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2017-10-06

Perkins , G D , Neumar , R , Monsieurs , KG , Lim , SH , Castrén , M , Nolan , JP , Nadkarni , V , Montgomery , B , Steen , P , Cummins , R & Chamberlain , D 2017 , ' The International Liaison Committee for Resuscitation-Review of the last 25 years and vision for the future ' , Resuscitation , vol. 121 , pp. 104-116 . <https://doi.org/10.1016/j.resuscitation.2017.09.029>

<http://hdl.handle.net/10138/298477>

<https://doi.org/10.1016/j.resuscitation.2017.09.029>

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Special paper

The International Liaison Committee on Resuscitation—Review of the last 25 years and vision for the future



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ARTICLE INFO

Article history:

Received 25 September 2017

Accepted 25 September 2017

Keywords:

ILCOR
Resuscitation
Advanced life support
Basic life support
Paediatric life support
Neonatal life support
First aid
Continuous evidence evaluation

ABSTRACT

2017 marks the 25th anniversary of the International Liaison Committee on Resuscitation (ILCOR). ILCOR was formed in 1992 to create a forum for collaboration among principal resuscitation councils worldwide. Since then, ILCOR has established and distinguished itself for its pioneering vision and leadership in resuscitation science.

By systematically assessing the evidence for resuscitation standards and guidelines and by identifying national and regional differences, ILCOR reached consensus on international resuscitation guidelines in 2000, and on international science and treatment recommendations in 2005, 2010 and 2015. However, local variation and contextualization of guidelines are evident by subtle differences in regional and national resuscitation guidelines. ILCOR's efforts to date have enhanced international cooperation, and progressively more transparent and systematic collection and analysis of pertinent scientific evidence. Going forward, this sets the stage for ILCOR to pursue its vision to save more lives globally through resuscitation.

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History of ILCOR

The first stimulus to the foundation of the International Liaison Committee on Resuscitation (ILCOR) was in 1990 [1]. Members of the European Resuscitation Council (ERC), American Heart Association (AHA), Australian Resuscitation Council (ARC), Heart and Stroke Foundation of Canada (HSFC), and the Resuscitation Council of Southern Africa (RCSA) gathered at Utstein Abbey [2] in Stavanger, Norway to discuss the lack of standardized language in reports on out-of-hospital cardiac arrest. This led to the adoption of the 'Utstein-style' for uniform reporting of data.

In 1992, the AHA invited representatives from 58 countries to their fourth National Conference on cardiopulmonary resuscitation (CPR) and emergency cardiovascular care (ECC). Richard Cummins,

who had conceived the initiative, chaired a session on international cooperation. He and Douglas Chamberlain, discussed how worldwide cooperation could most effectively develop and disseminate resuscitation guidelines. An international committee was formed, which first met in November 1992 at the conclusion of an ERC meeting in Brighton, UK. In attendance were the AHA, ERC, HSFC, ARC, and RCSA, and Cummins and Chamberlain were elected Co-Chairs (Table 1). Walter Kloeck from RCSA, suggested the name International Liaison Committee on Resuscitation—a play on words relating to treatment guidelines for a sick heart, 'ILL-COR'.

Subsequent years became increasingly busy from an organizational and science perspective, consistent with its 1993 mission statement:

"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), paediatric life support (PLS), and

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Table 1
ILCOR Co-chairs (1992–present).

Name	Years of Service	Council
Richard Cummins, MD	1992–1999	AHA
Douglas Chamberlain, MD	1992–1999	ERC
William Montgomery, MD	1999–2007	AHA
Petter Steen, MD	1999–2001	ERC
Jerry Nolan, MD	2001–2012, 2015–2016	ERC
Vinay Nadkarni, MD	2007–2017	AHA
Ian Jacobs, RN [*] [3]	2012–2014	ANZCOR
Gavin Perkins, MD	2016–Present	ERC
Robert Neumar, MD	2017–Present	AHA

^{*} Ian Jacobs died in 2014.

advanced life support (ALS). While the major focus will be upon treatment guidelines, ILCOR will also address the effectiveness of educational and training approaches and topics related to the organization and implementation of emergency cardiac care. ILCOR will also encourage coordination of dates for guidelines development and conferences by various national resuscitation councils. These international guidelines will aim for a commonality supported by science for BLS, PLS, and ALS.¹

In 1997, the Consejo Latinoamericano de Resucitacion (CLAR) joined ILCOR and in 2006 the Resuscitation Council of Asia (RCA) (Fig. 1). By then, several significant ILCOR Advisory Statements had been published. Later, the ‘Guidelines 2000 Conference’ produced international resuscitation advice. The founding chairs of ILCOR passed the leadership roles to Bill Montgomery from the AHA and Petter Steen of the ERC.

