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ORIGINAL ARTICLE

Leveraging tele-mentoring and remote learning to strengthen the emergency care capacity of health workers in Uganda

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ABSTRACT

Background: A robust emergency care system is a cost-effective method of reducing preventable death and disability, especially in low-and middle-income countries. To scale emergency care expertise across the country, the Uganda Ministry of Health and Seed Global Health established the Emergency Medical Services (EMS) ECHO program. We describe the process of establishing the program in a resource-limited setting, best practices, and lessons learned in Uganda.

Methods: Investigators conducted a mixed-methods evaluation to assess the initial 4 months' implementation of the EMS ECHO. We conducted pre/post-program assessments of healthcare worker knowledge, self-efficacy, and professional's satisfaction with the program. The analysis compared the differences between pre/post-test scores descriptively.

Results: The EMS ECHO was initiated in November 2021. A phased curriculum was developed with the initial phase focusing on the ABCDE (Airway, Breathing, Circulation, Disability, and Exposure) approach to the emergency patient. This phase reached 2,030 health workers cumulatively across 200 health facilities. The majority of the participants were medical doctors (n = 751, 37%), and nurses (n = 568, 28%). Majority of participants (95%) rated the sessions as informative. On whether the ECHO sessions diminished professional isolation, 66% agreed or strongly agreed.

Conclusions: Similar to other ECHO program evaluation results, Uganda's EMS ECHO program improved knowledge, skills, and the development of a virtual community of practice thereby diminishing professional isolation. It also demonstrates that through a planned stepwise process, virtual learning and telementorship can be used efficiently to improve healthcare worker knowledge,skills and multiply the limited number of emergency care experts available in the country.

Background

Emergency medical care saves lives through timely evaluation, management, and prevention of acute illnesses and injuries [1]. The Global burden of disease study estimated that 8% of all deaths in 2019 were due to injury and Africa experienced an increase in injury-related mortality from 7.6% to 9.9% between 2000 and 2019. This despite a decline in the crude death rates from 52.9 per 100,000 to 4.1 per 100,000 [2]. In Uganda, acute illnesses and injuries especially from road traffic accidents—which contribute 48% of trauma—constitute most emergency cases significantly causing mortality yet most of them are preventable [3,4]. Investing in a well-planned emergency care system is a proven cost-effective method of reducing preventable death and disability, especially in low and middle-income countries (LMICs) [5]. Indeed, strengthening prehospital care by training community-based providers and using staffed community ambulances cost approximately less than US$ 170 per life saved, and reduced mortality by 25-50% in some LMICs [6].

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The seventy-second World Health Assembly held in 2019, called on member states to improve and strengthen their emergency care systems through activities such as policy development, emergency care system assessment to identify gaps and priorities for action, creating protocols to guide care and building a trained emergency care workforce [7]. In Uganda, the COVID-19 pandemic highlighted gaps in the system and underscored the need to have a more resilient emergency care system than ever before. As a result, in November 2021, the Ministry of Health Uganda launched the first national emergency medical services policy highlighting 12 pillars of focus among which focuses on building human resource capacity for the provision of evidence-based, safe, and patient-centred pre-hospital and hospital emergency medical care is a priority [4,8].

Irrespective of these establishments, the capacity to offer emergency services in Uganda is still inadequate with only 5% and 25% of the health facilities classified as having very good and good capacity respectively [9]. To date, Uganda has only about 13 emergency physicians and approximately 80 nurses with graduate training in emergency care to cover over 2000 health facilities that serve 45 million residents. These are mostly concentrated in urban areas therefore in rural areas, patients with acute illnesses and injuries fall on health workers who are not well-trained to recognize emergencies and intervene in a timely fashion. A few institutions offer emergency care training programs at all levels with only two Masters of Medicine in emergency medicine programs for doctors, one critical care and emergency masters program for nurses, one diploma program in emergency care and one certificate program for prehospital providers. Thus, it will take decades to bridge the urgently needed human resource gap to ensure universal coverage of emergency medical care in the country. Therefore, there is a need to optimize existing personnel, materials, and health-system infrastructure for training health workers in emergency care provision across various parts of the country with different levels of resource availability.

