

Consensus vs. evidence in medicine: resuscitation

An emergency physician's experience with respect to evidence-based medicine, by Walter G.J. Kloeck.

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ILCOR has published more than 18 scientific Advisory Statements, including the 2000 and 2005 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. A Universal Cardiac Arrest Algorithm was designed, reflecting major consensus recommendations placed in chronological sequence. Since the publication of the 2005 International Consensus, survival rates appear to be doubling or tripling worldwide.
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ABSTRACT Despite advances in medical education, equipment and facilities, survival rates following cardiac arrest over a 40-year period have not improved significantly. Attempts to scientifically review resuscitation techniques commenced in 1966, with the American Heart Association publishing recommended standards and guidelines in 1974, 1980 and 1986. In 1987, the Heart Foundation of South Africa convened a National CPR Symposium with a view to achieving national consensus guidelines for the teaching, training and performance of CPR. This was followed by the formation of a Southern African Resuscitation Council in 1989 in order to foster and co-ordinate the practice and teaching of resuscitation and to promote uniformity and standardization of resuscitation techniques. With the creation of Resuscitation Councils worldwide, an International Liaison Committee on Resuscitation (ILCOR) was established in 1992, comprising representatives from the American Heart Association, the Heart and Stroke Foundation of Canada, the European Resuscitation Council, the Australian Resuscitation Council and the Resuscitation Council of Southern Africa. ILCOR's mission is to provide a consensus mechanism by which the international science and knowledge relevant to emergency cardiovascular care can be identified and reviewed.

Evidence-based medicine has been defined as "the conscientious, explicit and judicious use of current best evidence in making decisions about individual patients".⁽¹⁾ Even though the first description of artificial respiration and closed chest cardiac massage was published by Safar and Kouwenhoven in 1958 and 1960 respectively,^(2,3) in 1999 a cumulative meta-analysis of published outcomes for victims of out-of-hospital cardiac arrest showed that survival rates are still dismal, and have generally remained at less than 6%.⁽⁴⁾ Why have survival rates not improved over a 40-year period, despite advances in medical education, equipment and facilities?

The first formal attempt to scientifically review resuscitation techniques occurred with the convening of a national conference hosted by the American Institute of Medicine in 1966.⁽⁵⁾ The American Heart Association thereafter sponsored subsequent conferences in 1973, 1979 and 1985, resulting in the publication of widely accepted standards and guidelines for cardiopulmonary resuscitation (CPR) and emergency cardiac care (ECC) in 1974, 1980 and 1986.⁽⁶⁻⁸⁾

As interest in resuscitation expanded around the globe, deviations and local variations inevitably emerged. Advances in medical technology and therapeutics led to further variations in protocols and recommendations, resulting in confusion and uncertainty among the medical and nursing professions, ambulance personnel and members of the public with regard to the use of different methods under different circumstances. It was for these reasons that the Heart Foundation of Southern Africa organized the first South African National CPR Symposium in March 1987, where standards and guidelines for the teaching, training and performance of CPR were discussed in detail, with a view to reaching a national consensus. The

Symposium attracted 513 CPR instructors and instructor trainers from around the country, and was followed by a National Workshop in June 1988, where official representatives of South Africa's 33 major CPR-promoting organizations critically analyzed, discussed and reviewed contentious issues, with a view to providing national guidelines. Unanimous consensus recommendations for the teaching of CPR techniques in Southern Africa, based on the principles of simplicity, safety, effectiveness and ease of learning, were published in 1990.⁽⁹⁾

The success of the Heart Foundation's National Workshop led to the formation of the South African Resuscitation Council in 1989, with the primary aim of fostering and co-ordinating the practice and teaching of resuscitation, and promoting uniformity and standardization of resuscitation techniques. The Council's name was shortly thereafter modified to "Resuscitation Council of Southern Africa" as membership rapidly grew to include neighbouring countries and organizations. The aims, objectives and list of member organizations of the Resuscitation Council are available from the website "www.resuscitationcouncil.co.za".

