Cardiopulmonary resuscitation in low-resource settings: a statement by the International Liaison Committee on Resuscitation, supported by the AFEM, EUSEM, IFEM, and IFRC

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Most recommendations on cardiopulmonary resuscitation were developed from the perspective of high-resource settings with the aim of applying them in these settings. These so-called international guidelines are often not applicable in low-resource settings. Organisations including the International Liaison Committee on Resuscitation (ILCOR) have not sufficiently addressed this problem. We formed a collaborative group of experts from various settings including low-income, middle-income, and high-income countries, and conducted a prospective, multiphase consensus process to formulate this ILCOR Task Force statement. We highlight the discrepancy between current cardiopulmonary resuscitation guidelines and their applicability in low-resource settings. Successful existing initiatives such as the Helping Babies Breathe programme and the WHO Emergency Care Systems Framework are acknowledged. The concept of the chainmail of survival as an adaptive approach towards a framework of resuscitation, the potential enablers of and barriers to this framework, and gaps in the knowledge are discussed, focusing on low-resource settings. Action points are proposed, which might be expanded into future recommendations and suggestions, addressing a large diversity of addressees from caregivers to stakeholders. This statement serves as a stepping-stone to developing a truly global approach to guide resuscitation care and science, including in health-care systems worldwide.

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Introduction

The context of cardiac arrest care in low-resource settings

Most scientific cardiopulmonary resuscitation (CPR) studies originate from a context of well resourced populations and high-resource environments, making the implementation of resuscitation guidelines in daily clinical practice difficult or impossible for low-resource health-care systems. As the cardiovascular disease burden is rising in low-resource countries, the incidence of potentially treatable cardiac arrests will similarly increase in the next few decades,[1,2] highlighting the magnitude of this problem. Emergency medicine is an essential part of universal health care, and more than half of deaths occurring in low-income or middle-income countries worldwide could potentially be addressed by improved emergency care—as has been highlighted by a resolution on emergency and trauma care adopted by the World Health Assembly in 2019.[3,4] In many situations, however, the standard of care offered in high-resource settings is unavailable or remains rare in lower resource settings owing to a scarcity of financial, infrastructural, and logistical resources, and sufficiently qualified personnel. For instance, delayed recognition of cardiac arrest, the absence of a functional pre-hospital ambulance system, a functionally limited emergency care system as defined by WHO, or an emergency care system still under development effectively hinder the implementation of resuscitation guidelines, and hospitals might not be equipped to provide post-resuscitation intensive care.[5–10] The African Federation for Emergency Medicine (AFEM) has previously undertaken groundbreaking work in this domain, and has raised concerns that international guidelines have not adequately addressed the local needs of their low-resource communities.[1,6,7]

Current recommendations on resuscitation

The international community has made little effort to address differences between high-resource and low-resource cardiac arrest care. The International Liaison Committee on Resuscitation (ILCOR) only suggests—on the basis of a very low certainty of evidence and expert opinion—that "alternative instructional strategies can be used for the teaching of basic and advanced life support in low-income countries".[11] Current recommendations from the European Resuscitation Council briefly stress that, "in low-resource settings, further research with Utstein-style reporting should be undertaken, differences in sociocultural and geographical terms should be explored, and maximal local acceptability and applicability of recommendations should be achieved through the involvement of experts from all resource backgrounds".[12] Furthermore, "a list of essential resuscitation care resources should be compiled".[12] The American Heart Association (AHA) states that the overall resource situation should be taken into account when, for instance, establishing extracorporeal CPR programmes,[13] and acknowledges the difficulties of CPR education in low-resource settings.[14] Additionally, the AHA mentions the need for mindfulness about a scarcity of resources in,

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For more on the **Pakistan Life Savers Programme** see https://www.plsp.org.pk/Pages/home.aspx

for example, neonatal life support.[15] WHO has developed an emergency care system framework that does not primarily focus on CPR, but rather provides a tool for priority evaluation and quality improvement.[16] The International Federation and the regional sections of the Red Cross and Red Crescent Societies have published practical guides on first aid, including resuscitation.[17,18] More local guidelines include, for instance, the guidelines by the Indian Resuscitation Council, which put forward an algorithm more suited to available resources with a subsequent sequential approach should more resources become available.[19] In Pakistan, modified recommendations for bystander CPR have been issued through the Pakistan Life Savers Programme, and in South Africa, pre-hospital guidelines on emergency medicine are being developed.[20,21]

