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Implementation of structured trauma training for first-year surgical residents in Ethiopia: a novel pilot program in a low income country

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Purpose: Curricula for surgical residents should include training in trauma care; however, such training is absent in many low income countries. At the largest surgical training institution in Ethiopia, a trauma training program was developed, integrated into the existing surgical curriculum, and implemented. This study was conducted to evaluate the trainees' response to the new program.

Methods: Over a 5-month period, 35 first-year surgical residents participated in weekly trauma care training sessions. The program included journal clubs, practical sessions, didactic sessions, and case-based discussions. Six months after the conclusion of the training, changes in knowledge, attitude, and practices were evaluated through a self-report survey.

Results: For knowledge-based items, the survey data revealed reported improvements in 83.8% to 96.8% of students. Furthermore, 90.3% to 93.5% of participants indicated improvements in practice, while 96.7% exhibited a change in attitude. Respondents reported that attending didactic courses improved their presentation skills and facilitated the acquisition of knowledge. They suggested the inclusion of additional practical sessions.

Conclusions: Training structures that are simple to implement are crucial for residency programs with limited resources. Such programs can be developed using existing academic staff and can aid residents in delivering improved care to trauma patients.

Keywords: Trauma training program; Quality improvement program; Low income countries

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INTRODUCTION

Background

Trauma represents a serious global health burden, accounting for 4.8 million deaths and 247.6 million disability-adjusted life years annually [1]. The World Health Organization has reported that 9% of annual deaths are attributable to trauma [2]. This burden disproportionately affects low and middle income countries, where 90% of global accident-related deaths occur [3].

Population growth and the modernization of low income countries, along with changes in the global geopolitical landscape, have altered the epidemiology of trauma, with a shift from

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primarily penetrating injuries to trauma from traffic accidents and terrorism [4]. These injuries often involve multiple body systems and thus require comprehensive treatment [4]. Research has demonstrated a significant decrease in mortality rates among patients with severe injuries following the implementation of focused trauma education programs [4]. This finding is supported by the success of Advanced Trauma Life Support (ATLS) training and other structured national and international programs [5,6]. However, the training of surgical residents in trauma care remains suboptimal in low income countries [7]. The high costs associated with ATLS training, coupled with the effectiveness of alternative, low-budget trauma programs, have led some countries to adopt different training formats that vary in content and objectives [8,9]. Despite the clear need for structured trauma training, none of the 14 training institutions in Ethiopia currently offer such instruction as part of their surgical residency programs, for reasons that remain unclear.

Objectives

The present study was conducted as part of the Surgical Residency Education Quality Improvement Program at Addis Ababa University College of Health Sciences (Addis Ababa, Ethiopia). Its goal was to integrate trauma training into the first-year curriculum, providing residents with both theoretical and practical knowledge of systematic trauma care. Through this study, we also aimed to evaluate changes in the knowledge, attitude, and practices of trainees 6 months after completion of the program.

METHODS

Ethics statement

The study was approved by the Ethical Review Board of the Department of Surgery, Addis Ababa University College of Health Sciences. The research was conducted in accordance with the Declaration of Helsinki, the Ethiopian National Research Ethics Guidelines, and the institutional regulations on research ethics. Written informed consents were obtained from all individual participants.

Study setting

The Addis Ababa University College of Health Sciences pioneered the surgical residency program in Ethiopia, followed by over 40 years of training general surgery residents. For nearly a decade, the college has also offered integrated subspecialty-level residency programs in plastic and reconstructive surgery, pediatric surgery, neurosurgery, and urology. Each year, between 30 and 50 residents are admitted to the surgical residency program, where they undergo 1 year of general surgery training. Subsequently, those pursuing neurosurgery begin a 4-year program in this field. In contrast, residents in plastic and reconstructive surgery, urology, and pediatric surgery complete an additional year of general surgery training before moving on to their respective 3-year subspecialty programs. General surgery residents undergo a total of 4 years of training.

Design of the training program

An initial discussion was held about the importance of basic trauma management training for incoming first-year surgical residents. This dialogue included a visiting trauma and critical care surgery consultant, the postgraduate program coordinator, and a representative of the first-year residents. The group recognized the need for a structured curriculum and tasked themselves with creating a 5-month, once-weekly training schedule. Further discussions led to the presentation of the curriculum to the department head, consultant members, and the postgraduate coordinator. The sessions listed in Table 1 were finalized, with the agreement to hold them on Thursday mornings, starting on February 6, 2020, and concluding on June 25, 2020. Each session lasted between 60 to 90 minutes, depending on the topic. Case discussions and practical sessions were led by the visiting trauma and critical care surgeon, with a faculty member of the department of surgery present. Each case discussion—lasting about 30 to 40 minutes—involved two trauma patient scenarios, focused on the scheduled topic. Residents engaged in evaluating, investigating, and managing each case, after which the session concluded with a didactic component. The didactic sessions, 30 to 50 minutes long and limited to 30 PowerPoint slides (Microsoft Corp), were presented by the first-year residents. The visiting surgeon and faculty members provided additional commentary. As part of this program, two journal club discussions with a specific topic were also held. Articles were distributed to residents 5 days before the sessions, which involved presentations of the articles followed by discussions of their strengths, weaknesses, and implications for trauma patient care. Notably, the latter half of the training was shifted to an online format due to the COVID-19 pandemic, but the structure of the program remained consistent with the in-person sessions. A practical session covering focused assessment with sonography for trauma was conducted as a 90-minute, 1-day program. Initially, additional practical sessions on tracheostomy, cricothyroidotomy, chest tube insertions, and central line placements were planned. However, these were omitted from the preliminary curriculum due to the pandemic.

