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COMMENTARY

The initiative for medical equity and global health (IMEGH) resuscitation training program: A model for resuscitation training courses in Africa

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ABSTRACT

In high-income countries, outcomes following in hospital cardiac arrest have improved over the last two decades due to the introduction of rapid response teams, cardiac arrest teams, and advanced resuscitation training. However, in low-income countries, such as Rwanda, outcomes are still poor. This is due to multiple factors including lack of adequate resuscitation training, few trainers, and lack of equipment.

To address this issue, the Initiative for Medical Equity and Global Health Equity (IMEGH), a training organization founded in 2018 by 5 local anesthesiologists has regularly taught resuscitation courses such as Basic Life Support, Advanced Cardiac Life Support, and Pediatric Advanced Life Support in hospitals throughout Rwanda. The aims of the organization include developing a sustainable model to offer context relevant resuscitation training courses, building a cadre of local instructors to teach on the courses, as well as engaging funding partners to help support the effort. From October 2018 until September 2022, 31 courses were run in 11 hospitals across Rwanda training 1,060 healthcare providers (mainly of non-physician anesthetists, nurses, midwives, and general practitioners). Ongoing challenges include lack of local protocols, inability to tracking resuscitation outcomes, and continued inaccessibility by many healthcare providers. Despite these challenges, the IMEGH program is an example of a successful context-relevant model and has potential to inform the design of resuscitation programs in other similar settings. This article describes the development of the IMEGH program, accomplishments as well as lessons learned, challenges, and next steps for expansion.

African relevance

- This article describes the development of the IMEGH training program with a focus on resuscitation capacity building in Rwanda, its accomplishments and challenges faced, and the next steps for expansion.
- The IMEGH training program is an example of a successful context-relevant model and has potential to inform the design of resuscitation programs in other similar settings in Africa and beyond.
- This article has potential to encourage African scholars to publish their work in this area and provide opportunities for collaboration among different countries and training programs.

Introduction

In high-income countries (HICs), the introduction of rapid response teams, cardiac arrest teams, and advanced resuscitation training has improved outcomes for in-hospital cardiac arrest (IHCA) over the last two decades [1–4]. In contrast, outcomes following IHCA in hospitals in low-income countries (LICs) remain poor [5,6]. The cause of lower

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survival after IHCA in LICs is likely multifactorial, including both lack of resuscitation training and lack of equipment. Resuscitation training courses developed by the American Heart Association (AHA) such as Basic Life Support (BLS), Advanced Cardiac Life Support (ACLS), and Pediatric Advanced Life Support (PALS), are often required of clinicians working in well-resourced healthcare systems [1,5]. This is often not the case in low-resourced settings [1,6]. In addition, these courses developed in high-resourced settings are not always relevant in the low-resource settings (LRS) [7]. Some existing courses designed for LRS such the World Health Organization (WHO) and International Committee of the Red Cross's Basic Emergency Care Course (BEC) do not focus on in-hospital resuscitation [8].

In 2018, the Initiative for Medical Equity and Global Health (IMEGH) was established by a team of Rwandan anesthesiologists (ET, AI, CS, JKN, JPM) with a goal to improve access to basic and advanced resuscitation courses that were locally relevant for healthcare providers across Rwanda. This article describes the development and implementation of the IMEGH program, over a 4-year period, in its effort to provide context-relevant resuscitation training for healthcare providers across Rwanda. In addition, we summarize the program's impact thus far, challenges faced with implementation, and potential opportunities for improvement.

Background: challenges of conducting resuscitation training in Rwanda

The Rwandan Ministry of Health (MOH) recommends BLS and ACLS courses for healthcare providers in Rwanda [9]. Yet opportunities for these types of training are few. Qualified trainers, training centers with appropriate simulation equipment, and funding are insufficient to meet the need [7]. To our knowledge, in 2018 there were no accredited (AHA or other certifying body) resuscitation training centers in Rwanda. The few courses that were offered were organized and funded by visiting instructors with AHA certification intermittently. For example, in 2012 AHA BLS and ACLS courses were offered in Rwanda in partnership with international teams through the Rwandan Human Resources Program (RHRH) program [10]. Unfortunately, these courses were few and access to these courses was limited. They were not available to the majority of healthcare providers and especially those working in the rural settings. Since then, occasional non-AHA resuscitation courses have been offered but often without oversight to ensure the quality of training. Hospitals are responsible for providing funding to support these courses with additional support from non-government organizations such as Partners in Health and Intrahealth. However, there is often a limited budget due to conflicting priorities.