Various methods have been employed across the world to rapidly improve knowledge and skills in specialized areas of care among which is the Project ECHO (Extension for Community Healthcare Outcomes) model. Established in 2003 at the University of New Mexico (UNM) in the USA, as a method to improve hepatitis C healthcare service delivery and patient outcomes, Project ECHO is a licensed and trademarked innovative tele-mentoring program designed to virtually bring together healthcare providers and subject matter experts using videoconference technology, brief lecture presentations, and case-based learning, fostering an “all learn, all teach” approach [10]. Through this, the limited subject matter experts replicate themselves without physically contacting the participants. At the UNM in 2011, project ECHO supported primary healthcare providers to achieve improved health outcomes among hepatitis C patients [11]. It has also surmounted geographical barriers to access to high-quality care by connecting specialists located in urban centres to rural-based healthcare providers for capacity building through knowledge sharing and clinical skills building [11]. In Namibia, Project ECHO was employed as a tool for in-service training to build competencies and reinforce skills in the management of HIV isolation through case-based learning and clinical mentorship. It led to the development of virtual communities of practice, improved healthcare worker knowledge, and satisfaction, and decreased professional isolation [12].

Riding on such experiences, in a bid to build emergency care human resource capacity in Uganda, the ECHO model was adopted for emergency medical services. The Uganda Emergency Medical Services (EMS) ECHO program was launched in November 2021 by the Government of Uganda, the Ministry of Health, and Seed Global Health. It offers a unique opportunity to foster emergency care learning teams and communities of practice across the country to connect and scale expertise. By using the hub-and-spokes approach, the EMS ECHO provides tele-mentoring for health workers, thus meeting the urgent need for capacity building in emergency medical services to reduce preventable deaths due to emergencies. This article describes the process of establishing an emergency medical services ECHO in a resource-limited setting, including best practices and lessons learned over four months in Uganda.

Methods

Project ECHO operates on the ABCD principles which include the Amplification of Knowledge by using technology to leverage scarce resources, Share Best Practices to Reduce disparity, Using Case Based Learning to Master Complexity, and Use Web-based Data to monitor outcomes. Local healthcare workers at distant spoke sites are connected with experts at a central hub through periodic didactic sessions via video conferencing. During sessions, participants and specialists discuss real cases which allows two-way learning. A single specialist contributes to the development of numerous local experts who apply gained knowledge and skills to improve the health of people in their communities. With a continuous loop of learning, mentoring, and peer support, this model ensures a long-lasting impact far beyond that of traditional telemedicine care, webinars, or e-learning courses. ECHO differs from telemedicine in that the treating physician retains responsibility for managing patients.

Uganda had 26 ECHO hubs with the EMS ECHO becoming the 27th and first-ever EMS ECHO on the continent. The EMS ECHO in Uganda has utilized the zoom technology where frontline health workers connect with subject matter experts to share knowledge, discuss complex cases, and master key skills in the management of patients. There is a central hub of emergency medicine experts from academic institutions, professional associations, emergency care partners, and the ministry of health at the Seed Global Offices located in Naguru Kampala that meets virtually with health care providers from all parts of the country during bi-weekly zoom meetings. The knowledge and skills simulated during the sessions were aimed at creating a multiple health workforce with experience in handling emergencies to better serve Ugandans across the country (Fig. 1). A 7-step implementation strategy with targeted objectives outlined below has been used to successfully establish the EMS ECHO in Uganda (Fig. 2).

