cohort or case-control studies

Level 5: Case series; patients compiled in serial fashion, control group lacking

Level 6: Animal studies or mechanical model studies

Level 7: Extrapolations from existing data collected for other purposes, theoretical analyses

Level 8: Rational conjecture (common sense); common practices accepted before evidence-based guidelines

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

A worksheet template was provided with step-by-step directions to help the experts document their literature review, evaluate studies, and determine levels of evidence. When possible, 2 expert reviewers were recruited to undertake independent evaluations for each topic.

Assessing the Quality of Evidence

In this step reviewers were asked to determine the level of evidence of relevant studies (Step 2A), assess the quality of study research design and methods (Step 2B), determine the direction of results (Step 2C), and cross-tabulate assessed studies (Step 2D).

The levels of evidence used for the 2005 consensus process were modified from those used in 2000. In many situations summary conclusions were based on lower levels of evidence because human clinical trial data was not available. The reviewers assessed the quality of research design and methods and allocated each study to 1 of 5 categories: excellent, good, fair, poor, or unsatisfactory. Studies graded as poor or unsatisfactory were excluded from further analysis.

Reviewers evaluated the direction of the study results as supportive, neutral, or opposed and then depicted the data in 1 of 2 grids. The grids were 2-dimensional, showing quality and levels of evidence. The reviewers completed a Supporting Evidence grid and a Neutral or Opposing Level of Evidence grid.

Controversies Encountered

Studies on Related Topics (Level of Evidence [LOE] 7)

Many reviewers identified studies that answered related questions but did not specifically address the reviewer's initial hypothesis. Examples include the extrapolation of adult data for pediatric worksheets and extrapolation of the results of glucose control in critically ill patients to the postresuscitation setting. Worksheet reviewers were instructed to clearly designate evidence that represented extrapolations. Reviewers could designate such studies as LOE 7, or they could assign a level of evidence based on the study design but include terms such as "extrapolated from" with specific relevant details in the draft consensus on science statements to indicate clearly that these were extrapolations from data collected for other purposes.

Animal Studies and Mechanical Models

Animal studies can be performed under highly controlled experimental conditions using extremely sophisticated methodology. Irrespective of methodology, all animal studies and all studies involving mechanical models (e.g., manikin studies) were classified as LOE 6. Specific details about these studies (including methodology) are included in the summary of science where appropriate.

Studies Evaluating Diagnosis or Prognosis

The default levels of evidence used for the 2005 consensus process were not designed for the review of studies that evaluate diagnosis or prognosis. For these studies other methods of assigning levels of evidence were considered (such as those proposed by the Oxford Centre for Evidence-Based Medicine [<http://www.cebm.net/>]). Worksheet reviewers planning to include alternative levels of evidence were asked to define such levels clearly and to retain the default levels of evidence.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus
Expert Consensus (Consensus Development Conference)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Worksheet reviewers created a summary of the science. In the summary format reviewers were encouraged to provide a detailed discussion of the evidence, including the outcomes evaluated and the strengths and limitations of the data.

The final step in the science summary process was the creation of draft consensus on science statements and treatment recommendations. Statement templates were provided to standardize the comprehensive summary of information. Elements of the consensus on science statement template included the specific intervention or assessment tool, number of studies, levels of evidence, clinical outcome, population studied, and the study setting. Elements of the treatment recommendation template included specific intervention or assessment tool, population and setting, and strength of recommendation.

The statements drafted by the reviewers in the worksheets reflect the recommendations of the reviewers and may or may not be consistent with the conclusions of the 2005 Consensus Conference.

All 380 participants at the 2005 Consensus Conference received a copy of the worksheets on CD-ROM. Expert reviewers presented topics in plenary, concurrent, and poster conference sessions. Presenters and participants then debated the evidence, conclusions, and draft summary statements. Each day the most controversial topics from the previous day, as identified by the task force chairs, were presented and debated in one or more additional sessions. The International Liaison Committee on Resuscitation (ILCOR) task forces met daily during the conference to discuss and debate the experts' recommendations and develop interim consensus science statements. Each science statement summarized the experts' interpretation of all the relevant data on a specific topic. Draft treatment recommendations were added if a consensus was reached.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Completed worksheets were posted on the Internet for further review. The initial process involved posting the worksheet to a password-protected area of the American Heart Association Intranet (accessible to worksheet reviewers). In December 2004 the completed worksheets were posted on an Internet site that could be accessed by the public for further review and feedback before the 2005 Consensus Conference in Dallas (www.C2005.org).

