International Journal of Emergency Medicine

EDUCATIONAL ADVANCES IN EMERGENCY MEDICINE Open Access

Fundamentals of emergency care support: a blended learning model to improve emergency and trauma care in a low-income country

Noman Ali[1,3*], Qamar Riaz[1], Salman Muhammad Soomar[1,2], Shahan Waheed[1], Uzma Khan[1] and Nadeem Ullah Khan[1]

Abstract

Background The burden of time-sensitive illnesses that require emergency care, such as heart diseases, respiratory tract infections, and road traffic injuries, is the leading cause of premature deaths. The healthcare providers of the emergency care system lack the essential knowledge and skills across different healthcare levels in our country. In this paper, we aim to describe the development and initial implementation of a blended learning curriculum for teaching and training non-EM-trained physicians working in the emergency departments of our country.

Methods We used a previously articulated curriculum designed by Patricia Thomas and David Kern. The model included general and specific need assessment, defining goals and objectives, selecting teaching and learning strategies, and implementation and evaluation plans.

Results Based on the need assessment, a module-based blended learning model has been designed with well-defined goals and objectives covering knowledge and skills. This ten-week module-based course focuses on four areas of critically emergent conditions, i.e., trauma, shock, difficulty in breathing, and altered mental status. Evaluation will be made by comparing the pre and post-test scores of the participants.

Conclusion We have developed a blended course to teach non-EM-trained physicians working in the ED of our country. We hope that through this blended learning model, we will be able to adequately train our physicians working in the emergency department without any formal training in EM, which will lead to improved patient care and outcomes.

Keywords Fundamentals, Emergency care, Trauma, Blended learning, Education

*Correspondence:
Noman Ali
noman.ali@aku.edu
[1]Aga Khan University, Karachi, Pakistan
[2]Kings College Hospital London, Dubai, UAE
[3]Department of Emergency Medicine, Aga Khan University, Karachi 74800, Pakistan

Introduction

Emergency medicine (EM) is a relatively new specialty in the world. Until now, Emergency Departments (ED) in many countries are not staffed with specialists with specific training in the discipline but rather with rotating physicians, residents, and interns from other specialties [1]. This is particularly true in resource-limited settings where there are relatively few EM-trained staff, few or no EM training programs, and limited organization of emergency medical services (including both prehospital care and hospital emergency departments). Lack of access to primary care, leading many patients to seek delayed treatment, further increases the burden on weak emergency medical services in these healthcare settings. As a result, resource-limited settings experience a significant mismatch of needs and services: high rates of critically ill patients and constrained or underdeveloped EM systems. The need for EM services in such settings is clear, yet efforts toward establishing EM in resource-limited settings have been slow [2].

The burden of time-sensitive illnesses that require emergency care, such as heart diseases, respiratory tract infections, and road traffic injuries, is alarming in our country and is the leading cause of premature deaths [3]. Data from one of the biggest cities in Pakistan (Karachi) showed that the main causes of death in adults included circulatory disorders, injuries (road traffic crashes, burns), and complications of pregnancy [4]. Another study from rural northern Pakistan found that reasons for poor outcomes in many cases of surgically treatable illness included misinterpretation of the severity of symptoms by first-level providers and miss-triage from the first-level facility [5]. In addition, emergency care is physically and financially inaccessible to the marginalized population in Pakistan [6, 7]. There is also a delay in attending to emergent patients in the emergency departments with an unprioritized triage system [6].