Rationale and aims

ILCOR aims to improve survival after cardiac arrest worldwide. To achieve this, ILCOR wants to produce internationally applicable scientific statements and treatment recommendations on resuscitation, supporting all health-care systems, ranging from low-resource to high-resource settings. This goal is a substantial challenge—one that can only be tackled through a joint international effort including all stakeholders worldwide. We aimed to create awareness of this dilemma while honestly acknowledging the inadvertent exclusionary approach of the past, which has provided a guidance perspective from almost only high-resources settings. This Health Policy aims to create a more inclusive view considering the diversity of health-care systems with varying degrees of development and resources, in the hopes that this awareness might trigger the development of local guidance and support the inclusion of representatives from low-resource settings in valid guideline development worldwide. Specifically, this Health Policy builds a base and a stepping-stone for further, more structured and evidence-based statements, and more inclusive recommendations and guidelines; acknowledges existing initiatives working on or around this topic and building a collaborative network; provides first suggestions for definitions of resuscitation in low-resource settings; highlights the new concept of the chainmail of survival as an approach towards creating a framework of resuscitation systems, care, and research that is adaptable for low-resource settings; identifies enablers, barriers, and potential gaps in the knowledge relevant to this new approach; and provides first action points for resuscitation in low-resource settings, aimed at all individuals involved.

Such individuals should not be restricted to health-care professionals, but should also include relevant members of the clinical research communities, national and local public health-care officers and politicians, research funding agencies, relevant societies, governmental and non-governmental agencies, representatives of local communities, and individuals seeking care, as they might all serve as possible facilitators of the implementation of local resuscitation strategies.

Development process

Originating from an ILCOR Education, Implementation and Teams (EIT) task force scoping review on clinical outcomes after CPR in low-resource countries,[5] and in response to the necessity of a truly international and inclusive approach in terms of contributions to such a statement, the Cardiopulmonary Resuscitation in Low-Resource Settings Group was formed. This group consists of a core statement-writing group of 19 individuals who also served as the authors of this Health Policy (ten experts in resuscitation from low-income and middle-income countries, and nine experts from high-income countries as defined by the World Bank;[22] seven women and 12 men; seven early-career professionals and 12 middle-career or late-career professionals; four ILCOR task force members and 15 non-ILCOR members). This core group discussed the proposed topics of this Health Policy with an advisory board (consisting of ILCOR task force members who were not part of the writing group and other experts engaged in emergency care from a range of resource settings). Thus, besides the EIT task force members, the collaborators comprise interested people from existing professional collaborations, personal contacts, known authors of relevant publications, nominated members of international organisations, known experts from the various subtopics, and local experts working in low-resource settings.

Owing to the impossibility of meeting in person due to the COVID-19 pandemic and the need to reach consensus, a pragmatic approach was chosen for effective, structured decision making and communication. After having composed the group of collaborators, a literature search on PubMed (MEDLINE) and Embase was performed, following a previously published search strategy,[5] which added new insights to already published information.[5] A prospective, multiphase expert consensus process was then conducted. Six general online meetings were held, and numerous conversations and discussions were conducted. From brainstorming and adding new thoughts, this process led the group through consensus finding on particular topics and ideas through to manuscript drafts and several steps of editing and rewriting this Health Policy. After finalisation, the manuscript was sent to various organisations, and received a statement of official support from the AFEM, the European Society for Emergency Medicine, the International Federation for Emergency Medicine, and the International Federation of Red Cross and Red Crescent Societies.

The writing group agreed to first publish this Health Policy to acknowledge the problem of international resuscitation guidelines inadequately responding to various resource settings and to create awareness around CPR in low-resource settings. As a next step,

and as approved by the ILCOR General Assembly on Nov 16, 2022, a full ILCOR statement including a major systematic literature review process will be produced by international collaborators in 2023 and 2024.