Between 2000 and 2005 ILCOR met in Utstein Abbey, Melbourne, Brazil, and Dallas in preparation for the 2005 International Consensus on ECC and CPR Science. This involved 403 systematic reviews, from 281 experts, on 276 topics. Also in 2005, ILCOR acquired an official structure with articles of incorporation and bylaws. Jerry Nolan and Vinay Nadkarni took up the reigns as ILCOR co-chairs in 2007 and led another very successful conference in 2010 with 313 participants (46% from outside US) and 411 scientific evidence reviews on 277 topics. Writing group members voted on each recommendation, facilitated by active international collaboration (Table 2 and Fig. 2).

Wanting to capitalize on lessons learned, ILCOR embarked on a new evidence evaluation process in 2012 under the leadership of Vinay Nadkarni and Ian Jacobs. Systematic reviews were conducted based on recommendations of the Institute of Medicine of the National Academies [4], and a systematic reviews assessment tool (AMSTAR) [5]. Evidence evaluation and recommendation development followed guidance from the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) Working Group [6]. Information scientists were commissioned to assist with article searches. Evidence was assessed using standardized risk-of-bias assessment tools. Evidence profile tables were developed using the GRADE Guideline Development Tool [7].

ILCOR’s most recent and ambitious undertaking was the collaborative science review for the 2015 International Consensus Conference on CPR and ECC Science. This included simultaneous publication of its Consensus on Science with Treatment Recommendations (CoSTR) in both *Circulation* and *Resuscitation*. The GRADE methodology and an online information system (SEERS) supported this process.

In February 2016, ILCOR adopted a new strategic plan. This included a vision of ‘saving more lives globally through resuscitation’, and a mission of using transparent evaluation of scientific data to promote, disseminate, and implement international consensus guidelines for resuscitation and first aid (see electronic supplementary material for more details).

Evidence evaluation has moved to a continuous process rather than 5-year cycle (see later in this article for more details). The first systematic review conducted by a knowledge synthesis unit in collaboration with ILCOR using the new continuous evidence evaluation process was published in Spring 2017 followed by the CoSTR in November 2017.

Throughout its history, ILCOR has been supported and guided by “Resuscitation Giants”, individuals who have made landmark contributions to cardiopulmonary resuscitation. Their contributions are acknowledged and appreciated by all associated with ILCOR. Further information is available in the electronic supplementary material.

Key changes to practice over the last 25 years

Basic life support and automated external defibrillation (BLS/AED)

The 1997 ILCOR advisory statement summarised the sequence of actions for a lay rescuer to treat a cardiac arrest victim and comprised an assessment of consciousness, airway, breathing and circulation (pulse check) [154]. Resuscitation was started with 2 rescue breaths followed by 15 chest compressions (rate 100 min, depth 4–5 cm). In 2000, the pulse check was removed from lay resuscitation guidelines and the rescuer was instead prompted to assess consciousness and look for the absence of normal breathing to diagnose cardiac arrest. Compression-only CPR was endorsed for those unable or unwilling to deliver rescue breaths or during dispatcher-assisted CPR [30]. In 2005, ILCOR recommended that the ratio of compressions to ventilations was changed from 15:2 to 30:2 [89]. The importance of high-quality CPR was emphasised in 2010. Rescuers were prompted to start resuscitation with chest compressions rather than ventilations and to increase compression depth to at least 5 cm [117]. CoSTR 2015 highlighted the central role that the emergency medical dispatcher plays in orchestrating the emergency response and in assisting the caller to recognise and treat cardiac arrest. The importance of high-quality chest compressions (5–6 cm, rate 100–120 min) with minimal interruptions is again highlighted [136].

The development of public access defibrillator schemes was promoted in 2000 [30] and ILCOR has continued to advocate their use by highlighting the evidence supporting their effectiveness [89,117,136].

Advanced life support (ALS)

In 2000, ALS [155] followed the 1997 ILCOR ALS advisory [19] concept of the Universal ALS Algorithm with interventions based on the cardiac arrest rhythm (VF/VT or non-VF/VT). This included three successive defibrillation attempts followed by one-minute of CPR before further shock attempts. This recommendation was changed to single defibrillation attempts followed by two minutes of CPR between shocks in 2005 [156]. There was also a recommendation to consider introducing medical emergency team (MET) systems to prevent in-hospital cardiac arrest, and therapeutic hypothermia (32–34 °C) was recommended for comatose survivors [93]. The 2010 CoSTR included a recommendation for waveform capnography to confirm and continually monitor tracheal tube position during CPR and the quality of CPR [120]. Comprehensive post resuscitation care with careful prognostication was recommended, whilst the lack of evidence supporting atropine led to it being removed from guidelines. The GRADE approach in 2015 showed that the quality of evidence to support many ALS interventions was low or very low and this led to many weak recommendations [138]. There was equipoise between basic and advanced airway interventions, a suggestion against the routine use of mechanical



Fig. 1. ILCOR member organisations.