The provision of emergency care is inadequate in Pakistan [8]. The healthcare providers of the emergency care system lack the essential knowledge and skills across different healthcare levels [6]. These deficiencies are likely to compromise the provision of quality emergency care. At the same time, emergency medical care has been an overlooked agenda at provincial levels in Pakistan. As a result, the only form of emergency care available nationwide, especially in larger hospitals and clinics, is based on post-colonial models of emergency departments in the public sector. In Pakistan, the emergency medicine training was started in 2012. Until now, we have only nine officially recognized EM residency programs, on average five years long, with 25 graduates leading to an insufficient number of EM specialists and a large gap in quality emergency care provision. This, in addition to the high turnover rate of the existing emergency doctors, results in a gap that will take many years to bridge. Hence, a training module is needed in the interim, comprising a well-developed, shorter EM curriculum to efficiently train the current ED workforce: predominantly medical officers (physicians who have completed their graduation from medical school but have not undergone any postgraduate training with less than 3 years of clinical experience) and senior medical officers (physicians who have completed their graduation from medical school but have not undergone any postgraduate training with more than 3 years of clinical experience) with no formal EM training.

This paper aims to describe the development and initial implementation of a blended learning curriculum for teaching and training non-EM-trained physicians working in the emergency departments of our country.

Methods

The skills required to develop and deliver this project were recognized as an essential first step in building a diverse course team. These skills include experts in the following fields: emergency medicine, toxicology, e-learning, and medical education. A course core group was developed with experts from these areas.

The framework used in this is a combination of previously articulated curriculum development designed by Patricia Thomas and David Kern [9]. Kern's framework for curriculum development has successfully been applied widely within medical education across multiple specialties and training. It can be used to develop planned educational experiences for short lessons and longitudinal programs for physical and online courses.

The six steps of the model are: (Fig. 1).

Results

Step 01: problem identification and general needs assessment

The first step in designing a curriculum aims at identifying the problem affecting the health of the public or a given community and the needs of the patients, healthcare professionals, medical educators, and society that the intended curriculum addresses. This also entails assessing how this specific or similar healthcare need has been addressed worldwide to determine the appropriate solution(s).

The general need assessment was conducted through published formal and informal literature by the national and international agencies on the need to improve emergency and trauma care management in Pakistan.

Step 02: Targeted needs assessment and determining and prioritizing content

The specific need assessment was conducted through focus group discussions (FGDs) with the non-EM trained medical officers and senior medical officers working in