Wording of science statements and treatment recommendations was refined after further review by International Liaison Committee on Resuscitation (ILCOR)

member organizations and the international editorial board. This format ensured that this final document represents a truly international consensus process.

The manuscript was ultimately approved by all ILCOR member organizations and by an international editorial board. The American Heart Association (AHA) Science Advisory and Coordinating Committee and the editor of *Circulation* obtained peer reviews of this document before it was accepted for publication. The document is being published simultaneously in *Circulation* and *Resuscitation*, although the version in *Resuscitation* does not include the sections on stroke and first aid.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Recognition

Signs of Cardiac Arrest

Rescuers should start cardiopulmonary resuscitation (CPR) if the victim is unconscious (unresponsive), not moving, and not breathing. Even if the victim takes occasional gasps, rescuers should suspect that cardiac arrest has occurred and should start CPR.

Airway and Ventilation

Airway

Opening the Airway

Rescuers should open the airway using the head tilt-chin lift maneuver. Rescuers should use the finger sweep in the unconscious patient with a suspected airway obstruction only if solid material is visible in the oropharynx.

Foreign-Body Airway Obstruction (FBAO)

Chest thrusts, back blows/slaps, or abdominal thrusts are effective for relieving FBAO in conscious adults and children >1 year of age, although injuries have been reported with the abdominal thrust. There is insufficient evidence to determine which should be used first. These techniques should be applied in rapid sequence until the obstruction is relieved; more than one technique may be needed. Unconscious victims should receive CPR. The finger sweep should be used in the unconscious patient with an obstructed airway only if solid material is visible in the airway. There is insufficient evidence for a treatment recommendation for an obese or pregnant patient with FBAO.

Ventilation

Mouth-to-Nose Ventilation

Mouth-to-nose ventilation is an acceptable alternative to mouth-to-mouth ventilation.

Mouth-to-Tracheal Stoma Ventilation

It is reasonable to perform mouth-to-stoma breathing or to use a well-sealing, round pediatric facemask.

Tidal Volumes and Ventilation Rates

For mouth-to-mouth ventilation with exhaled air or bag-valve-mask ventilation with room air or oxygen, it is reasonable to give each breath within a 1-second inspiratory time to achieve chest rise. After an advanced airway (e.g., tracheal tube, Combitube, laryngeal mask airway [LMA]) is placed, ventilate the patient's lungs with supplementary oxygen to make the chest rise. During CPR for a patient with an advanced airway in place, it is reasonable to ventilate the lungs at a rate of 8 to 10 ventilations per minute without pausing during chest compressions to deliver ventilations. Use the same initial tidal volume and rate in patients regardless of the cause of the cardiac arrest.

Mechanical Ventilators and Automatic Transport Ventilators

There is insufficient data to recommend for or against the use of a manually triggered, flow-limited resuscitator or an automatic transport ventilator during bag-valve-mask ventilation and resuscitation of adults in cardiac arrest.

Chest Compressions

Chest Compression Technique

Hand Position

It is reasonable for laypeople and healthcare professionals to be taught to position the heel of their dominant hand in the center of the chest of an adult victim, with the nondominant hand on top.

Chest Compression Rate, Depth, Decompression, and Duty Cycle

It is reasonable for lay rescuers and healthcare providers to perform chest compressions for adults at a rate of at least 100 compressions per minute and to compress the sternum by at least 4 to 5 cm (1-1/2 to 2 inches). Rescuers should allow complete recoil of the chest after each compression. When feasible, rescuers should frequently alternate "compressor" duties, regardless of whether they feel fatigued, to ensure that fatigue does not interfere with delivery of adequate chest compressions. It is reasonable to use a duty cycle (i.e., ratio between compression and release) of 50%.