CPR devices, and uncertainty about the role of drugs (adrenaline and amiodarone). Post resuscitation care included the concept of TTM (targeted temperature management) with a target temperature between 32 and 36°C, and the need for delayed (more than 24 h after ROSC) multimodal prognostication in comatose cardiac arrest survivors.

Acute coronary syndromes

The 1997 ILCOR Advisory Statement focused on what we now call acute coronary syndrome from the standpoint of encouraging prompt recognition as a means to deliver key interventions to prevent cardiac arrest [24]. The section on special circumstances stated “if cardiac arrest has not yet occurred, ECG clues



Fig. 2. ILCOR major guidelines/evidence evaluation conferences.

Table 2
ILCOR Advisory statements, Guidelines and Consensus on Science with Treatment Recommendations.

Year	Title	Sections
1991	Utstein Report	Out of Hospital Cardiac Arrest [8–10]
1997	Utstein Report	In Hospital Cardiac Arrest [11–13]
1997	Advisory Statements	Overview [14–16], BLS [17,18], ALS, [19,20] Defibrillation [21,22], PLS [23,24]
2000	International Guidelines	Introduction [25,26], Ethics [27,28], Adult BLS [29,30] and AED [31,32] First Aid, [33,34] ALS (overview, [35,36] defibrillation [37,38], airway [39,40], devices [41,42], drugs [43–46], universal algorithm [47,48], and post resuscitation care [49,50]), Reperfusion (ACS [51,52] and Stroke [53,54]), Advanced Challenges in Resuscitation (electrolytes [55,56] toxicology [57] and special circumstances [58–65]), Paediatric BLS [66,67], Paediatric ALS [68,69], Neonatal Resuscitation [70,71]
2003	Advisory Statement	Therapeutic Hypothermia after Cardiac Arrest [72,73]
2003	Advisory Statement	Use of AED in Children [74–76]
2003	Utstein Report	Drowning [77,78]
2004	Utstein Report	Out of Hospital Cardiac Arrest:Update [79,80]
2005	Consensus on Science with Treatment Recommendations	Introduction [81,82], Methods (evidence evaluation process [83,84], conflict of interest [85,86]), Controversial topics [87]) Adult BLS [88,89], Defibrillation [90,91], ALS [92,93], ACS [94,95], PLS [96,97], Neonatal resuscitation [98–100], Interdisciplinary [101,102], Knowledge gaps and priorities for research [103,104]
2007	Advisory Statement	Post cardiac arrest syndrome [105–108]
2008	Advisory Statement	Executive summary [109,110], Methods (collaboration [27,111] evidence evaluation [112,113] conflict of interest [114,115]) Adult BLS [116,117], Defibrillation [118,119], ALS [120,121], CPR techniques and devices [122,123], ACS [124,125], PLS [126,127], NLS [128,129], Education implementation and teams [130,131]
2010	Consensus on Science with Treatment Recommendations	Out of Hospital Cardiac Arrest Update [132,133]
2015	Utstein Report	Executive summary [110,134] Methods (evidence evaluation and conflict of interest [7,135]), Adult BLS and AED [136,137], Advanced Life Support [138,139] Acute Coronary Syndromes [140,141], PLS [142,143], Neonatal Resuscitation [144,145], Education, Implementation and Teams [146,147], and First Aid [148,149]
2015	Consensus on Science with Treatment Recommendations	Drowning: Update [150,151]
2017	Utstein Report	CoSTR [152,153]
2017	Continuous Evidence Evaluation	
2017	Consensus on Science with Treatment Recommendations	
2017	Advisory Statement	Gaps in Science and Priorities for Research <i>In press</i>
2017	Advisory Statement	Core Outcome Set for Cardiac Arrest (COSCA) <i>In press</i>

Acute Coronary Syndromes (ACS), Advanced Life Support (ALS), Automated External Defibrillation (AED), Basic Life Support (BLS), Paediatric Life Support (PLS).

may be helpful” [24]. In 1997, reperfusion strategies using thrombolytic therapy in the setting of ST-elevation myocardial infarction (STEMI) were widely used. Percutaneous coronary intervention (PCI) was reserved for cases of failed reperfusion, the presence of contraindications to thrombolysis, or cardiogenic shock, and was not used routinely, as it is now. In 2005, ILCOR reviewed the evidence specifically related to diagnosis and treatment of ACS/AMI in the out-of-hospital setting and during the first hours of care in the emergency department [95]. The recommendations focused on diagnostic testing using biomarkers and the ECG, and recommended that prehospital ECGs be routinely available, favored paramedic interpretation and prehospital catheterization lab activation. PCI was favored over fibrinolysis if symptom duration was over 3 h and time to PCI was less than 90 min. In 2010, ILCOR offered guidance on achieving the timeliest reperfusion for STEMI, and addressed the treatment of STEMI and NSTEMI patients following return of spontaneous circulation following cardiac arrest [124]. In 2015, ILCOR recommended that coronary angiography be performed emergently (rather than later in the hospital stay or not at all) for OHCA patients with suspected cardiac etiology of arrest and ST elevation on ECG. Coronary angiography is reasonable for select (e.g. electrically or hemodynamically unstable) adult patients after OHCA of suspected cardiac origin but without ST elevation on ECG, regardless of whether the patient is comatose or awake [140].