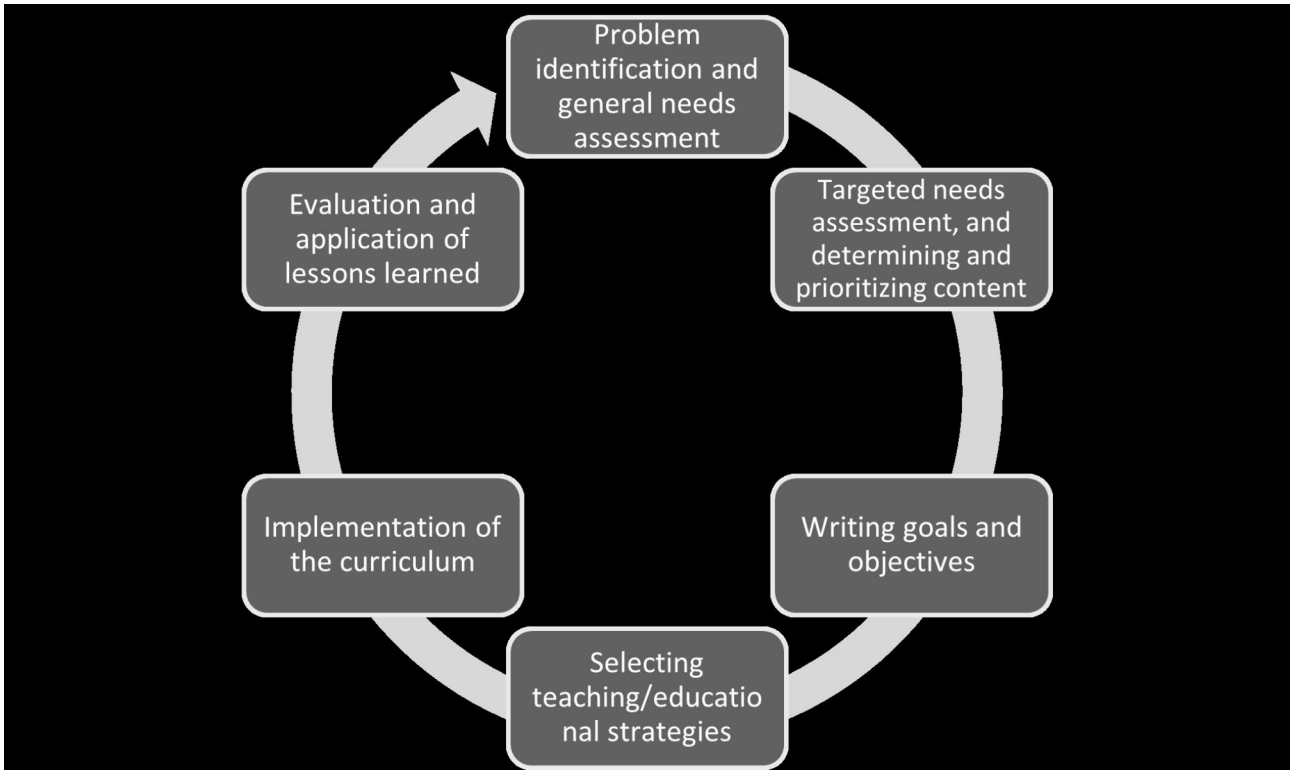

Fig. 1 Approach to curriculum six steps

the ED to identify the areas that need to be addressed for training and education. The participants of these FGDs were from different tertiary level hospitals across different provinces of Pakistan, including the Aga Khan University Hospital (AKUH) Karachi, Combined Military Hospital (CMH) Lahore, and Bolan Medical College (BMC), Quetta. Formal meetings were also held with the medical directors of these institutes to find out the specific needs related to their patient population.

Step 03: Writing goals and objectives

The EM-trained faculty members and the faculty member from the Department of Education and Development of the AKUH met to identify curricular goals and objectives and to delineate the accreditation requirements for implementing this course. A literature search was also conducted to identify existing resources for guidance in developing curricular goals and objectives in our local context.

Step 04: Select teaching/educational strategies

A working group of core faculty members, including EM-trained physicians, educationists, internists, and toxicologists, was tasked with developing course curriculum content and delivery methods. A literature search was also conducted to identify EM-specific educational resources developed in the low-middle income country (LMIC) settings that could be adapted to our local context.

We also discussed the feasibility and acceptability of various formats for delivering this curriculum with the participants during FGDs. While all the participants preferred a physical mode of learning because of higher engagement, many also showed an inclination towards an online course that would involve participation by a diverse group of ED physicians working across different geographical locations all over Pakistan.

Steps 05 & 06: implementation and evaluation of the curriculum

The course will be reviewed, refined, and approved by all the core faculty members, and implementation will be done in the middle of 2023. Feedback will be taken from the participants and teaching faculty members, and necessary changes will be made per the suggestions. Evaluation will be made by comparing the pre and post-test scores of the participants.

The last two steps are currently underway and will be reported once completed.

Need assessment

Based on the general and targeted needs assessment, a list of clinical conditions/ presentations was developed that served as the basis of the intended curriculum for

ER physicians. This list was Compared with the 'Basic Emergency Care' course of the World Health Organization (WHO), which was developed in collaboration with frontline providers who manage acute life-threatening conditions with limited resources [10, 11]. To ensure contextual relevance, this list was validated for content by the EM-trained national and international faculty members, educationists, internists, and toxicologists who were actively involved in developing the EM residency program in Pakistan. After further deliberations within the core group, a competency-based, blended course comprised of modules was conceived. The course will strengthen the knowledge and skills of the physicians working in the emergency departments of public and private hospitals where a recognized emergency medicine residency program is not offered.