The recruitment of participants was both online and physical. A central WhatsApp group of mobilizers was created that could share posters and links of registration to their various contacts. The emails of registered participants for each session would also be captured and emails sent to them directly for subsequent sessions. Seed Global Health in partnership with Baylor Uganda also held emergency care training workshops for lower level health facilities in rural areas of the four—East, West, North, and Central—regions of the country, and health workers who participated were informed of the EMS ECHO program . At these workshops, ambassadors from each attending facility were identified to aid the mobilization of other members back at their facilities, and emails of all participants were captured. Emails of each session would be sent directly to the registered participants from the workshops.

The first session was held on November 19, 2021, introducing participants to the nature of the program and its rationale. Five other sessions were conducted in the ensuing four months about the WHO Basic Emergency Care focusing on the ABCDE approach to the emergency patient as a foundation for emergency care. Participants would receive session registration links embedded with a short pre-session questionnaire capturing their qualifications, place of work, current role, practicing license numbers for continuous professional development points, knowledge of the session’s subject matter, and their expectations and suggestion of what they wanted the specialists/experts to talk about. This link was circulated a week before the sessions. During the sessions, participants took part in a pre-and post-session evaluation using polls to determine the change in their knowledge of the covered topic but also whether they found the session relevant, and informative and what could be improved from the next session.

Primary outcomes were to describe the process of establishing an emergency medical services ECHO in a resource-limited setting in Uganda. Secondary outcomes included: 1) Knowledge change of par-

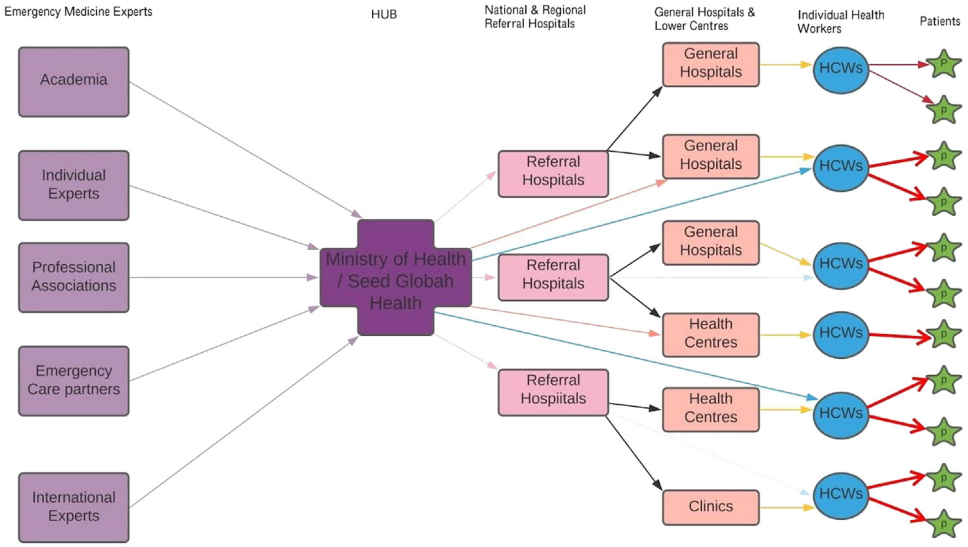


Fig. 1. EMS ECHO Force Multiplier Illustration.