Paediatric life support (PLS)

The first publication in 1997 specifically on Paediatric BLS and ALS highlighted variation from adult practice, becoming the ILCOR template for children’s resuscitation [23]. In BLS, high-quality CPR became mandated [127], with specification of lower sternal depression by at least 1/3 of AP diameter (4 cm in infants and 5 cm for

children) [142] rather than approximately 1/3 of AP diameter. Bystander CPR requirements being 30:2 chest compressions to ventilations whilst for healthcare workers, this ratio being 15:2 [97]. One second duration of breath delivery came in line with adult practice [142]. AED guidance was introduced [98], and subsequently expanded for all ages [142].

In Paediatric ALS, a single defibrillation shock replaced three stacked shocks, high-dose adrenaline was not advised after an initial dose of 10 mcg/kg (and the tracheal route was not recommended for drugs) [127]. Recommendations on airway management included cuffed tracheal tubes and monitoring of end-tidal carbon dioxide during CPR [127]. In seriously ill children recommendations changed to judicious fluid infusion, especially in sepsis and in the non-shocked patient, with emphasis on reassessment [142].

Recommendations on post resuscitation care evolved in response to available science, e.g. recommending TTM using mild hypothermia or strict normothermia, with fever prevention being key [142]. Single prognostic predictors still remain elusive [142].

Neonatal life support (NLS)

An influential practice change in neonatal resuscitation over the past 25 years was prompted by ILCOR consensus on science reviews comparing initiation of neonatal resuscitation in the delivery room with air or the long-standing tradition of using 100% oxygen. This was first considered for term babies in the 2005 [99] (although at that time there was insufficient evidence to make a recommendation) and again in 2010 [128] which led to the world-wide rejection of routinely exposing term newborns to 100% oxygen because of an increased risk of death, delay in onset of spontaneous breathing and oxidative damage to tissues when compared with room air. In 2010

there was little evidence about the risks and benefits of 100% oxygen for resuscitation of preterm infants; however, over the next 5 years evidence also demonstrated no benefits for preterm newborns. By 2015 the ILCOR CoSTR concluded that for preterm infants, resuscitation should be initiated with low concentrations of oxygen and titrated with a blender to meet minute by minute oxygen saturation goals using pulse oximetry [144]. The mandate to monitor and titrate oxygen introduced additional neonatal equipment of oxygen blenders and pulse oximetry into delivery and operating rooms throughout the world.

Education implementation and teams

Douglas Chamberlain and Richard Cummins addressed the importance of “effectiveness of educational and training . . . and topics related to . . . implementation of emergency cardiac care” in the 1997 ILCOR advisory statements [15]. The first International Guideline in 2000 had no formal task force on education or implementation but an important conference objective was to “review and recommend changes in the methods for teaching knowledge and skills of ECC” [25]. “The goal of teaching the community” as a strategy to aid adoption of guidelines focused on “lay public educated in the importance of early BLS and ACLS” and “to support the life of the cardiac arrest victim until ACLS becomes available”. Consensus was reached that BLS training needed simplification [157] and for the first time, short video-self instructions showed more retention of information and skills than a 4 h course [158].

In 2005 a major guideline conference topic was what would be “the best way to train lay rescuers” [159]. An interdisciplinary task force assessed evidence for educational methods until the 2005 consensus of science and treatment recommendations were issued [101]. These CoSTRs underpinned the first ERC Guideline section dedicated to “Principles of training in resuscitation” [160].

Over the following five years the newly formed Education, Implementation, and Teams (EIT) Task Force addressed 32 worksheet topics highlighting that CPR knowledge and skills decay fast, AED use should not be restricted to trained personnel, and that CPR prompt devices improve CPR skills acquisition and retention. Important knowledge gaps were formulated, such as the unknown optimal frequency of refresher training, best dissemination of guideline implementation, and the importance of cardiac arrest centers [130].

The next evidence evaluation cycle was characterized by a rigorous systematic evaluation process using GRADE. The Task Force reviewed 6 education PICO questions for BLS and 4 for ALS, and 7 PICO questions for implementation. Key findings were the usefulness of feedback devices for CPR skills learning; training sessions might be more efficient if short and delivered more frequently and the use of information technology to notify CPR-providers to promptly use AEDs during BLS [146].

First aid

First aid science remains in its infancy, with publication of the first formal CoSTR related to first aid practice in 2005 in conjunction with ILCOR [161].