Key objectives and anticipated outcomes

During this third step in Kern's development, the core group worked on developing a broad goal and specific learning objectives for the course. Revised Bloom's taxonomy was used to create Specific, Measurable, Achievable, Relevant, Time-bound (SMART) learning objectives for each of the four modules of this course. This training program aims to strengthen the knowledge and skills of the physicians required to evaluate and manage trauma and common life-threatening medical and surgical emergencies presented to the emergency departments of public and private hospitals where a recognized emergency medicine residency program is not offered.

Objectives

1. Apply the knowledge and skills learned during the course in real-life emergency settings.
2. Immediately recognize, evaluate, treat, and dispose of patients in the emergency department setting.
3. To evaluate the effectiveness of this online course in addressing the gap in knowledge and skills of the target learners.

After completing this course, the participants will attain the competencies required for the evaluation and management of trauma and common medical and surgical emergencies, which will, in turn, improve patient care outcomes.

Educational strategies (curriculum development)

A modular approach was taken to develop this ten-week course focusing on four areas of critically emergent conditions, i.e., management of trauma, shock, difficulty in breathing, and altered mental status. Each of these areas was developed as a two-week module introducing the learners to a systematic approach to patient assessment, diagnosis, and management. Table 1 presents the details of the learning objectives and content of each of the four modules.

Based on the input from the needs assessment and the experts in the core group, this course was developed as a competency-based, blended course that the Department of Emergency Medicine would offer at Aga Khan University. The blended framework will facilitate learners from distant places to enroll and acquire the required competencies without compromising their professional responsibilities. Multiple teaching-learning and assessment methodologies will be applied to achieve the required competency level.

The course will be developed in the virtual learning environment (VLE). Each module will be for two weeks and will be delivered online using synchronous and asynchronous formats. The asynchronous learning will occur through pre-recorded mini-lectures, reading material, and videos posted on the VLE. Adult and pediatric emergency physicians have been contacted to develop educational material related to various presentations of medical and surgical emergencies (Supplementary Material). Video recordings will be done for all the lectures and uploaded on VLE.

Educational videos demonstrating essential clinical and procedural skills will also be uploaded on VLE. These videos will either be developed locally, or a link to the videos related to essential emergency skills freely available on medical websites will be shared with the learners via VLE. All the educational content will be reviewed by the core faculty members of the course for appropriateness and relevance as educational material.

Learner engagement was a challenge identified by the experts in virtual or online sessions. To address this, a discussion board will be used to generate discussion around critical topics and clarify queries or important concepts by the facilitator. Participants will be encouraged to use this platform to share relevant evidence-based literature with the rest of the group as a peer learning strategy. The assigned lead facilitator for the module will respond to queries on the discussion board or clarify any misconceptions. Facilitator-led case-based discussions will be conducted during the once-weekly synchronous learning sessions using Zoom.

For the procedural and/or clinical skills, two 2-day physical sessions (workshop format) will be conducted after the second and the fourth modules, respectively. During these physical face-to-face sessions, the procedural and/or clinical skills relevant to the two preceding modules will be demonstrated by the facilitators, followed by practiced by the learners on mannequins and simulators at the Center for Innovation in Medical Education (CIME) at AKU, or place(s) accessible to the participants (Fig. 2).