Consensus statement

Definitions of low-resource settings

There is no straightforward definition of low-resource settings. Previously, the gross national income per capita based on the World Bank definitions of low income, middle income, and high income was commonly used to rank countries and regions according to their economies.[5,22] However, this approach might be restricted, as low-resource settings are not always limited to national borders or regions, and high-income countries can have communities or regions with low levels of resource availability.

Low-resource settings is a broader term and includes all possible settings in which resources can be limited in quantity or quality (or both), both in time and in space. A low-income country can have areas with different levels of resource availability (eg, urban *vs* rural regions). Vice versa, high-income countries can have a highly sophisticated pre-hospital ambulance system and overall emergency care system that can, for example, be limited in its application in large areas of wilderness. These settings might gradually change over time with the implementation and development of advanced services. Rapid changes in resource levels are also possible in the cases of natural disasters, pandemics, or other unforeseen events. Moreover, the nature of resource scarcity can vary and can include a scarcity of political commitment, financial resources, time, training or expertise, personnel, equipment, or a combination of any of these resources. These concepts are important when discussing emergency medicine in general and cardiopulmonary resuscitation specifically—a situation with low resources can occur to anyone anywhere.

It is not only resource-directed care or frameworks that can differ between (and among) high-resource and low-resource settings, but also cultural and ethical considerations. Current resuscitation guidelines address ethical approaches from a high-resource setting, concentrating on the termination of resuscitation rules, bystander initiation of CPR, and patients' and families' preferences and treatment options.[23] Low-resource settings open up a different bandwidth and perspective on the topic. For instance, is CPR ethically justifiable when it has known low overall success rates, and when the likelihood of success is further diminished by scarce equipment, trained personnel, transport, subsequent intensive care facilities, or further care such as coronary angiography and rehabilitation?[24–29] Are psychological, sociocultural, and religious views on end-of-life resuscitation and subsequent intensive care different between low-resource and high-resource settings? What about do-not-resuscitate orders or similar policies? In which area of public health should a health-care system primarily spend its scarce resources—on vaccination programmes, clean water, nutritional support, saving mothers and babies, or general CPR programmes? These open-ended questions remain unanswered, and thus stimulate debate.

For this statement, the expert group discussed the various kinds of low-resource settings, such as the overall situation in a low-income country or in remote environments in high-income countries (eg, ships, oil platforms, spacecraft or aircraft, or Antarctic research stations), or acute resource-constrained situations (eg, as a result of natural disasters, pandemics, war, or other conflict areas). Naturally, every CPR situation in each of these settings means a fight for the life of a person, and all these situations deserve attention. Resuscitation efforts are also not limited to sudden cardiac death and early defibrillation, but embrace all causes of cardiac arrest and treatment options. Moreover, many of the topics that were discussed could be further dissected into cases of out-of-hospital and in-hospital cardiac arrest. However, as noted earlier, the group proposed that—for capacity reasons—this statement should not focus on specific situations leading to cardiac arrest, such as polytrauma and trauma, land mine incidents, or drowning (these situations should be revisited in the systematic review), but rather give a general overview and first foray into the subject matter. Most importantly, we do not want to imply that CPR is always the most important health-care topic and that scarce resources must be allocated away from other areas towards resuscitation efforts; other health-care issues (eg, clean drinking water, diseases such as malaria, trauma, and women's health) can often be much more pressing in the broader picture.

Existing and implemented initiatives

We acknowledge that there are already several existing and implemented efforts to improve emergency care or resuscitation programmes, such as the very successful initiatives of the Pakistan Life Savers Programme, the Helping Babies Breathe programme (a successful global initiative teaching essential neonatal and newborn resuscitation skills, predominantly in low-income and middle-income countries),[30] the international effort against drowning,[31–34] and WHO programmes for the assessment of trauma care and emergency medical systems (eg, the WHO Basic Emergency Care course and the WHO Emergency Care System Framework).[16,35–37] The Helping Babies Breathe initiative was initially confronted with a scarcity of resources and structure, as is also the case with other resuscitation efforts. However, the programme's success through simple but effective interventions (eg, assessing and opening the individual's airway, providing ventilation, or keeping newborns warm) induced the necessary enthusiasm of local facilitators needed to trigger the support of local and international governmental organisations.[30]