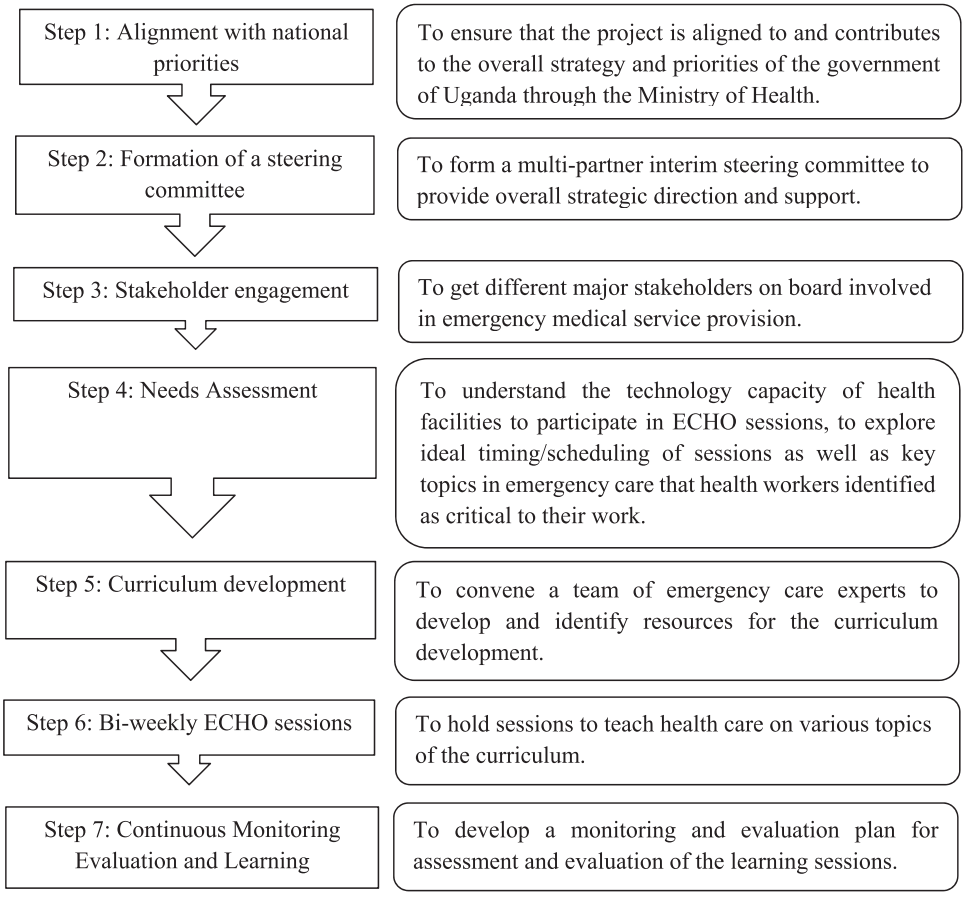


Fig. 2. 7-step implementation strategy used to successfully establish the EMS ECHO in Uganda.

ticipants on emergency medicine pre- and post the EMS-ECHO program in Uganda, and 2) Satisfaction of participants with the EMS-ECHO program in Uganda.

A mixed methods assessment was used to assess the impact of the national EMS ECHO program for the first 4 months of implementation. These included pre/post session assessments of healthcare worker knowledge, self-efficacy, and professional satisfaction; assessment of continuing professional development (CPD) credit acquisition; Analysis compared the differences between pre/post scores descriptively.

Information that was collected was kept anonymous and confidential. Identities were concealed and no individual data was presented in any of the findings shared. The course instructors (and the present study team) were the only ones with the authority to access the collected data and password access was required. Informed consent was sought and Ethical approval for this study was got from Busitema University Research and Ethics Committee approval number BUFHS-2022-26.

Table 1
Achievements of the EMS-ECHO implementation process.

Step	Achievements
Alignment with national priorities	• Overall project's technical design was created through multiple engagements with the Ministry of Health. • Approval to establish the EMS ECHO was granted by the Ministry's top leadership in September 2021.
Formation of a steering committee	• The committee was formed with members from the Ministry of Health, Seed Global Health, and technical advisers like emergency physicians, nurses, and prehospital professionals. • Selected members from the steering committee underwent immersion training facilitated by ECHO India to understand the setup of ECHO sessions and learn from various successful partners.
Stakeholder engagement	• Various engagements were done with heads of emergency centres, hospital directors, and heads of emergency care and the ECHO Methodology. • 40 heads of department, 14 regional emergency coordinators, and 190 emergency focal persons were sensitized via zoom.
Needs Assessment	• A needs assessment across 117 high-volume facilities was done. This assessment directly informed the curriculum and biweekly timing of sessions. • The majority (47%) of participants used cell phones to attend webinars. 83% of the facilities were connected to zoom and 89% mentioned that it would be helpful to access professional development through ECHO
Curriculum development	• The steering committee assembled a group of experts in emergency care to establish an initial 4-month curriculum that would be used based on findings from the needs assessment. • Thereafter, the curriculum will continue to be produced in a phased approach, based on progress, inputs from experts, participants, and the needs assessment findings. • The Initial was hinged on the WHO BEC course.
Bi-weekly ECHO sessions	• Hosting fortnight ECHO sessions: On November 19, the inaugural EMS ECHO session was held that focused on leadership and governance in Emergency Care. • To ensure engaging sessions and foster learning, the steering committee incorporated demonstrations/skills learning components to aid translation from theory to practice.
Continuous Monitoring Evaluation and Learning	• A monitoring, evaluation, and learning plan was developed that highlighted key indicators of assessing the EMS ECHO sessions. • Key means of evaluation include pre and post-test evaluations for each session, key informant interviews, and focus group discussions. • Additionally, quarterly monitoring and evaluation visits were conducted to ascertain and observe health workers' application of knowledge and skills gained.