In 2005, bleeding was controlled using direct manual pressure, and long held practices to use elevation and pressure points were no longer recommended. By 2010, translation of the battlefield experience to civilian practice led to evidence supporting the use of hemostatic agents and dressings, and in 2015 supporting the use of tourniquets, both specifically for life-threatening bleeding not controlled by direct pressure [149,162].

First aid recommendations for medical topics have also evolved over the past 10 years. In 2005, it was recommended that first aid providers assist with adrenaline autoinjectors for anaphy-

laxis [161]; however, in 2010 evidence demonstrated that first aid providers have difficulty recognizing anaphylaxis without repeated episodes of training and experience [162]. By 2015, a second dose of adrenaline was recommended for patients with anaphylaxis not responding to the initial dose [149].

Administration of aspirin for chest discomfort was first recommended in the 2010 Consensus on First Aid Science [161]. A separate review in 2015 evaluated early (prehospital or within the first hours from onset of symptoms) vs. later administration of aspirin and supported early administration of aspirin by first aid providers to adults with chest pain due to suspected myocardial infarction [149].

Stroke assessment systems were also evaluated in 2015, with a strong recommendation for their use by first aid providers to improve recognition of stroke and time to treatment [149].

Impact on process and outcomes

At the time that ILCOR was born, in the early 1990s, survival rates from out-of-hospital cardiac arrest (OHCA) were generally very poor and broadly in the range of 2–6% [163–166]. A systematic review of OHCA studies from 1950 to 2008 that was published in 2010 concluded rather disappointingly that the survival rate from OHCA worldwide had not changed throughout this 30 year period [163]. This lack of progress in OHCA outcomes was particularly disappointing given the comprehensive systematic review of all the science underpinning CPR, undertaken and published by ILCOR in 2000 [25] and the first International Consensus on CPR Science with Treatment Recommendations (CoSTR) published in 2005 [82].

In contrast to the early systematic reviews on outcomes, several more recent studies have documented significant increases in survival rates from OHCA over the last 10–15 years [167–171]. At least one study has documented improving neurological outcomes among the survivors of OHCA [168].

It is not possible to know which, if any, of the ILCOR treatment recommendations made in 2000, 2005 and 2010 (outlined elsewhere in this paper) might account for the improving survival rates from OHCA but all these authors report increasing bystander rates and most report increasing use of AEDs by bystanders [167,168,170,171]. The 2010 CoSTR recommended that all rescuers, trained or not, should provide chest compressions to victims of cardiac arrest. Chest compression-only CPR has subsequently been implemented in many parts of the world and in Japan this has contributed to a substantial increase in bystander CPR (from 17.4% in 2005–39.3% in 2012) and an associated increase in survival [172]. The 2010 CoSTR recommended that EMS dispatchers provide telephone instruction in chest compression-only CPR for untrained rescuers. Dispatcher-assisted chest compression-only CPR has been implemented widely in many regions of the world and accounts for much of the increase in bystander CPR rates. In Korea in OHCA in private settings, bystander CPR was associated with improved neurological recovery only when dispatcher assistance was provided [173].

There is also evidence that in-hospital cardiac arrest (IHCA) survival rates have also increased over the last 10–15 years. Data from the AHA Get with the Guidelines-Resuscitation registry between 2000 and 2009 indicate that survival rates are increasing and that this was due to improvement in both acute resuscitation survival and post-resuscitation survival [174]. An analysis of a large in-patient database in the United States also documented increasing survival after in-hospital CPR during the period 2007–2012 among 236,000 adults aged 18–64 years [175]. Survival to hospital discharge increased from 27.4% to 32.8% (P value for a trend <0.001); however, there was no significant change in survival trend before and after the 2010 AHA CPR Guidelines (and the 2010 CoSTR). Given