While accredited courses developed in HICs are often considered the "Gold Standard" for resuscitation training, they are not optimized in LICs such as Rwanda, a resource-constrained setting where it is common for patients' to present late in the disease course, few acute care specialists exist (e.g. emergency physicians, intensivists, anesthesiologists, critical care and emergency nurses, etc.), resuscitation medications, equipment and local protocols are inconsistent or lacking. [7,11-13] Furthermore, unlike many high-income health care systems, there is no national resuscitation registry to track outcomes following IHCA, which would allow the evaluation of the impact of resuscitation interventions [14].

Development, implementation, effectiveness, and impact of a Rwanda-specific resuscitation training program

Program development

IMEGH was founded as a local training organization committed to improving the quality of resuscitation and perioperative care in hospitals across Rwanda through Public Private Partnership, Continuous Medical Education (CME), and patient safety initiatives [15]. The IMEGH team is multidisciplinary and is composed of local anesthesiologists, medical officers, nurses, midwives, and public health experts. IMEGH has made some efforts to engage other specialties involved in resuscitation by inviting emergency and critical care physicians, critical care nurses, and non-physician anesthetists to teach on our courses. However, these efforts have been limited mainly by lack of sufficient funding and shortage of staff in these specialties.

The IMEGH team obtained permission to adopt the training curriculum of the National Health Care Providers Solutions (NHCPS), which is based on the recent American Heart Association (AHA) ACLS guidelines and adapt it to the LRS [15,16]. NHCPS is a US based teaching organization that develops resources to support resuscitation training such as books, videos, and e-learning to support affordable resuscitation course that can be delivered globally [16]. Modifications were based on consensus of local experts with experience in teaching resuscitation and providing resuscitation care in Rwanda. A team of three anesthesiologists (ET, AI, CS) made the initial modifications of ACLS based on the feedback from 10 local instructors based on their experience conducting resuscitation training in Rwanda. The modified ACLS course was evaluated using a mixed method study [19]. There was no modification needed for other courses; SAFE OB and VAST were already designed for LRS; BLS and PALS contents already met the needs of our participants.

The NHCPS curriculum was chosen as a foundation for our curriculum because of its low cost and flexibility in allowing customization to the local context, while still following the recent ACLS guidelines.

The following adaptations were made:

1. *Scenario modification* - Scenarios were revised to include medical conditions commonly seen in LRS such as infections, trauma, and complications from pregnancy. Instruction in EKG interpretation was expanded due to minimal local training and exposure with EKG interpretation .
2. *Alternative medications and advocacy* - Inconsistent supply of medications and equipment is a common issue in hospitals in Rwanda [17, 18]. To address this issue, alternative medications were proposed during resuscitation when possible. (e.g., lidocaine and amiodarone for management of tachyarrhythmias). Advocacy efforts were promoted at the hospital level during the courses to try to ensure appropriate resuscitation medication were on their essential medication list and equipment availability such as defibrillators were available in their emergency departments and operating rooms.
3. *Importance of non-technical skills (NTS) training as a component of resuscitation training* - Several studies have shown improved teamwork, communication, leadership, task management, and conflict management as a result of NTS training during ACLS in high-resource settings (HRS) [19–22]. In 2022, the IMEGH added the Vital Anaesthesia Simulation Training (VAST) course to its offerings. The VAST course content adds team dynamics and communication to conventional ACLS training, using scenarios commonly seen in LRSs and allowing more time for NTS training [22]. We have shown that a combination of ACLS and VAST can improve ACLS skills amongst healthcare workers in LRSs by increasing team coordination, empowerment to act, and advocacy for system improvement [19].

Program implementation

IMEGH used the following strategies to ensure successful implementation of the program:

1. *Increase the number of qualified trainers* - The IMEGH team conducted BLS and ACLS courses while mentoring local healthcare providers from each of the 11 hospitals to become instructors. In addition, the IMEGH engaged members of the Rwanda Society of Anesthesiologists (RSA) to increase the pool of instructors and to ensure coverage of more hospitals. RSA has potential to support our advocacy efforts and influence the implementation of resuscitation policies and standards in Rwanda. Currently, the IMEGH has more than 15 instructors located in 10 hospitals across the country. New trainers are recruited after successfully completing the provider training based

on their motivation and commitment. New trainers are given opportunities to teach at least 2 courses under mentorship by an experienced instructor before joining the team as an instructor.