Results

Through each different step in the implementation process, various achievements were attained as summarized in table 1 below.

A cumulative total of 2030 health workers attended the ABCDE approach to the emergency patient. The average attendance was 290 health workers with the highest number of 377 participants in a single session. Generally, attendance increased with each subsequent session (Fig. 3).

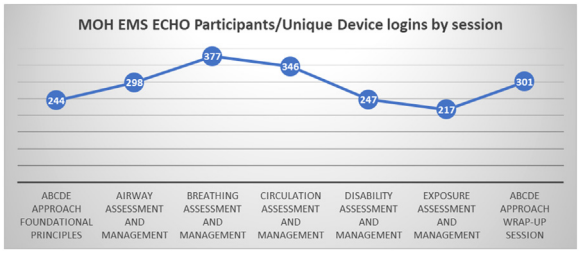


Fig. 3. Line graph showing trajectory of attendance per session.

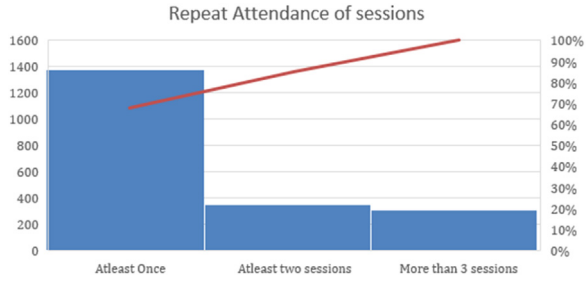


Fig. 4. Repeat attendance of participants for the different ECHO sessions.

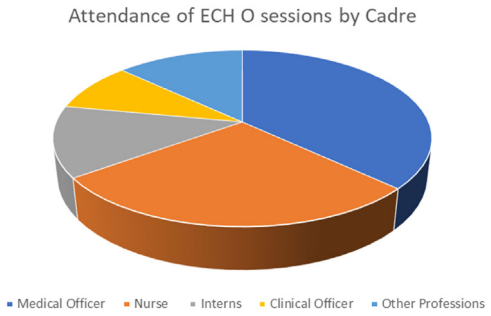


Fig. 5. Attendance of ECHO sessions by cadre of Health Profession.

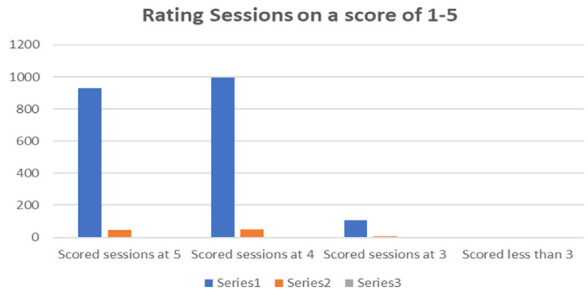


Fig. 6. Rating of sessions by the participants.

1380 Health workers (68%) attended at least one ECHO session, 345 (17%) attended 2 sessions and 264 (14%) attended more than 3 sessions as shown in Fig. 4 below.