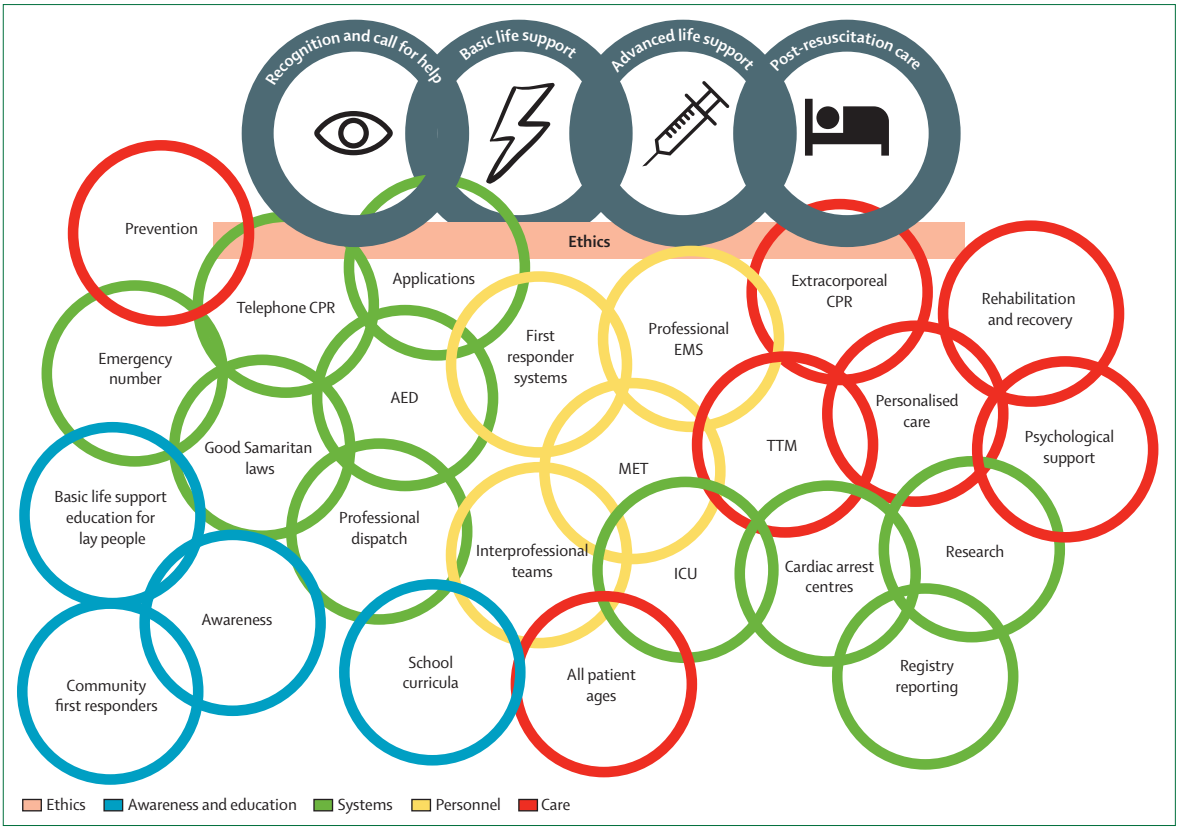

Figure: **The chainmail of survival for cardiopulmonary resuscitation as an adaptable concept for various resource settings and pathologies**
Adapted from Schnaubelt and colleagues[46] with permission from Elsevier. AED=automated external defibrillation. CPR=cardiopulmonary resuscitation. EMS=emergency medical services. ICU=intensive care unit. MET=medical emergency team. TTM=targeted temperature management.

Epidemiology

Epidemiological data on CPR in low-resource settings are scarce, especially from low-income regions (following World Bank definitions).[5,22] The scarce data show widely varying rates of return of spontaneous circulation (0–62%), low survival rates (1–17% patient survival to hospital discharge), and poor neurological outcomes (1–9% favourable neurological outcome).[5] These reported figures are generally much lower than those from high-resource systems.[38,39] The scarcity of resources expands into few possibilities for research on, or registries about cardiac arrest, which is understandable when other more pressing health-care topics need to be prioritised by local authorities.[1,5,6,40] This scarcity could result in reporting, selection, or imprecision bias as major confounding factors to available data. In Africa, for example, only a third of countries have a functioning pre-hospital emergency system, reaching only 9% of populations,[41] and the quality of the existing systems is heterogeneous.[21] Thus, study cohort sizes might be too small to accurately record the incidences and outcomes of cardiac arrest, leading to an overestimation of effect sizes from non-representative samples. Moreover, the absence of evidence-based international recommendations or scientific position statements on this specific topic could discourage (or at least not motivate) local authorities and health-care stakeholders to improve local situations regarding resuscitation efforts.[5,42–44]