2. *Increased availability of simulation equipment* - Additional simulation equipment for training, especially mannequins, was actively sought. In 2020 low-fidelity CPR mannequins were obtained from Healthy People Rwanda (HPR), and a high-fidelity mannequin donated by the Laerdal foundation in 2021. Additional needed equipment was purchased directly. In 2023, organizers of the VAST course loaned IMEGH simulation equipment including mannequins and airway equipment for additional training as part of a collaboration between the two organizations.
3. *Identification of funding partners* - The IMEGH employed a public-private partnership model to fund courses with a strong emphasis on local ownership. Funding came mainly from local hospital resuscitation budgets or in-kind donations and small grants from non-government organization (NGO) such as the World Federation of Societies of Anaesthesiologists (WFSA); VAST Ltd; and HPR. In order to minimize costs, the IMEGH ran most courses at the hospital and not at a hotel or conference center.
4. *Use of hybrid teaching method* - The IMEGH used Tutor learning management system (LMS), which allowed for a flipped classroom model. For example, with the BLS course, pre-work was assigned on the LMS one week before the course. Participants were then required to complete the assignment and pass a test prior to being able to participate in the one day in-person practical session.

This hybrid model was accessible at low cost as it was partially funded through a collaboration with NHCPS and Disque foundations [16]. The online pre-work allows us to ensure that participants are properly prepared for the in-person sessions. It also decreases the length of the course. Since moving to this model, the length of the BLS course has decreased from 2 days to 1 day.

5. *Increased accessibility* - There is no fee for participants to attend the course. Local hospitals are responsible for meals, conference room, audiovisual equipment. Trainers receive a small per diem for transportation and accommodation that is funded either by local hospitals or grants from our partners.

Program effectiveness

An evaluation of a modified 2-days ACLS combined with 3-days VAST course has shown to improve time to CPR, time to epinephrine administration, time to defibrillation, and overall quality of resuscitation in simulated resuscitation scenarios [19]. The improvement in resuscitation skills was maintained at 3 months after training. In addition, participants reported confidence in applying resuscitation skills in the workplace and advocating for systems improvement [16].

It is important to note that this study evaluated two of our courses (ACLS and VAST) which were conducted in 4 hospitals for 5 consecutive days followed by 1 day refresher after 3 months. Other courses received positive feedback from participants (good learning experience especially with simulation, high confidence in resuscitation skills, intention to use the skills learned at their workplace, etc.). A formal assessment of the full IMEGH program remains to be conducted. Participants were not required to complete all 5 courses offered by IMEGH. Each course was conducted separately based on identified gap, the need for the hospital and the accreditation requirement.

Program impact

As of October 31st, 2023, we have run 31 courses in total, reaching 1060 healthcare providers (Anesthesiologists, non-physician anesthesia providers, general practitioners, nurses, midwives, obstetricians, and surgeons) from 11 district hospitals across Rwanda (Table 1 and Fig. 1) [15]. The details about topics covered is also shared in table 2.

Table 1
List of completed resuscitation courses in district hospitals in Rwanda between 2018 and 2022.

Name of Institution	Year	# of participants	Course
Masaka District Hospital	2018	26	BLS
	2018	20	PALS
	2022	48	ACLS
	2022	48	VAST
Rwinkwavu District Hospital	2018	30	BLS
	2019	30	BLS
Kiziguro District Hospital	2018	40	BLS
	2019	31	SAFE OBs
	2020	30	BLS
	2021	30	BLS
	2022	60	BLS
	2022	48	ACLS
	2022	48	VAST
Kirehe District Hospital	2018	40	BLS
	2019	25	BLS
	2020	25	BLS
	2021	25	BLS
	2021	25	BLS
Byumba District Hospital	2018	50	BLS
Gitwe District Hospital	2018	28	BLS
Kibungo Hospital	2019	18	SAFE OBs
	2019	18	ACLS
Nyanza District Hospital	2019	12	SAFE OBs
Ngarama District Hospital	2021	30	BLS
	2022	30	BLS
Kibagabaga District Hospital	2018	24	SAFE OBs
	2022	25	BLS
	2022	48	ACLS
	2022	48	VAST
Gatunda District Hospital	2022	50	BLS
	2022	50	BLS
Total		1060	19 BLS 5 ACLS 3 VAST 4 SAFE obstetrics 1 PALS

Fig. 1. Pre-brief session about simulation-based resuscitation training at Kibagabaga District Hospital, June 2022.