Firm Surface for Chest Compressions

Cardiac arrest victims should be placed supine on a firm surface (i.e., backboard or floor) during chest compressions to optimize the effectiveness of compressions.

CPR Process Versus Outcome

It is reasonable for instructors, trainees, providers, and Emergency Medical Services (EMS) agencies to monitor and improve the process of CPR to ensure adherence to recommended compression and ventilation rates and depths.

Alternative Compression Techniques

CPR in Prone Position

CPR with the patient in a prone position is a reasonable alternative for intubated hospitalized patients who cannot be placed in the supine position.

Compression-Ventilation Sequence

Any recommendation for a specific CPR compression-ventilation ratio represents a compromise between the need to generate blood flow and the need to supply oxygen to the lungs. At the same time any such ratio must be taught to would-be rescuers, so that skills acquisition and retention are also important factors.

Effect of Ventilations on Compressions

Interruption of Compressions

Rescuers should minimize interruptions of chest compressions.

Compression-Ventilation Ratio During CPR

There is insufficient evidence that any specific compression-ventilation ratio is associated with improved outcome in patients with cardiac arrest. To increase the number of compressions given, minimize interruptions of chest compressions, and simplify instruction for teaching and skills retention, a single compression-ventilation ratio of 30:2 for the lone rescuer of an infant, child, or adult victim is recommended. Initial steps of resuscitation may include (1) opening the airway while verifying the need for resuscitation, (2) giving 2 to 5 breaths when initiating resuscitation, and (3) then providing compressions and ventilations using a compression-ventilation ratio of 30:2.

Chest Compression-Only CPR

Rescuers should be encouraged to do compression-only CPR if they are unwilling to do airway and breathing maneuvers or if they are not trained in CPR or are uncertain how to do CPR. Researchers are encouraged to evaluate the efficacy of compression-only CPR.

Postresuscitation Positioning

Recovery Position

It is reasonable to position an unconscious adult with normal breathing on the side with the lower arm in front of the body.

Special Circumstances

Cervical Spine Injury

For victims of suspected spinal injury, additional time may be needed for careful assessment of breathing and circulation, and it may be necessary to move the victim if he or she is found face-down. In-line spinal stabilization is an effective method of reducing risk of further spinal damage.

Airway Opening

Maintaining an airway and adequate ventilation is the overriding priority in managing a patient with a suspected spinal injury. In a victim with a suspected spinal injury and an obstructed airway, the head tilt-chin lift or jaw thrust (with head tilt) techniques are feasible and may be effective for clearing the airway. Both techniques are associated with cervical spinal movement. Use of manual in-line stabilization (MILS) to minimize head movement is reasonable if a sufficient number of rescuers with adequate training are available.

Face-Down Victim

It is reasonable to roll a face-down, unresponsive victim carefully into the supine position to check for breathing.

Drowning

CPR for Drowning Victim in Water

In-water expired-air resuscitation may be considered by trained rescuers, preferably with a flotation device, but chest compressions should not be attempted in the water.

Removing Drowning Victim From Water

Drowning victims should be removed from the water and resuscitated by the fastest means available. Only victims with risk factors or clinical signs of injury (history of diving, water slide use, trauma, alcohol) or focal neurologic signs should be treated as a victim with a potential spinal cord injury, with stabilization of the cervical and thoracic spine.

EMS System

Dispatcher Instruction in CPR

Providing telephone instruction in CPR is reasonable.

Improving EMS Response Interval

Administrators responsible for EMS and other systems that respond to patients with cardiac arrest should evaluate their process of delivering care and make resources available to shorten response time intervals when improvements are feasible.

Risks to Victim and Rescuer

Risks to Trainees

Training manikins should be cleaned between trainee ventilation sessions. It is acceptable to clean them with commercially available antiseptic, 30% isopropyl alcohol, 70% alcohol solution, or 0.5% sodium hypochlorite, allowing at least 1 minute of drying time between trainee ventilation sessions.