With the establishment of Resuscitation Councils in other countries and continents, and the surge of interest in emergency cardiovascular care research, the need for the development of uniform terms and definitions rapidly became evident. In June 1990, a Task Force comprising representatives of the American Heart Association, European Resuscitation Council, Heart and Stroke Foundation of Canada and the Australian Resuscitation Council convened in the historic Utstein Abbey, situated on the remote island of Mosteroy just off the coast of Stavanger, Norway, and produced a scientific statement on recommended guidelines for uniform reporting of data from out-of-hospital cardiac arrest.⁽¹⁰⁾

This landmark publication was co-published in no less than 7 peer-reviewed journals, surely a historic event in medical literature and undoubtedly signalling the intense interest and importance of cardiac arrest research and the need for evidence-based medicine! The "Utstein Style" format in achieving international consensus has resulted in at least 10 subsequent landmark publications, covering uniform reporting of in-hospital resuscitation, laboratory CPR research, pediatric life support, disaster research, major trauma, drowning, resuscitation registries, education, medical emergency teams, as well as research on post-resuscitation care.

At the American Heart Association's 5th National Conference on CPR and ECC in February 1992, which was attended by delegates from over 25 different countries and representing 53 international organizations, an International Emergency Cardiac Care Panel was established to consider the following:

- International support for countries to develop effective emergency care
- The creation of a permanent infrastructure of international experts

- The creation of common international guidelines on CPR and ECC.⁽¹¹⁾

Following the momentum established at the 1992 Conference, representatives from guidelines-producing organizations, i.e. the American Heart Association, the Heart and Stroke Foundation of Canada, the European Resuscitation Council, the Australian Resuscitation Council and the Resuscitation Council of Southern Africa met in Brighton, England, to establish the International Liaison Committee on Resuscitation (ILCOR). In subsequent years, the New Zealand Resuscitation Council, the Consejo Latino-Americano de Resuscitation (which now forms part of the Inter-American Heart Foundation) and the Resuscitation Council of Asia have been added as formal ILCOR members.

The mission of ILCOR is "to provide a consensus mechanism by which the international science and knowledge relevant to emergency cardiac care can be identified and reviewed. This consensus mechanism will be used to provide consistent international guidelines on emergency cardiac care for basic life support (BLS), pediatric life support (PLS) and advanced life support (ALS). These international guidelines will aim for a commonality supported by science for BLS, ALS and PLS".⁽¹²⁾

Since its inception in 1992, ILCOR has formally met on 26 separate occasions and has published over 18 scientific Advisory Statements with the goal of explaining, eliminating or reducing international variations, while endorsing evidence-based resuscitation guidelines.

The world's first international conference assembled specifically under the auspices of ILCOR to produce international guidelines, was held in Dallas, USA in February 2000, and culminated in the publication of a widely accepted international consensus on resuscitation science.⁽¹³⁾ The huge success and widespread adoption of the 2000 consensus recommendations led to a further ILCOR Consensus Conference in 2005. In the most comprehensive review of resuscitation literature ever performed, ILCOR published the 2005 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations.⁽¹⁴⁾ This landmark publication involved more than 380 experts from 18 different countries who completed 403 worksheets reviewing 276 different topics on resuscitation and emergency cardiovascular care over a 36-month period!

To ensure a consistent approach to the evidence evaluation process, 8 levels of evidence were determined in order to assess the quality of literature reviews (Table 1). Integration of the review process leading to final publication followed a comprehensive 12-step sequence (Table 2). Worldwide participation in this process was encouraged by means of posting the completed worksheets on the internet (www.c2005.org) and inviting public comment and review prior to final publication.