Gaps in, enablers of, and barriers to the expanded chainmail of survival

Not only are there gaps in pure clinical and outcome data in low-resource settings,[5] but also in all the links of the well known chain of survival—early recognition of cardiac arrest, early CPR, early defibrillation, and early advanced care.[12] The concept of the chain of survival should be tailored to what is available (ranging from local to systemic resources), and emphasis must be shifted from topics in high-resource surroundings (eg, drones delivering defibrillators) to more basic topics such as acquiring defibrillators or basic life support education, and the ethical feasibility of CPR. The classic concept of the chain of survival suggests that if one of the links is missing, the chain breaks and cannot function as intended. We therefore used the concept of a chainmail of survival,[45] rather than a single chain, as the multiple joint links strengthen the whole mission, even when single parts are not functioning or are not (yet) in place. Some links are more important or essential than others, such as the recognition of cardiac arrest (figure).[7,46] We

	Enablers	Barriers
Awareness and education		
1	The introduction of any type of registry or surveillance of cardiac arrest and CPR that is adapted to the possibilities at hand	Poor cardiac arrest surveillance and the priority allocation of funds towards more pressing issues such as immediate care[55]
2	Improved survival after cardiac arrest due to campaigns, such as the Helping Babies Breathe programme,[56] the international effort against drowning,[31–34] the WHO assessments of trauma care[35,36] or emergency care systems,[16] the Kids Save Lives campaign,[57] or the World Restart a Heart Day[58]	Ongoing scarcity of knowledge about resuscitation in national and local communities
3	Involving well established local organisations or initiatives in awareness creation and CPR education	The absence of such organisations or initiatives
4	Engaging policy makers to lobby for the implementation of laws and directives towards CPR	Poor recognition of the problem by politicians or the presence of other, more urgent financial and structural health-care needs
5	The organisation of public protests and demands for improved access to CPR training and application when indicated	Impaired freedom of speech and public protest
6	Acknowledging (and incentivisation of) the people and organisations already involved in the care of cardiac arrest victims	Leaving the burden of inducing change on individual people without encouragement
7	Training community members who could potentially provide access to care should they come across a site of a cardiac arrest, such as taxi drivers or truck drivers[59]	Negative misinterpretations or misconceptions concerning CPR
8	First responder programmes similar to known systems in trauma care[60]	No or few first responder or bystander protection laws
9	Improving public health literacy and knowledge about communicable diseases	Concerns of the public around acquiring communicable infections during CPR
Systems		
1	Initiating the foundation of ambulance (vehicle) systems or the harmonisation of an existing but heterogeneous ambulance system, and acknowledging alternative modes of transport already in use in a setting (eg, taxis)[61]	The absence of emergency transport options
2	Advocating for prioritising ambulances in traffic systems and efforts towards an improved basic accessibility of hospitals (as a first step) and residential areas (as a second step)	Poor accessibility of hospitals (eg, road access) and the limited free movement of ambulances due to traffic or other drivers' actions
3	Collaboration and communication between pre-hospital and hospital systems for a comprehensive emergency care system[16]	A general scarcity of emergency medicine
4	The implementation of universal emergency phone numbers and professional dispatch systems	The continuous absence of such systems or various heterogeneous singular systems
5	The creation of collaborative networks between neighbouring areas or countries and the sharing of resources	Poor cooperation and secondary and tertiary referral systems, or no communication between systems
6	The availability of external support for local initiatives if requested	External aid is not desirable or appropriate due to political or local reasons
7	Contextualised guidelines being developed or co-developed or adapted by experts from low-resource settings	Imposing external (cultural) values and stressing inequities
Personnel		
1	The education of personnel not only concerning CPR skills, but also structural strategies and their implementation	A scarcity of professionally run emergency care systems, under-equipped emergency care systems, or an absence of any emergency care systems (this is also applicable to other groups of health-care workers)
2	The education of personnel in accessible, simple, but effective interventions, and in transport options (including or beyond ambulances) in a stepwise approach	A deficiency in personnel numbers (understaffed teams) and in the education of health-care providers
3	Generally applicable basic training programmes with subsequent advanced modules, generating easily applicable levels of education	Heterogeneously educated staff
4	Clear communication with generally understood terms and languages on the one hand, and local dialects on the other	Language barriers, especially in heterogeneously populated areas
Care		
1	The implementation of a higher level of care or ICU care and referral centres as appropriate (eg, in densely inhabited areas as a first step), and air support for covering large distances	A scarcity of post-cardiac arrest care
2	Providing the possibility of psychological support[18]	No system of psychologists available for patients, bystanders, first responders, or relatives
Ethics		
1	Local social, religious, and cultural beliefs about life and death (but also about the role of organ donation and autopsies)	Local social, religious, and cultural beliefs about life and death (but also about the role of organ donation and autopsies)