Risks to Responders

Providers should take appropriate safety precautions when feasible and when resources are available to do so, especially if a victim is known to have a serious infection (e.g., human immunodeficiency virus [HIV], tuberculosis, hepatitis B virus [HBV], or severe acute respiratory syndrome [SARS]).

Risks for the Victim

Rib fractures and other injuries are common but acceptable consequences of CPR given the alternative of death from cardiac arrest. After resuscitation all patients should be reassessed and reevaluated for resuscitation-related injuries.

If available, the use of a barrier device during mouth-to-mouth ventilation is reasonable. Adequate protective equipment and administrative, environmental, and quality control measures are necessary during resuscitation attempts in the event of an outbreak of a highly transmittable microbe such as the SARS coronavirus.

CLINICAL ALGORITHM(S)

The International Liaison Committee on Resuscitation (ILCOR) Universal Cardiac Arrest Algorithm is provided in the "Introduction" section of the original guideline document (see "Availability of Companion Documents" field).

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

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

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate application of cardiopulmonary resuscitation techniques to increase the chance of successful intervention

POTENTIAL HARMS

Possibility of resuscitation related injuries or infections to patient and rescuer

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

This document summarizes current evidence for the recognition and response to sudden life-threatening events, particularly sudden cardiac arrest in victims of all ages. The broad range and number of topics reviewed and the inevitable limitations of journal space require succinctness in science statements and, where recommendations were appropriate, brevity in treatment recommendations. This is not a comprehensive review of every aspect of resuscitation medicine; some topics were omitted if there was no evidence or no new information.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Clinical Algorithm

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Adult basic life support. In: 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with

Treatment Recommendations. Circulation 2005 Nov 29;112(22 Suppl):III5-16.
[215 references]

ADAPTATION

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

DATE RELEASED

2005 Nov 29

GUIDELINE DEVELOPER(S)

American Heart Association - Professional Association

SOURCE(S) OF FUNDING

American Heart Association

GUIDELINE COMMITTEE

International Liaison Committee on Resuscitation (ILCOR)

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Not stated

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

A robust conflict of interest policy was developed to ensure full disclosure of potential conflicts and to protect the objectivity and credibility of the evidence evaluation and consensus development process. This policy is described in detail in an editorial companion document (see "Availability of Companion Documents" field). Representatives of manufacturers and industry did not participate in this conference.

Potential conflicts of interest of the editorial board are listed in Appendix 3 of the original guideline document (see "Availability of Companion Documents" field). Potential conflicts of interest of the worksheet authors are noted in the worksheets and can be accessed through the links to the worksheets contained in the original guideline document. All 380 attendees were required to complete forms in order to document their potential conflicts of interest. Most attendees were also worksheet authors. The information from the conflict of interest forms completed by all conference attendees, including worksheet authors, can also be accessed at the website http://circ.ahajournals.org/content/vol112/22_suppl/#APPENDIX. Readers of the print version can also access the statements at the American Heart Association website: www.C2005.org.

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

The following are available:

- Introduction. 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. *Circulation* 2005 Nov 29;112(22 Supplement):III-1-III-4.
- The evidence evaluation process for the 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. *Circulation* 2005 Nov 29;112(22 Supplement):III-128-III-130.
- Conflict of interest management before, during, and after the 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. *Circulation* 2005 Nov 29;112(22 Supplement):III-131-III-132.
- Controversial topics from the 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. *Circulation* 2005 Nov 29;112(22 Supplement):III-133-III-136.
- Appendix 1: Worksheet topics and authors. *Circulation* 2005 Nov 29;112(22 Supplement):B1-B14.
- Appendix 3: Conflict of interest for editors, editorial board, special contributors and reviewers, and honorees. *Circulation* 2005 Nov 29;112(22 Supplement):B16-B18.
- Interdisciplinary topics. 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. *Circulation* 2005 Nov 29;112(22 Supplement):III-100-III-108.

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

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on February 2, 2006. The information was verified by the guideline developer on March 7, 2006.

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