Continuing challenges and next steps

Lack of local protocols - Lack of local resuscitation protocols is an ongoing problem. Without establish standard practices, sub-standard and potentially unsafe practices and poor quality can result. IMEGH members are actively advocating to the Rwandan MOH and RSA about the need to develop local resuscitation protocols. In parallel, IMEGH is also trying to address the lack of local protocols by ensuring that copies of current AHA guidelines are shared with hospital administration where courses are taught. The faculty advocates that theses guideline be posted throughout the hospital.

Tracking resuscitation outcomes – Regular reporting of outcomes following cardiac arrest and using a resuscitation registry have multiple benefits including understanding factors associated with poor outcomes,

Table 2
Summary of Topics covered in each course.

BLS (1 day)	ACLS (2 days)	PALS (2 days)	SAFE Obstetrics (3 days)	VAST (3 days)
• Anatomy and Physiology • Adult BLS • Pediatric BLS • Defibrillation • Foreign Body Airway Obstruction • Practical Sessions	• Systems of Care and Team dynamics • Tachyarrhythmias • Bradyarrhythmias • Cardiac arrest/PEA • Acute Coronary Syndrome • Stroke • Airway Management • Post cardiac arrest care • EKG review • Megacode	• Pediatric Assessment • Pediatric Airway • Shock • Neonatal Emergencies • Pain management • Sedation • Toxicology • Shock • Toxicology • Respiratory failure • CNS emergencies • Surgical Emergencies • Trauma and Burns • Medical Emergencies	• Airway • Rapid Sequence Induction • Extubation • Difficult Intubation • Cricothyroidotomy • Assessment and preparation • WHO surgical safety checklist • Recovery and post op pain • Spinal anaesthesia • Regional anesthesia • Critical care • Pre-eclampsia and eclampsia • Haemorrhage • Obstetric emergencies	• Non-technical skills • Crisis-resource management • Pain management • Unanticipated difficult intubation • Rapid sequence induction • Neonatal resuscitation • Obstetric assessment • C-section • Intra-partum haemorrhage • Paediatric case • Post-extubation • Laryngospasm • Trauma primary survey • Paediatric burns

comparing performance among hospitals, and implementing quality improvement programs. [23–26] Currently, there is no national resuscitation registry in Rwanda. IMEGH is currently advocating to pilot the implementation of a resuscitation registry in 4 hospitals.

Accessibility and sustainability - There is a need for a national strategy for resuscitation care in Rwanda under the leadership of the MOH. The MOH is in a unique position to be able to support hospitals with sustainable funding, local training capacity, quality assurance, and limitation of duplication of efforts from different stakeholders (i.e. professional bodies, NGOs, universities, etc.).

Despite improvements in availability of resuscitation courses through this program, courses are not routinely offered in all hospitals across Rwanda. The IMEGH suggests the use of the Training of Trainers (TOT) model to train a sufficient number of IMEGH instructors for national coverage and to organize regular courses at hospital level in collaboration with hospital administration. For example, La Croix du Sud hospital, located in Kigali, Rwanda, has signed a memorandum of understanding (MOU) with the IMEGH to conduct 12 training sessions each year for its staff members.

Conclusion

Despite the challenges of conducting context-relevant resuscitation courses in Rwanda, including lack of qualified trainers, training centers, simulation equipment, funding, the IMEGH resuscitation program is an example of a locally developed model to overcome these barriers. We ask that other clinicians from LRSs providing resuscitation training to share their experience by publishing their work. This may allow more understanding of the current resuscitation training practices and create potential research collaboration among different hospitals especially Sub-Saharan Africa where little literature exists on this topic. The IMEGH resuscitation program has potential to inform the design of the resuscitation training program for rural and non-teaching hospitals in Rwanda or other similar settings.

Dissemination of results

This program has been presented during the Rwanda Society of Anesthesiologists (RSA) meeting and a summary report has been shared with the Ministry of Health (MOH).

Author contributions

Authors contributed as follows to the conception or design of the work; the acquisition, analysis, or interpretation of the data for the work; and the drafting or revising it critically for important intellectual content. ET contributed 45 %, AI 15 %, CS and FME 10 % each, and BF, JPM, JK, and NR 5 % each. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The co-authors (ET, AI, JPM, JK, CS) are co-founders and instructors within the Initiative for Medical Equity and Global Health (IMEGH) delivering different resuscitation courses across Rwanda.

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