PICO Vigilance

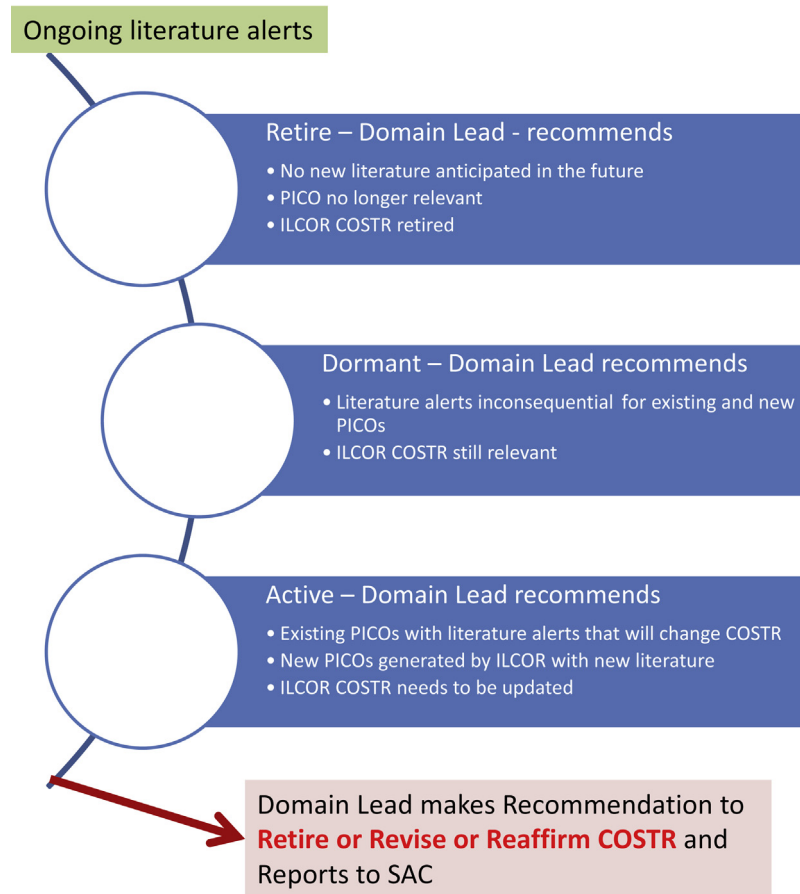


Fig. 3. Process for managing population intervention comparator outcome (PICO) questions. SAC is abbreviation for the proposed Scientific Advisory Committee.

that guideline changes take 1.5 years or more to implement, we should not be surprised by this finding [176].

Data from the UK indicate that post-resuscitation survival rates are increasing following both OHCA and IHCA (odds ratio (OR) per year 0.96 (95% confidence interval 0.95–0.97)) but that the increase is greatest among those admitted to intensive care units after IHCA [177]. ILCOR has made several treatment recommendations in relation to post-resuscitation care over the last 15 years, the most significant being targeted temperature management [72,106], and the implementation of these recommendations may account for at least some of this increasing survival rate. The 2015 international CoSTR recommended the use of multimodal tests for prognostication and generally delaying such tests until at least 72 h after ROSC [138]. Implementation of these recommendations should reduce the number of premature withdrawal of life-sustaining treatment (WLST) decisions that have been made in the past [178].

Future perspectives and priorities

ILCOR strategic plan

In 2015, ILCOR's Co-Chairs, Vinay Nadkarni and Gavin Perkins launched a comprehensive strategic planning process coordinated by Bill Montgomery to develop a five-year strategic plan for ILCOR. A two-day retreat in Singapore in 2016, attended by 43, representing all ILCOR member councils refreshed the vision, mission and

value for ILCOR (Table 3 and Electronic Supplementary Material). Four key strategic pillars underpinned the strategy: continuous evidence evaluation and task forces; leadership, mentorship and accountability; membership and partnerships, and research and registries (Fig. 3).

Continuous evidence evaluation

The ILCOR Continuous Evidence Evaluation (CEE) model offers continuous evidence review options that are based on the complexity of a research question (Figs. 3 and 4). A simple research question formatted as population, intervention, control, and outcome (PICO) will be answered by a systematic review (SR) team whereas a more complicated question perhaps involving more than one population, intervention or taskforce will be addressed by a knowledge synthesis unit (KSU). A knowledge synthesis unit is an internationally renowned group of systematic review methodologists who conduct rigorous reviews on contract. Resuscitation science PICOs are defined, and then categorized into reaffirmed, reposed or retired. The reaffirmed (active) and reposed questions are prioritized by the ILCOR Task Forces. PICOs that are shared across taskforces are identified early in this process. This list of questions is continually updated as new PICOs are created and some are retired. All the active and reposed PICOs are categorized into domains by Information Specialists based on their search strategies, providing an efficient way to monitor the new literature. Each domain will have

Table 3
ILCOR Vision, Mission and Values.

VISION

Saving more lives globally through resuscitation

MISSION

- To promote, disseminate and advocate international implementation of evidence-informed resuscitation and first aid, using transparent evaluation and consensus summary of scientific data.
- We fulfill this mandate by:
 - Rigorous and continuous review of scientific literature focused on resuscitation, cardiac arrest, relevant conditions requiring first aid, related education, implementation strategies and systems of care
 - Publishing regular and ongoing consensus on science with treatment recommendations
 - Collaborating with others to facilitate knowledge dissemination and exchange, inform effective education and training, implement and share trusted evidence-informed resuscitation practices
 - Enhancing capacity through mentorship and fostering the next generation
 - Leading the international resuscitation research agenda to address gaps in knowledge and promote funding related to resuscitation and relevant first aid practices
 - Encouraging engagement of patients, families and the public as partners in our activities
 - Monitoring and reporting incidence, process of care and outcomes to improve patient care
 - Building the foundation to evolve from international to global impact