TABLE 1: Determination of Levels of Evidence

Evidence	Definition
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, non-randomized cohort studies
Level 4	Historic, non-randomized cohort or case-control studies
Level 5	Case series; patients compiled in serial fashion, lacking a control group
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

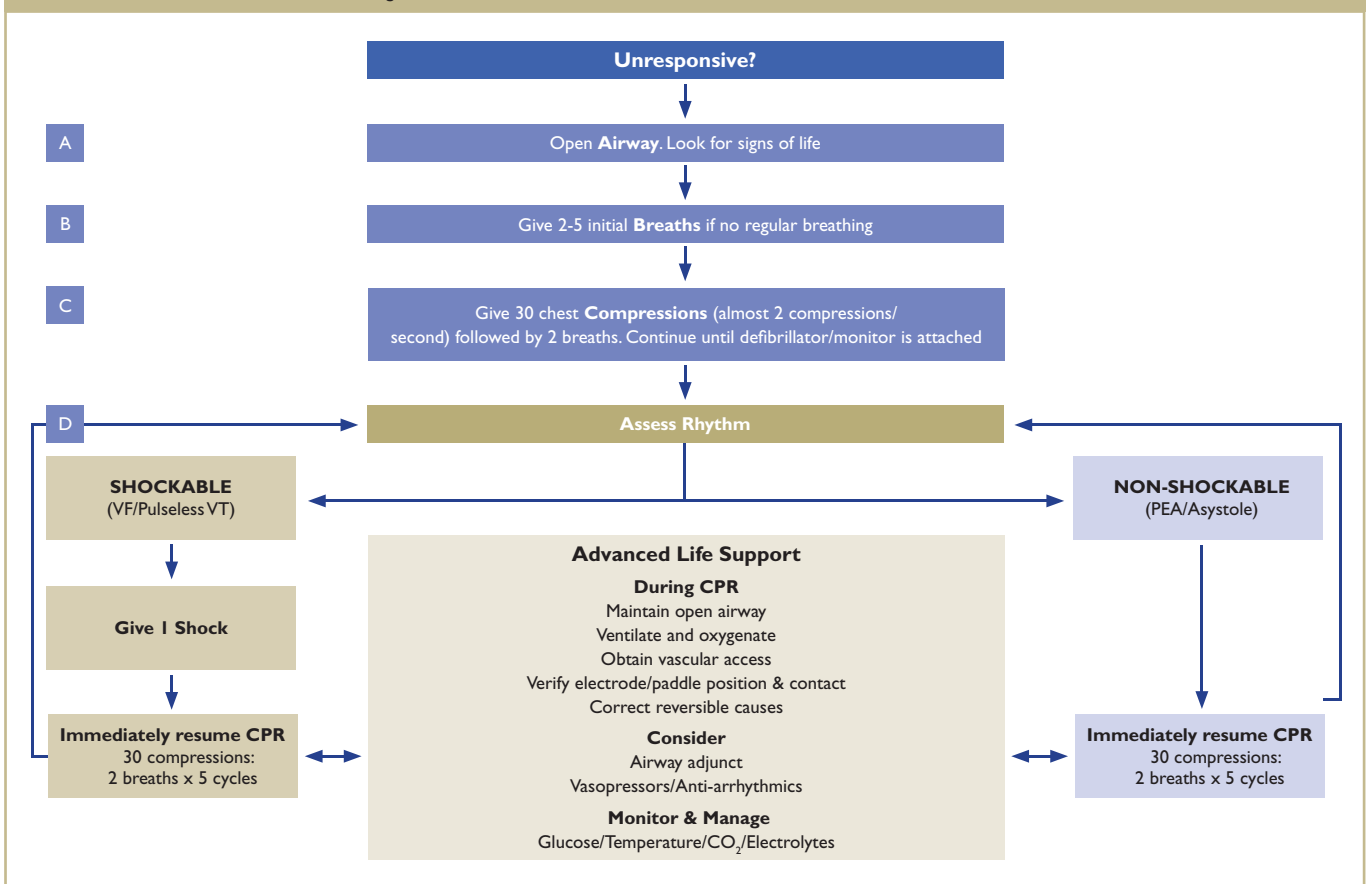
TABLE 2: The 2005 Evidence Evaluation Process