These enablers and barriers are directed at all individuals involved in cardiopulmonary resuscitation in low-resource settings. If enablers or barriers are not cited from previous literature, they are the result of the collaborators' own discussions. CPR=cardiopulmonary resuscitation. ICU=intensive care unit.

Table: **Enablers of and barriers[2,49–54] to the successful implementation of the chainmail of survival**

suggest that future recommendations should incorporate both the chainmail of survival as a concept that is easily conveyable to all levels of stakeholders, and the WHO Health System Building Blocks[47,48] for a structured approach to improving emergency care. All the enablers of, and barriers to, the successful implementation of a chainmail of survival will show at least some potential for further research (table). Specific knowledge gaps for

resuscitation in low-resource settings were specifically suggested by collaborators from low-resource settings (panel 1).

Implications, action points, and prospects

The true international applicability of statements and recommendations on improving resuscitation efforts can only be achieved by assessing data from all low-resource settings, to provide support in developing structures for individual health-care systems.[75] A one-size-fits-all best-care concept currently does not exist—and probably never will.[70]

Summarising the information from our preliminary literature search and the opinions of experts from various settings including low-income, middle-income, and high-income countries, we propose several action points as a first step that might be expanded into recommendations for resuscitation guidelines for low-resource settings if systematically based on the relevant evidence for each setting (panel 2). The list given is not conclusive and will be expandable according to the needs of emergency care systems. All measures should be safe and sustainable, measurable (in terms of their effects or outcome), accessible, reliable, timely, effective, and rate and cost effective (SMARTER)—as previously proposed by the AFEM.[7] All these steps require adequate financing, and the possibility of local health systems prioritising the order of different steps themselves—as these systems know best how to balance their funding allocations. A two-tier approach with a basic first tier of measures (eg, help through lay people) and subsequent next-level measures (eg, ambulances) as suggested by the AFEM[7] seems wise and could guide the structure and process of gradually increasing the resources allocated to emergency care for entire populations over time.

A global (low-resource) approach towards CPR could follow in the successful footsteps of the Helping Babies Breathe programme. Establishing implementation task forces and inviting a broad range of stakeholders, always in collaboration with target audiences, could be a first step. High-quality research can subsequently show the effectiveness of these endeavours. The Helping Babies Breathe programme states that "simplicity and clarity open the door for change; facility-based education in knowledge and skills initiates change; mentoring and empowerment of health workers solidify change; monitoring, data collection, and use of data to improve care supports continued change".[77] A possible starting point could be the WHO Basic Emergency Care Course, a low-cost educational effort that has already been implemented and does not focus on CPR, but has already achieved great results in the prevention of in-hospital cardiac arrest.[37] Most topics covered in this statement could also be applied not only to resuscitation, but also to general first aid—an application that should be further explored.