Table 1 Objectives and learning outcomes

Objectives	Learning Outcomes
Approach a patient with polytrauma	- Perform a primary and secondary survey of trauma patients (the ABCDE approach) - Assess an airway - Explain when advanced airway management is needed - Assess breathing - Explain when to assist breathing (Non-invasive and invasive mechanical ventilation) - Assess fluid status (circulation) - Provide appropriate resuscitation for hemorrhagic shock (Damage control resuscitation) - Recognize life-threatening injuries (Tension pneumothorax, Massive hemothorax, Traumatic brain injuries, Cardiac tamponade) - Perform critical interventions for high-risk conditions - Assess and manage burn patients
Approach a patient with undifferentiated shock	- Recognize early signs of shock - Assess and manage hypovolemic shock (hemorrhagic and non-hemorrhagic), e.g., Upper and Lower Gastrointestinal bleeding and Cholera - Assess and manage cardiogenic shock, e.g., STEMI, NSTEMI, Arrhythmias, Myocarditis - Assess and manage distributive shock, e.g., septic shock, anaphylactic shock, and neurogenic shock - Assess and manage obstructive shock, e.g., cardiac tamponade, tension pneumothorax, and massive pulmonary embolism
Approach a patient with difficulty in breathing	- Recognize early signs of respiratory failure - Assess and manage the status of asthmatics, COPD exacerbation, and COVID Pneumonia - Assess and manage pneumothorax, pneumonia, pleural effusion, and pulmonary edema. - Assess and manage massive pulmonary embolism. - Assess and manage common respiratory diseases in Pediatrics, e.g., croup, bronchiolitis, and reactive airway disease
Approach a patient with altered mental status	- Recognize key history findings suggestive of different causes of altered mental status. - Recognize key physical findings suggestive of different causes of altered mental status - Assess and manage patients presented with stroke, meningitis, and seizures - Assess and manage a patient with acute liver failure, acute kidney injury, and severe electrolyte imbalance - Assess and manage patients with diabetic ketoacidosis, hyperosmolar hyperglycemic syndrome, thyroid Storm, and myxedema coma - Assess and manage patients with snake bite - Assess and manage patients with poisoning (organophosphates, beta-blockers, calcium channel blockers, paracetamol poisoning)

During the workshops, the participants will be signed off for critical procedural/ clinical skills using standardized checklists on the mannequin/ simulators. Each course module will be preceded by an MCQ/EMQ-based pre-test to assess the learners' existing knowledge. There will be a post-test at the end of the module, and the gain in knowledge will be measured as the increase in scores in the post-test. Both the pre and post-test will be administered via VLE. A formative assessment on VLE will follow each module to re-enforce the knowledge and skills learned. The end-of-module assessment (post-test) will be used for summative purposes. A passing score of 75% will be required to successfully complete the module. Those failing to score 75% will be allowed to re-take the module and post-test at the end of the course to be eligible for the course certificate.

Implementation

After the content development and uploading on VLE, we will start the registration process. Twenty-five to thirty physicians will be allowed to register for the course at that time. To ensure maximum utilization of the educational resource on the VLE and the synchronous session during the course, all the participants will be oriented with and provided hands-on training on using VLE and Zoom features. Faculty will also be trained in using VLE and Zoom and developing videos and other educational materials, especially using a discussion board as a teaching-learning resource.

A dedicated admin staff will be hired and trained to manage and resolve any VLE, zoom, or IT-related issues and facilitate faculty and participants in educational activities. The VLE will be continuously monitored for the participants' timely completion of the reading assignments and other tasks.

As a quality assurance mechanism, accreditation will be sought from the Department of Continuing Professional Education (DCPE) at AKU, which will allocate the Accreditation Council for Continuing Medical Education (ACCME) accredited credit hours for the participants as well as the facilitators. This will also increase the involvement of the facilitators and the participants.

Evaluation

The evaluation plan for this blended course will comprise of:

1. Performance of the learners during the course and in the post-test. The success of the course in imparting/ enhancing essential emergency knowledge and skills will be measured through an increase in the post-test scores.