VALUES

- **Scientific Rigor** – We deliver the highest quality continuous evaluation of relevant science and timely consensus on science and treatment recommendations
- **Collaboration** – We promote an inspiring, respectful, mentoring and collegial environment that fosters productive relationships and networks with global partners
- **Diversity** – We embrace a broad range of cultures, disciplines and perspectives
- **Integrity** – We place integrity at the core of our processes and relationships and manage conflict of interest and potential or perceived bias in all our endeavors
- **Accountability, Communication and Transparency** – We are transparent in our conduct of business, methodology, recommendations, communications and actions
- **Responsiveness** – We are sensitive to local, national, international and global contexts

- **CEE WG** – Continuous Evidence Evaluation Working Group – an interim group appointed by ILCOR exec to implement the strategic plan for continuous evidence evaluation
- **SAC** – Scientific Advisory Committee – a proposed oversight committee that will replace the CEE WG. The terms of reference for this team are under review of the ILCOR exec and will require a bylaw change to get approval
- **Domains** – topics across taskforces that are grouped by search strategy to enable efficient publication alerts prioritization of topics based on potential impact of new publications. SMH information specialists are under contract to use the searches to define domains.
- **Domain Leads** – oversee a content area through publication alerts and ensure compliance with process and timelines for KSU and SR reviews
- **KSU** – knowledge synthesis unit on contract – large units across the world that provide systematic reviews on contract that are led by the world’s leaders in SR and meta-analyses and network meta-analyses methodologies. The KSU can address PICOs that are large and complicated or where a number of PICOs can be lumped and addressed through sensitivity analyses or subgroup analyses. The KSU is on contract with a deliverable of COSTR, knowledge gaps and published SR within tight timelines
- **SR** – systematic reviewer on contract- is a trained SR methodologist with a track record of publishing SRs and meta-analyses with a deliverable of COSTR, knowledge gaps and published SR within tight timelines
- **Node** – when a KSU takes on a PICO that is of interest to more than one taskforce the domain lead will identify all interested taskforces as ‘nodes’ of interest and will ensure that engagement of all taskforces in the KSU process is facilitated by the content experts.

Fig. 4. Evidence evaluation roles.

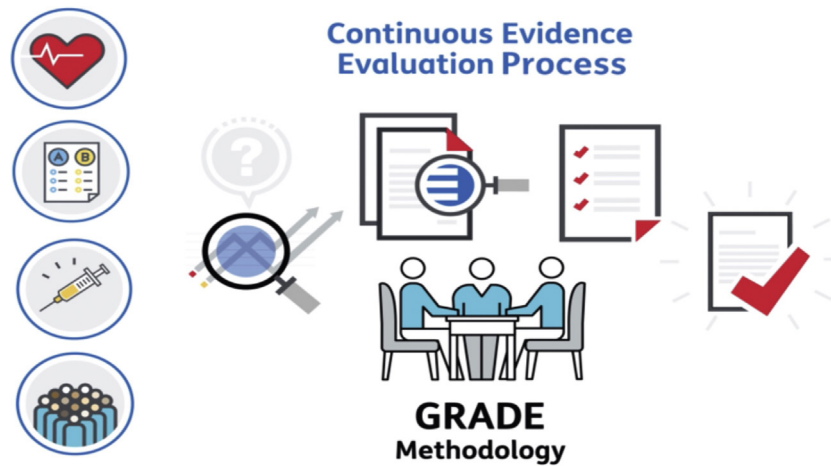


Fig. 5. Summary of Continuous Evidence Evaluation process.

a designated domain lead who will monitor publication alerts for a threshold to trigger a PICO review, and assign this review to either a systematic review (SR) specialist or a knowledge synthesis unit based on the complexity of the PICO. Either pathway will deliver a Consensus on Science with draft Treatment Recommendation based on the GRADE methodology to the ILCOR Task Force chairs. The Task Force will finalize the COSTR, evidence to decision framework and knowledge gaps, engage the public in commenting on posted drafts, and after ILCOR executive approval post the confirmed final version on the ILCOR website (Fig. 5). Either pathway will deliver a published systematic review that will be linked to the posted COSTR on the ILCOR website (www.ilcor.org). The model includes mentorship opportunities to build capacity in systematic review methodology across the ILCOR councils.

Governance

The ILCOR CEE model consists of methods experts and content experts in resuscitation (spanning first aid, prehospital, in-hospital, education, systems optimization, as well as paediatrics, adult and neonatal). It reports to the ILCOR executive and ensures the quality and timeliness of the reviews. The CEE working group (Scientific Advisory Committee) provides guidelines for when to employ either pathway: systematic reviews versus knowledge synthesis unit. It collaborates as required with ILCOR and AHA to develop contracts with systematic review/meta-analysis/GRADE experts and KSUs. The CEE working group defines, advises and monitors benchmarks for completion for domain leads and both knowledge synthesis unit and systematic review approaches.

