

Cardiopulmonary Resuscitation and Acute Cardiovascular Life Support—A Protocol Review of the Updated Guidelines

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For the first time in 5 years, new guidelines for cardiopulmonary resuscitation (CPR) of adults and children were introduced at the end of November 2005. The new CPR guidelines evolved from emerging evidence-based resuscitation studies and the evaluation process included the input of 281 international resuscitation experts who evaluated hypotheses, topics, and research over a 36-month period. The process included evidence evaluation, review of the literature, and focused analysis [1].

It is very difficult to perform clinical trials in CPR science because of the low survival rate of out-of and in-hospital cardiac arrest, ethical issues, and the logistics of obtaining informed consent. The greatest challenge is to complete trials with sufficient power to be able to demonstrate impact on long- or short-term outcomes. In the past, end point criteria were for the patient to survive to hospitalization and be neurologically intact by hospital discharge. These trials were small, underpowered, not randomized, and had interventions that made it hard to demonstrate a benefit. Informed consent regulations in Europe [2] and North America [3] made it also challenging.

The Emergency Cardiovascular Care (ECC) experts used the American Heart Association–American College of Cardiology (ACC/AHA) classification system for reviewing the resuscitation studies with large prospective randomized controlled trials serving as foundation of their (Class I) recommendations. Very few of the resuscitation trials had sufficient power to show an effect on mortality during hospitalization. Recommendations are based

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therefore on human trials that are nonrandomized observational studies or inferred from animal studies and outcomes that are intermediate. The AHA/ACC Class IIa recommendation is when the benefit is greater than the risk for a procedure/treatment or diagnostic test/assessment. Class IIb recommendations are divided into two categories: (1) optional and (2) recommended by experts despite lack of highly powered supporting evidence. Optional interventions in cardiopulmonary resuscitation are identified by terms “can be considered” or “may be useful.” Interventions that the experts believe should be performed are identified as “we recommend.” Class IIb recommendations were given when evidence showed only short-term benefit (eg, amiodarone for pulseless ventricular fibrillation arrest).

There are four major changes to the previous guidelines concerning CPR and sudden cardiac arrest. The most significant changes in the CPR guidelines were to increase the number of compressions delivered per minute and reduce the interruptions of the CPR cycles.

The first major recommendation relates to first exposure to an unresponsive, pulseless, and nonbreathing victim. Two rescue breaths are given over 1 second, each assuring the chest rises. The two rescue breaths are followed by 30 chest compressions. The recommendation is a 30:2 ratio for single rescuers of victims of all ages (except newborn infants). The old recommendation was for a ratio of 15:2. The 30:2 ratio is based on circulatory studies showing that over time blood flow increases with a greater amount of chest compressions [4]. If interrupted, as in the old 15:2 with two rescue breaths, blood flow decreases causing less perfusion of tissues. The 30:2 ratio of compressions to ventilation is based on a consensus opinion rather than derived from evidence. This increased ratio of chest compressions to breaths is thought to reduce hyperventilation of the patient, minimize interruptions of compressions, and simplify teaching to health care professionals and laypeople. The 30:2 ratio is based on the speed of the compressions and not the actual number of compressions per minute. There is insufficient evidence from human studies for an optimal compression rate. Animal [4] and human [5,6] studies support a chest compression rate of greater than 80 compressions per minute to achieve optimal forward blood flow during CPR. The guidelines recommend a compression rate of about 100 compressions per minute (Class IIa).

The second major recommendation is the amount of shocks given in the face of ventricular fibrillation (VF)/pulseless ventricular tachycardia (VT). The latest recommendation is for only one shock of 200 J, using a biphasic defibrillator, or 360 J if using a monophasic defibrillator. This takes the place of the three stacked shocks at 200, 300, and 360 J, as were previously recommended in the Advanced Cardiac Life Support (ACLS) guidelines. The one shock is followed by 2 minutes of CPR. The committee felt that a delay of 37 seconds or more while waiting for the defibrillator to charge, deliver a shock, and check for a pulse was delaying the administration of life-saving compressions [4]. In cases of witnessed arrest with a defibrillator

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