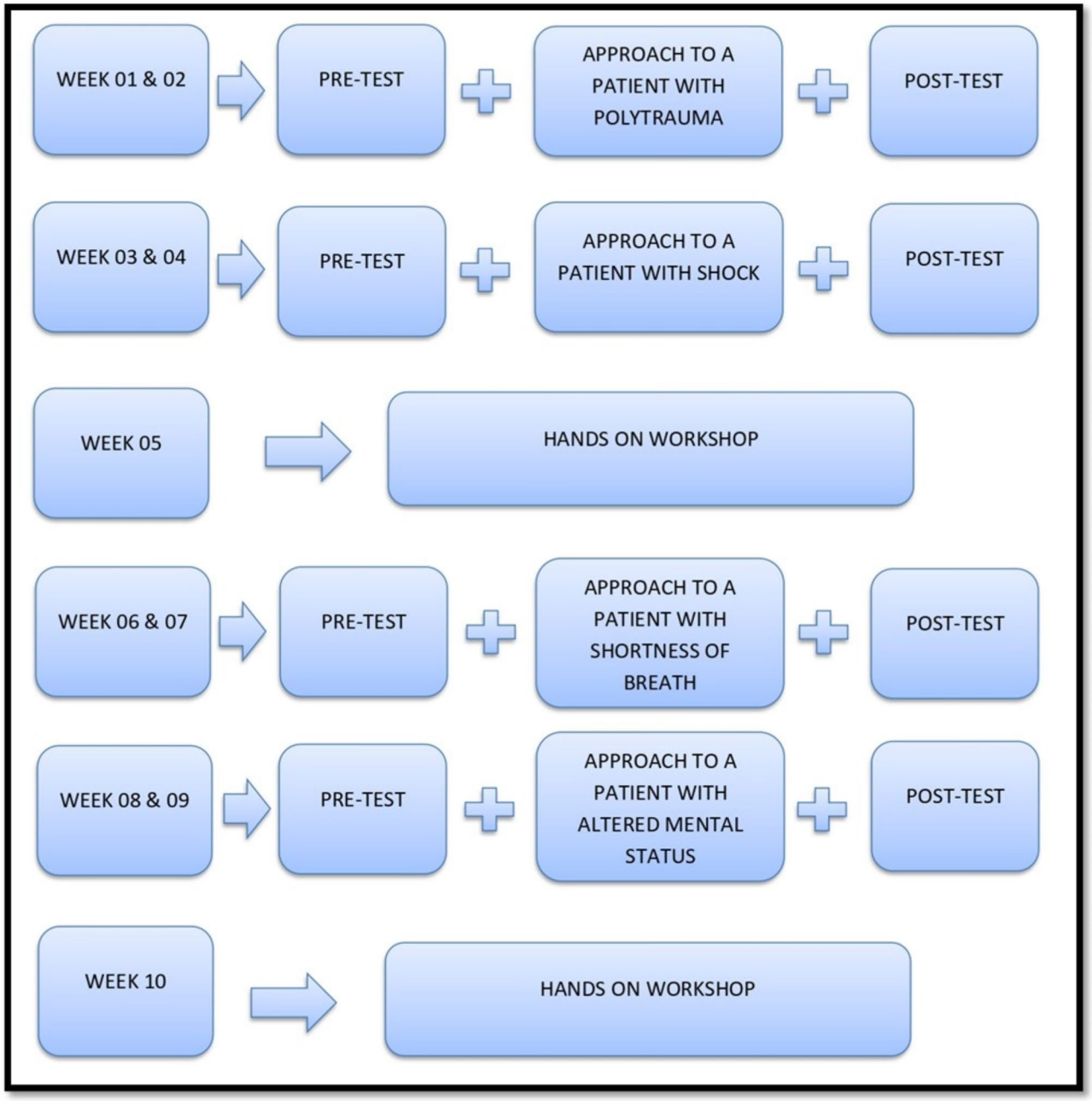

Fig. 2 Course execution details

2. All the learners will be requested feedback to evaluate the utility and relevance of the educational resource/material, the quality of the case in stimulating discussion and acquiring new knowledge, and the role of the facilitators during case-based discussions and moderating discussion boards during each module.
3. Additionally, participants' satisfaction will be measured using a structured survey.
4. The course faculty and administrators' feedback will be sought in a focus group discussion.