Most of the attendees (751) were medical doctors (n = 751, 37%), followed by nurses (n = 568, 28%), then medical interns (n = 264, 13%), clinical Officers/physician assistants/medical assistants (n = 183, 9%) and 264 other professions such as anaesthesiologists, prehospital professionals, pharmacists and academia (n = 264, 13%) (Fig. 5).

Among the 2030 health workers who attended, 95.2% (1932) found the sessions informative, while 3.6% (73) of them were not sure and 1.2% [25] did not find the sessions informative. When participants were asked to rate the session on a scale of 1-5 with 5 being the highest and 1 being the lowest, 45% (930) rated the session at 5, 49% rated sessions at 4 and 5.2% (105) rated sessions at 3 while none rated sessions at less than 3. (Fig. 6). The participants stated that the sessions diminished their professional isolation with 44% agreeing and 22% strongly agreeing that this was the case. 11% neither agreed nor disagreed, 11% disagreed and 12% strongly disagreed.

The majority of the participants (n = 1665, 82%) reported the sessions to be relevant to their work while 18% (365) were not sure. 0.2% [4] said the sessions were not relevant. Health workers scored an average of 46.8% in the pretest assessment and an average of 78% in post-test assessments posting an increase of 31.2%.

Mbale Regional Referral Hospital and Jinja Regional Referral Hospital in Eastern Uganda had a participation of more than 12 members per facility while Arua Regional Referral Hospital in the West Nile Region of Uganda and Mbarara Regional Referral Hospital in Western Uganda also had good participation as illustrated in the map in Fig. 7. This participation points to the strong mobilization skills of the Regional Emergency Coordinators or Focal persons for the Ministry of Health.

Discussion

Unmet needs for quality emergency healthcare mostly in the remote areas of low- and middle-income countries especially in Sub-Saharan Africa partly hinges on the distribution discrepancy of trained experts and unmatched numbers to the growing population demand. People in rural areas feel the deepest pinch of health inequity as they stay far from hospitals with specialized services and present the most need [13]. This gap should be bridged to achieve the third sustainable development goal of universal health coverage and telemedicine/telehealth provide an opportunity to overcome this bottleneck. Telemedicine has significantly evolved over the past two decades with increased utilization to enable wide access to care. It has demonstrated improvement in health outcomes and addressed mostly geographical barriers to healthcare access [14]. In that space, the ECHO model provides a unique pedagogical approach that empowers accessible primary health workers through the extrapolation of knowledge at an interactive platform so that people in rural areas with limited access to specialists can receive almost similar specialized care [15].

The ECHO model has been widely adopted in 49 countries as of 2020 across 6 continents, with 528 hubs and 955 different programs covering disease conditions, such as rheumatology, dermatology, musculoskeletal disease, asthma, chronic pain, diabetes, epilepsy, hypertension, liver disease, mental health, HIV, geriatric, COVID19 among others [16]. In Uganda, Seed Global Health and the Ministry of Health applied this approach to the emergency medical services, the first on the African continent and we evaluated its impact for a pilot period of 6 months and also provide an account of its establishment as a benchmark for other countries. We approached EMS-ECHO establishment through a stepwise approach and pivoted on the engagement of relevant stakeholders both in the public and private sectors to pool both financial and human resources towards building emergency care capacity. The program has also been aligned with national priorities to leverage the government's potential for scale-up, adaptation, and continuity of the program as a national strategy in the future. This approach has maximized efforts in numerous technology-related health implementations elsewhere in the world in a timely and cost-effective manner [17,18].