Limitations

This statement is a first step in considering some of the aspects of resuscitation efforts in low-resource settings. Although we involved experts from low-resource settings (as is reflected by the majority of authors from low-income and middle-income countries), the consensus process was not systematic, and we might not have

Panel 1: **Specific knowledge gaps for resuscitation in low-resource settings**

- The absence of general ethical considerations for resuscitation and resource deployment[24–29]
- A poor understanding of beneficence and non-maleficence in relation to resuscitation (and the cost-effectiveness of emergency care in general and resuscitative efforts in particular)[62,63]
- Potential differences in patient expectations and cultural or geographical differences between communities, regions, countries, and continents
- A poor understanding of how to ensure patient autonomy
- A poor understanding of how traditional beliefs might influence systematic scientific research
- Gaps in data reporting, including poor routine description of the local emergency care system when reporting on cardiopulmonary resuscitation (CPR),[2,64–68] reasons for the low reported incidences of cardiac arrest cases[69,70] and underlying true numbers; and a scarcity of detailed rates of return of spontaneous circulation, survival, and favourable neurological outcome derived from large registries; and the need for a comparison with rates from high-resource settings[5]
- Scarce information on cardiac arrest recognition and the situation of bystander CPR, and awareness programmes and education for lay people and health-care professionals[2,64–66,71–73]
- Scarce information on the different causes of cardiac arrest and the limits of the applicability of CPR guidelines, including trauma care, perinatal situations, drowning and intoxication, and a comparison with already-existing recommendations[2,34,35,74]
- Differences in epidemiology, treatment, and outcome between out-of-hospital and in-hospital cardiac arrests in low-resource settings[5]
- The absence of a comprehensive list of potential types of low-resource settings and where or when all these considerations might be applicable
- Scarce data on various populations and subpopulations, such as children, that might differ between low-resource and high-resource settings
- The possibility of reduced post-resuscitation care in low-resource settings
- Further (yet undetected or under-reported) barriers to or facilitators of a successful resuscitation programme[49]

Panel 2: Primary action points for resuscitation efforts in low-resource settings

The following action points are directed at all individuals involved in cardiopulmonary resuscitation in a low-resource setting.

Ethics
- Explore ethical considerations and sociocultural aspects concerning resuscitation in all resource settings (low, middle, and high) within the context of their origins
- Encourage community engagement to create specific suggestions and adaptations of general recommendations that are then more deeply rooted in their respective settings

Experts in the field
- Broadly involve experts from all resource backgrounds to formulate recommendations and guidelines on resuscitation
- Be mindful of potential paternalistic views from high-resource systems when offering support and follow an anti-colonial social theory[76]
- Involve appropriately resourced, local societies for resuscitation, emergency medicine, anaesthesiology, cardiology, critical care, nursing, paediatric care, neonatal care, pre-hospital care, simulation, etc

Research
- In resuscitation research, be aware of potential under-reporting and imprecision and reporting bias
- Address different populations and subpopulations, and explore different kinds of low-resource settings and different causes of cardiac arrest
- Evaluate the preferred outcomes of resuscitation research; return of spontaneous circulation might not be the primary measurement of choice in the absence of intensive care, but could be more achievable than longer-term outcomes such as 30-day survival
- Consider long-term outcomes
- Progressively include low-resource topics in the International Liaison Committee on Resuscitation (ILCOR) process of evidence evaluation and the creation of recommendations (eg, include options for both low-income and high-resource settings at each future recommendation where appropriate)
- Actively include collaborators from low-resource settings in ILCOR task forces, and create specific working groups addressing relevant issues (eg, through deeper cooperation with various resuscitation councils and organisations)
- When reporting data from a whole country, add the World Bank income classification (low income, middle income, high income) as a comparator

Registries
- Use the Utstein style for reporting incidences, processes, and outcomes

Education
- Consider alternative teaching approaches such as distance, virtual, hybrid, and blended-learning methods, and low-cost mannequins
- Make standardised cardiopulmonary resuscitation courses available for all citizens at low cost or for free, and try to determine optimal refresher intervals within respective communities
- Make standardised courses for immediate and advanced life support available for all health-care professionals for all patient age groups—at least at referral centres
- Offer multilingual training support where applicable
- Develop emergency care recommendations or guidelines that specifically address the resource situation
- Develop online learning material and respective social media content to accompany increasing internet availability and penetration

Pre-hospital emergency systems
- Report on the specifications of the available ambulance system when providing resuscitation data
- Introduce or improve pre-hospital systems tailored to the setting's needs and possibilities