Based on continuous monitoring, learner performance, and feedback, necessary revisions in the content and design of the course will be made to meet the changing needs of the participating physicians over time. The core faculty members and directors will be responsible for updating all the content as per the evidence-based literature.

Discussion

We have developed a blended course to teach non-EM-trained physicians working in the ED of our country. This will be the first blended learning model of training in emergency medicine in Pakistan. There is no such program available in our country that offers formal training to emergency care physicians. This project will lead to interdepartmental and institutional collaboration and help in developing emergency physicians' capacity in our country. This project will also serve as a proof-of-concept that will provide direct evidence on the utility and feasibility of introducing a blended clinical, educational intervention addressing emergency clinical skills to strengthen the existing workforce in the emergency care setups and to achieve improvement in physician's clinical skills, knowledge, and ultimately patient outcomes.

Blended learning integrates online and face-to-face learning to facilitate critical, complex, and creative intellectual skills [12]. A well-blended course should translate into better learning outcomes at a reduced time, cost, and manpower while at the same time enabling flexible participation from any location at any time [13]. Blended learning is about bringing learning to the people instead of bringing the people to learning without compromising the quality of content delivery [14].

There is enough evidence in the literature supporting blended and online approaches for teaching and learning emergency medicine. Studies have shown that learners find a blended approach to learning basic, emergency, and disaster medicine very effective and enjoyable despite their initial unawareness of the virtual learning system [15, 16]. Another randomized controlled trial reported blended learning as effective as face-to-face learning for emergency airway management training of doctors, suggesting that blended learning may be a feasible alternative to face-to-face learning for such skill training in emergency departments [17].

The challenges involved in this project will be mostly related to implementing this course in other cities of Pakistan and other low-income countries, as it will be difficult for the faculty members to frequently travel and teach hands-on skills. To mitigate this issue, we need to train multiple instructors of this course in the initial phase of implementation [17].

Strength and limitations

This is one of the curriculums to be implemented in Pakistan, which will teach a detailed emergency care course to improve emergency and trauma care. Also, this will be the first blended course with in-person and online learning using the virtual learning environment. Moreover, the evaluation will be robust and full of activities to understand the participant's level of knowledge and learning. Furthermore, as it is implemented at multiple medical colleges and hospitals across the country, the sample size will be large and generalizable to all over Pakistan. There are a few limitations, this course can be implemented only in areas where the internet and technology are available. Since it is a blended course, it is labor-intensive, expensive, and time-consuming. Moreover, there is a lack of results regarding the feasibility, applicability, and effectiveness of the blended learning model. These aspects will be evaluated in the subsequent phases of the project, with planned assessments including participant feedback, expert reviews, and pre-and post-test comparisons. The findings from these evaluations will be reported in future publications.

Conclusion

In conclusion, we hope that through this blended learning model, we will be able to adequately train our physicians working in the emergency department without any formal EM training, which will lead to improved patient care and outcomes. The main idea behind the development of this course is to promote the level of trauma and emergency care management that will result in the same standard of care throughout our country. We are also willing to advance and validate our course in other low-income countries.

Abbreviations

ACCME	Accreditation Council for Continuing Medical Education
AKUH	Aga Khan University Hospital
BMC	Bolan Medical College
CIME	Center for Innovation in Medical Education
CMH	Combined Military Hospital
DCPE	Department of Continuing Professional Education
ED	Emergency Departments (ED)
EM	Emergency Medicine
FGDs	Focus Group Discussions
ICRC	International Committee of the Red Cross
IFEM	International Federation for Emergency Medicine
SMART	Specific, Measurable, Achievable, Relevant, Time-bound ()
VLE	Virtual Learning Environment
WHO	World Health Organization

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12245-024-00726-x.

Supplementary Material 1

Acknowledgements

None.