The EMS-ECHO program reached a total of 2030 participants in the space of four months which depicts a high interest among health workers to improve their knowledge and skills in emergency care provision in Uganda. Other studies have also reported such high motivation towards ECHO-based learning among health workers [12,19] therefore it's a highly acceptable program that could be widely adopted and used. Various categories of participants including different cadres of health workers mostly doctors (37%), and nurses (28%) attended the sessions. Other emergency care professionals like prehospital teams and pharmacists among others had only about 13% representation. Most of the participants were also distributed in the Central, East, and Western region which calls for increased far-reaching mobilization and motivation strategies for the underrepresented groups. Our program included other categories of participants like administrators, policymakers, and students who attended the sessions. Although the main focus was on building the capacity of qualified primary healthcare workers in the rural areas of Uganda, the wider involvement provides a chance for engagement in discussions on improving emergency care at all levels and tackling other challenges to health care provision especially those related to resource allocation in facilities. This is a unique approach that hasn't been used by other ECHO programs that mainly targeted only qualified health workers [16,20,21].

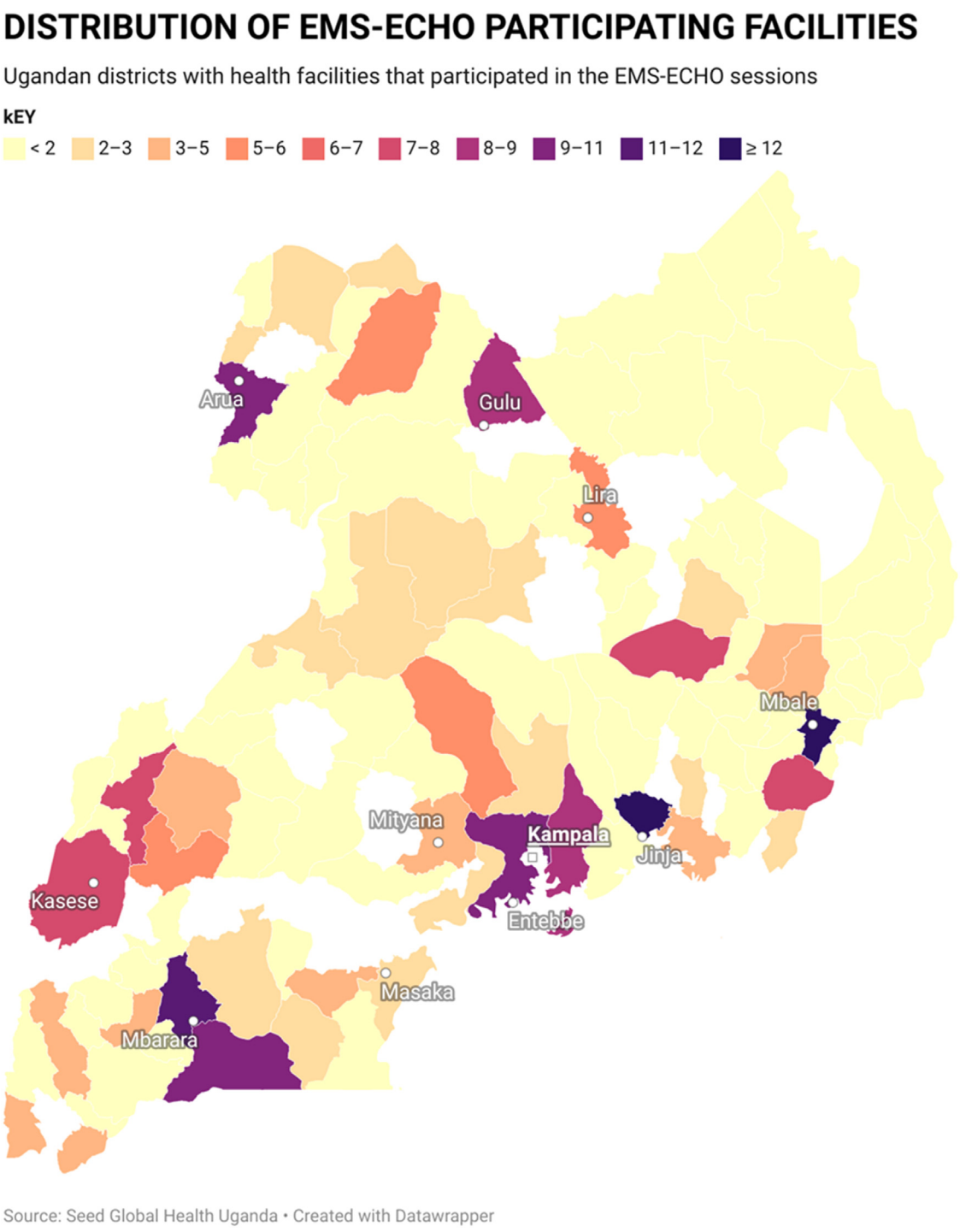


Fig. 7. Distribution of EMS-ECHO participating facilities.

The majority of our participants (95.2%) found the sessions informative and rated them maximally on a scale of 5 in alignment with other ECHO programs [22]. Similarly, most participants (82%) reported the sessions to be relevant and 66% agreed or strongly agreed that their professional isolation had been dimished by participating in these sessions. This is cross-cutting to other studies where participants found the case-based interactive teaching relevant to learning and their daily experiences with patients in health facilities [16,23]. It also provides an opportunity for networking rather than just accessing expert opinions like other traditional learning methods [24]. There was an overall increment of 31.2% in the knowledge of health workers on pre-and post-assessment which is consistent with other ECHO projects implemented in areas of HIV [25], chronic pain [26], substance use disorder [27], and children with behavioural health disorders [28]. Although at the moment we hadn't evaluated the change in practices that will come in long term, other studies have improved the change in practices of health workers [12,19].

The implementation of EMS-ECHO comes along with numerous lessons but not without challenges that should be addressed to maximize its potential for improving health indicators in Uganda, especially in the field of emergency medicine. The ultimate planning of sessions requires adequate human resources and mobilization; thus, we identified that