Barriers and facilitators
- Identify barriers and facilitators in the chainmail of survival and develop and implement coping strategies

Politics and organisations
- Encourage and support all people involved in governmental and non-governmental bodies to provide resources to implement basic resuscitation measures and to evaluate their effectiveness
- Connect large, worldwide-acting organisations that are already experienced in the topic of resuscitation and emergency medicine in general (eg, WHO, the International Federation of Red Cross and Red Crescent Societies, Médecins Sans Frontières, and African Federation for Emergency Medicine)—potentially through ILCOR
- Promote local leadership by national scientific societies linked to resuscitation

Implementation
- Aim for a stepwise implementation of essential resources and grow the emergency care system from there

Evaluation
- Evaluate the impact of any actions on reductions in morbidity and mortality, including the effect of disparities in resources

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(Panel 2 continued from previous page)

Essential resources (to be implemented and used)

- Use the following (non-exhaustive) list of essential resources for resuscitation as a basis for discussions with stakeholders to implement health-care measures, and as a stepping-stone for the expansion of existing measures; this list is meant to be in addition to basic health-care needs such as clean water or electricity

Basic resources

- An educational programme to teach lay people how to recognise cardiac arrest, call for help, and do chest compressions
- A programme to strive for bystander protection laws
- Emergency transportation to medical care facilities
- Medical personnel trained in out-of-hospital and in-hospital emergency care (considering mandatory education)
- Medical personnel providing basic life support in terms of chest compressions and defibrillation, both in and out of hospital
- Medical oxygen in ambulances and hospitals
- Bag-mask ventilation in different sizes, including neonatal masks
- Emergency departments on a regional level
- Community ambassadors to promote resuscitative measures in their local context

Advanced resources

- A programme to strive for automated external defibrillation in densely inhabited or visited areas
- Advanced airway management, such as supraglottic airway devices or endotracheal intubation
- Intensive care units (at least in referral centres) with a subsequent step of catheterisation laboratories if feasible
- An adapted recommendation or guideline approach depending on the resource situation (a stepwise approach)
- A plan to approach donors, sponsors, politicians, or facilitators, presenting short-term, intermediate-term, and long-term goals

provided enough equal opportunities for interested people to participate, which is a necessary component of future efforts. We are aware of the need to involve more experts (especially from low-income and very low-income countries), in a more structured way, and from a larger variety of subspecialties. Particular views might have been missed and other views might still be perceived as being biased by the high-resource perspective of some of the authors. Nevertheless, crucial key points of discussion were identified, and with that, the basis for a future in-depth literature review was provided (which will be needed for the development of evidence-based suggestions and guidelines for low-resource settings).

Conclusion

Cardiac arrest and subsequent CPR present a globally increasing pressure on health-care systems. Most recommendations on resuscitation were developed from the perspective of high-resource settings, and were aimed to be applied in these settings. Organisations, including ILCOR, have taken a suboptimal approach towards encouraging the implementation of such recommendations in low-resource settings, and have not adequately considered local contexts and priorities. We seek to develop international guidelines that are more applicable in low-resource settings and represent equitable statements that decrease the global burden of cardiac arrest. This first consensus statement on resuscitation in low-resource settings must be calibrated and discussed to obtain consensus by experts from all settings. It should then serve as a stepping-stone for the development of guidelines that are based on an in-depth literature review and local expert consensus for a globally measured approach towards improved cardiac resuscitation.

Contributors

All authors contributed to the conceptualisation, data validation, investigation, and review and editing of this Health Policy. SS, KGM, and RGr contributed to the method, resources, and project administration. KGM and RGr were responsible for supervision. SS wrote the original draft of this Health Policy.

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Declaration of interests

KGM is chair of the European Resuscitation Council (ERC) and has received an unrestricted research grant from the Laerdal Foundation. RGr is ERC director of guidelines and chair of the International Liaison Committee on Resuscitation (ILCOR) and the ILCOR Education, Implementation, and Teams (EIT) Task Force. SS is vice-chair of the Austrian Resuscitation Council, a member of the ERC Adult Advanced Life Support SEC, and an ILCOR EIT task force member, and has received an unrestricted research grant from the Laerdal Foundation. All other authors declare no competing interests.

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