Author contributions

NA & SW- conceptualization & writing, reviewing, and editing.QR- conceptualization, methodology & writing, reviewing, and editing original draft. SS- methodology & writing, reviewing, and editing final draft.UK & NK- supervisionAll authors read and approved the final manuscript.

Funding

No funding was received.

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethical approval and consent to participate
Ethical requirements were fulfilled under the "Declaration of Helsinki." Ethics approval was obtained from the Ethics Review Committee at the Aga Khan University Hospital Karachi, Pakistan. Informed written consent was exempted from the Ethics Review Committee at the Aga Khan University Hospital Karachi, Pakistan.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 23 April 2024 / Accepted: 28 September 2024
Published online: 14 November 2024

References

1. Dill MJ, Salsberg ES. The complexities of physician supply and demand: projections through 2025. Association of American Medical Colleges; 2008.
2. Nowacki AK, Landes M, Azazh A, Ritchie LMP. A review of published literature on emergency medicine training programs in low-and middle-income countries. Int J Emerg Med. 2013;6(1):1–10.
3. Internet. Global Burden of Disease, Pakistan [Internet]. 2017.
4. Marsh DR, Kadir MM, Husein K, Luby SP, Siddiqui R, Khalid SB. Adult mortality in slums of Karachi, Pakistan. J Pak Med Assoc. 2000;50(9):300–6.
5. Ahmed M, Ali Shah M, Luby S, Drago-Johnson P, Wali S. Survey of surgical emergencies in a rural population in the Northern Areas of Pakistan. Tropical Med Int Health. 1999;4(12):846–57.
6. Bhatti JA, Stevens K, Mir MU, Hyder AA, Razzak JA. Emergency care of traumatic brain injuries in Pakistan: a multicenter study. BMC Emerg Med. 2015;15:1–7.
7. Hasan IJ, Khanum A. Health care utilization during terminal child illness in squatter settlements of Karachi. J Pakistan Med Association. 2000;50(12):405.
8. Razzak JA, Baqir SM, Khan UR, Heller D, Bhatti J, Hyder AA. Emergency and trauma care in Pakistan: a cross-sectional study of healthcare levels. Emerg Med J. 2015;32(3):207–13.
9. Thomas PA, Kern DE, Hughes MT, Tackett SA, Chen BY. Curriculum development for medical education: a six-step approach. JHU; 2022.
10. Organization WH. BASIC EMERGENCY CARE: approach to the acutely ill and injured. World Health Organization; 2018.
11. Fatima I, Humayun A, Anwar MI, Iftikhar A, Aslam M, Shafiq M. How do patients perceive and expect quality of surgery, diagnostics, and emergency services in tertiary care hospitals? An evidence of gap analysis from Pakistan. Oman Med J. 2017;32(4):297.
12. Garrison DR, Kanuka H. Blended learning: uncovering its transformative potential in higher education. Internet High Educ. 2004;7(2):95–105.
13. Rowe M, Frantz J, Bozalek V. The role of blended learning in the clinical education of healthcare students: a systematic review. Med Teach. 2012;34(4):e216–21.
14. Beldarrain Y. Distance education trends: integrating new technologies to foster student interaction and collaboration. Distance Educ. 2006;27(2):139–53.
15. Spedding R, Jenner R, Potier K, Mackway-Jones K, Carley S. Blended learning in paediatric emergency medicine: preliminary analysis of a virtual learning environment. Eur J Emerg Med. 2013;20(2):98–102.
16. Ingrassia PL, Ragazzoni L, Tengattini M, Carenzo L, Della Corte F. Nationwide program of education for undergraduates in the field of disaster medicine: development of a core curriculum centered on blended learning and simulation tools. Prehosp Disaster Med. 2014;29(5):508–15.
17. Kho MHT, Chew KS, Azhar MN, Hamzah ML, Chuah KM, Bustam A, et al. Implementing blended learning in emergency airway management training: a randomized controlled trial. BMC Emerg Med. 2018;18(1):1–10.

Publisher's note