Disseminating the message

The ILCOR website (www.ilcor.org) provides the primary tool for collecting feedback from the wider public regarding new PICOs, modifications to existing PICOs, and COSTRs. The ILCOR website will disseminate the products of continuous evidence evaluation: COSTR postings; published linked systematic reviews; and published annual summaries. ILCOR member organizations can link their revised guidelines to the CEE products.

Task forces future perspective and priorities

The task forces remain a very important component of the ILCOR organization. They are comprised of dedicated experts in resuscitation and first aid. The members come from all over the world and it

is their task to develop consensus on science statements that makes it possible for ILCOR to develop treatment recommendations which regional resuscitation organizations convert to local guidelines.

ILCOR task forces have changed over the last 25 years as methodological approach to evidence evaluation and the focus of resuscitation guidelines have changed and become more rigorous. Initially task force members brought expert opinion to ILCOR. Over time this shift in methodologic approach to rigorous evidence evaluation has required task force members to become familiar with GRADE and where task force members were evidence reviewers, to use the GRADE methodology in their approach to evidence evaluation and systematic reviews. As the focus of task force work has migrated in part to KSUs and systematic reviewers it will be important for the task force members to work with domain leads and systematic reviewers. The strategic plan referenced elsewhere has dictated a new task force structure in which task force member recruitment has become transparent and based on expertise rather than ILCOR council representation. The new structure has additionally brought in early career members to grow to future leaders resulting in the more experienced members needing to have mentoring skills. The new task force work will be a continuous process with nimble turnaround times, monthly conference calls and webinar meetings but fewer face to face meetings and more intensive collaboration with the public. Team or task force work is now even more important as working together instead of working alone or in pairs as in the past. The new appointment process ensures room for new experts with fresh ideas.

Leadership, mentorship and accountability

Strong leadership is essential to ILCOR's continued success. ILCOR's Articles of Incorporation and Internal Rules are being updated to enable implementation of its strategic plan.

ILCOR is committed to building capacity, nurturing and supporting aspiring resuscitation leaders. Key changes to the constitution of task forces were the introduction of published criteria for membership. Applications are reviewed by a Nominations Committee and recommendations based on the scientific merit and clinical expertise across ILCOR task forces and domains, and balance of representation across ILCOR member councils, gender, and career levels (early, mid, senior). Opportunities to develop the next generation of resuscitation scientists are supported by the appointment of early career researchers to task forces and trainee opportunities for systematic reviewers.

Membership

ILCOR's vision and mission is committed to inclusiveness, strengthening and expanding ILCOR's connection to the international resuscitation community and to strategic partnerships that save more lives. Inclusive broadening international and global representation will bring expanded evidence and evidence evaluation perspectives to greater impact in countries or regions with the highest incidence of cardiovascular deaths.

Moving from a multinational to a global impact requires ILCOR to expand the geographic reach of its CoSTR. The long-term goal is to substantially partner and expand our international resuscitation community to include regions that are not currently represented and regions where participation is limited.

At the February 2016 ILCOR strategic planning retreat, there was unanimous agreement to strategically expand international membership and collaboration, with a spread to resource-limited global settings on a longer horizon.

Measuring impact and importance of registries

Utstein-style reporting guidelines

The concept of "we can only improve what you can measure" is well accepted. Continuous quality improvement (CQI) process assessing clinical performance and system of cares is essential to save more lives from cardiac arrests.

ILCOR has developed and updated the Utstein-style guidelines to improve public health internationally by providing a structured framework including uniform terms and definitions for resuscitation and standardized reporting forms. These guidelines provide us with a better understanding of the epidemiology of cardiac arrest, facilitate intersystem and intra-system comparisons, and enable comparison of the benefits of different systems.

Future perspectives

During the last decade worldwide, many registries have been developed based on these recommendations and these have generated a lot of valuable research. ILCOR has started to establish a system to collect descriptive data on systems of care and outcomes following both out-of-hospital and in-hospital cardiac arrest. Using a survey tool, summary data will be collected from registries across the world. An annual report describing the epidemiology and outcomes from out-of-hospital and in-hospital cardiac arrest will be published on the ILCOR website and will support quality improvement and benchmarking. These activities by ILCOR will enhance international collaboration in resuscitation science, which should help to overcome knowledge gaps and improve survival from cardiac arrests.

Conclusion

ILCOR has delivered international consensus on science and treatment recommendations for the last 25 years. ILCOR's refreshed vision, mission and values sets the stage for future collaboration and sustainable growth. Today's priorities are to deliver continuous evidence evaluation to enable the world's resuscitation scientists and practitioners to receive the most up to date and relevant information to their practice. Expanding the global reach of ILCOR is a key priority for enabling ILCOR to save more lives globally through resuscitation.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.resuscitation.2017.09.029>.

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