the program needs dedicated remunerated full-time personnel to run efficiently. The entire targeted health workers could hardly be accessed online due to differing schedules across the different levels of health facilities. Therefore, the steering committee shares links and recordings for the sessions for those who are unable to join. It is also important to identify a secure repository for resources and recordings of the sessions that is easily accessible to health workers and other interested parties to access. While EMS ECHO is considered relatively cost-effective, as participants only need to log in to a Zoom call, in Uganda this is not possible for all participants – the internet may be not free or readily available with the frequent unstable internet which may prevent some health workers from participating in all sessions. Hospital or health facility conferencing facilities may not be readily accessible for health workers in the emergency departments. There is a critical need for continuous monitoring, evaluation and learning to check progress, make improvements in sessions and assess the impact of sessions on health worker skills and patient outcomes.

Conclusions

The EMS ECHO establishment has generally been a success in Uganda. Based on our experience, deliberate and stepwise approaches that we describe in this paper are required to successfully establish innovative approaches to health worker capacity building programs such as the EMS ECHO. Additionally, health workers in Uganda have demonstrated a keen interest in utilizing the ECHO methodology of telementoring to build their capacity in the provision of emergency care services. Through tele-mentoring, the EMS ECHO program was able to improve participant's knowledge in key concepts of emergency care such as the ABCDE approach. However, there is still a need to continuously monitor, evaluate and learn to ascertain how these ECHO sessions impact health worker skills and ultimately, patient outcomes.

Dissemination of results

Results from the EMS ECHO program were shared with the ministry of health and other implementing partners and the health care workers in various conferences such as the Emergency Care Conference in Uganda and the African Emergency Care Conference in Ghana. Progress reports were also published on the Seed Global Health Uganda Annual Report, website, and the Project ECHO websites.

Authors' contribution

Authors contributed as follows to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: IA, and AAN contributed each 12%; BA and AN each 11%; AMK, and RBK each 9.5%; TB, HE, RE, LF, OJ, MJN, JBW contributed 5% each. All authors approved this version to be published and agreed to be accountable for all aspects of the work.

Declaration of Competing Interest

The authors declared no conflicts of interest.

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