Step 1	Literature review performed; recording of search terminology and of databases searched
Step 2	Studies relevant to hypothesis selected
Step 3	Level of evidence determined based on methodology (see Table 1)
Step 4	Critical appraisal performed
Step 5	Evidence integrated into a science summary and possible treatment recommendations
Step 6	Evidence evaluation and worksheet preparation
Step 7	2005 Consensus Conference presentations and discussion
Step 8	ILCOR Task Force discussions
Step 9	Approval by ILCOR Member Organizations
Step 10	Final editorial review and approval by international editorial board
Step 11	Blinded peer review
Step 12	Publication

As an example of the consensus process, a Universal Cardiac Arrest Algorithm, applicable to adult, child and infant resuscitation (excluding newborns), was designed by ILCOR to reflect the major changes in resuscitation recommendations, placed in chronological sequence (Figure 1).⁽¹⁵⁾

Adhering to the well-known "Airway-Breathing-Circulation" sequence, a single compression:ventilation ratio of 30:2 was recommended for use by single rescuers of victims of all ages (excluding newborns). The motivation behind this consensus decision was to promote

FIGURE 1: ILCOR Universal Cardiac Arrest Algorithm



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memory and skills retention in resuscitation training as well as supporting the wealth of evidence in favour of minimizing interruptions and increasing the number and quality of chest compressions. Once a defibrillator/monitor is attached, the rhythm is determined as either "shockable" (ventricular fibrillation or pulseless ventricular tachycardia) or "non-shockable" (pulseless electrical activity or asystole). The recommendation of providing a single defibrillatory shock followed immediately by chest compressions, without pausing to determine the resultant rhythm or to check for a return of pulse until after 5 cycles of CPR have been done, is in line with the body of evidence supporting the need for uninterrupted chest compressions.

During CPR, interventions such as maintaining an open airway, obtaining vascular access and correcting contributory causes (Table 3)⁽¹⁶⁾ should all be performed such that interruptions in chest compressions are kept to a minimum. Although no medication has shown to increase long-term survival from cardiac arrest, it is considered reasonable to administer 1mg adrenaline (0,01mg/kg in children) every 3-5 minutes during CPR, and to consider the use of an anti-arrhythmic such as 300mg amiodarone (5mg/kg in children) in patients who are in ventricular fibrillation or pulseless ventricular tachycardia, which is refractory to CPR, defibrillation and adrenaline.

Although the ILCOR Universal Cardiac Arrest Algorithm was an example of a consensus product based on best available scientific evidence, and although Resuscitation Councils worldwide have subsequently based their current guidelines on these recommendations, minor regional and local variations have inevitably occurred. In the spirit of continued international co-operation, ILCOR member organizations are currently in the process of again reviewing the emergency cardiovascular care literature with the objective of revising/ updating the guidelines as appropriate in 2010. Since the publication of the 2005 recommendations, survival rates appear to have doubled or tripled worldwide in response to implementation of these new protocols. After 45 years of research, there now at last appears to be some light at the end of the tunnel! In the words of Douglas Chamberlain, co-founder of ILCOR, "Our problems in resuscitation are similar the world over, but none of us has a monopoly of wisdom, knowledge, or experience. We must, therefore, continue to work effectively together for the good of all".⁽¹⁷⁾

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TABLE 3: Contributory Causes of Cardiac Arrest (Hs & Ts)

H - Hypoxia	T - Tension pneumothorax
H - Hypovolemia	T - Tamponade
H - H ⁺ and electrolyte abnormalities	T - Toxins and therapeutic agents
H - Heart attack	T - Thrombo-embolism
H - Hypothermia	T - Trauma