Table 1. Curriculum for weekly trauma training sessions for first-year residents

Training session	Allotted time (min)
The ABCs of trauma (didactic session)	60
FAST examination (practical session)	90
Resuscitation/transfusion	
Case discussion	30
Didactic session	40
Journal club (presentation/discussion)	60
Chest wall injury: rib fracture, pneumothorax, hemothorax	
Case discussion	30
Didactic session	40
Chest tube placement (practical session)	90
Blunt abdominal trauma and damage control surgery	
Case discussion	30
Didactic session	50
Journal club: CRASH-2 trial (presentation/discussion)	60
Liver and splenic injury	
Case discussion	30
Didactic session	40
Head injury	
Case discussion	30
Didactic session	40
Journal club: placement of bowel anastomosis in trauma patients (presentation/discussion)	60
Small bowel, colon, and rectal injury	
Case discussion	30
Didactic session	40
Retroperitoneal hematoma	
Case discussion	30
Didactic session	40
Neck trauma	
Case discussion	30
Didactic session	40
Pelvic injury	
Case discussion	30
Didactic session	40
Thoracoabdominal vascular trauma	
Case discussion	30
Didactic session	40
Extremity vascular trauma	
Case discussion	30
Didactic session	40

ABC, airway, breathing, and circulation; FAST, focused assessment with sonography for trauma; CRASH-2, Clinical Randomization of an Antifibrinolytic in Significant Hemorrhage 2.

GREET (Guideline for Reporting Evidence-based Practice Educational Interventions and Teaching) statements

Intervention

A basic trauma training program was introduced into the curriculum for first-year surgical residents within the first 5 months of the academic year.

Learning objectives

The learning objectives were to improve the knowledge, confidence, and practices of trainees in the care of injured patients. Additionally, the goal was to establish a unified and systematic approach to trauma care among surgical residents.

Theory

Introducing trainees to proper trauma patient management early in their surgical training may improve overall trauma care and patient outcomes throughout their training and into their subsequent practice.

Materials

Trainees receive PowerPoint presentations prepared by their peers for didactic sessions and by trainers for case discussions. Simulation rooms and training dummies are used during the practical segments of the training.

Educational strategies

The training involved didactic sessions, case discussions, and practical sessions.

Instructors

The instructors comprised a visiting trauma and critical care surgeon, as well as faculty members from the general surgery and cardiovascular surgery divisions of the department.

Delivery

The practical sessions began with an introduction by the trainers, followed by supervised practice onsite. Case discussions were facilitated by the trainers, who provided the cases, while the trainees engaged in evaluating, diagnosing, and managing them. Subsequently, didactic sessions were held, presented by the trainees.

Environment

The training took place within the surgical department of Addis Ababa University College of Health Sciences, utilizing both classrooms and the simulation center.

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Schedule

Weekly sessions took place over a 5-month period, with each session occurring on Thursday mornings at 8:00 AM. The duration of these sessions ranged from 1 to 1.5 hours, with a total of 20 hours dedicated to training.

Study design and population

Six months after participants completed the training, a cross-sectional survey was administered to evaluate the program's effectiveness in terms of changes in knowledge, attitude, and practices. This 6-month interval between the conclusion of training and program evaluation was chosen to provide trainees with sufficient time to consider the impact of the program on their individual practices. The impact of the training program was gauged using self-reported improvements in the trainees' knowledge, attitude, and practices, rather than through objective measures. This approach was selected because the trainees entered the program with varying levels of prior knowledge and experience in trauma care, as well as differing exposure to trauma cases during their first year of residency. It was anticipated that these factors could influence an objective assessment independently of the training program's effects.

The study population comprised all first-year residents who participated in the trauma patient care training program, conducted over 5 months.

Study variables

The independent variables included age, sex, sponsoring institution, previous trauma training experience, the specialty program in which the respondent was enrolled, and the percentage of trauma sessions attended. The dependent variables consisted of 10 questions designed to evaluate changes in knowledge, attitude, and practices that occurred after participation in the trauma training sessions. Additionally, trainees were asked to rate their overall satisfaction with the training on a scale from 0 to 10. Lastly, we collected suggestions from the respondents to improve future trainee satisfaction and the effectiveness of the training program.

Statistical analysis

The data were collected through an online survey distributed to all trainees 6 months after they completed the training program. Prior to distribution, the survey questions underwent a testing process by the researchers to ensure clarity and comprehensiveness. Once collected, the data were evaluated for completeness and subsequently entered into IBM SPSS ver. 23.0 (IBM Corp). Analysis was performed using the same software, employing the descriptive analysis method.

RESULTS

Of 35 eligible residents, 31 (88.6%) responded to the survey. Among these respondents, 26 (83.9%) were male, and the mean participant age was 28.8 ± 1.8 years (range, 26–36 years). The respondents included nine general surgery residents (29.0%) and seven neurosurgery residents (22.6%). Most of the respondents, 22 residents (71.0%), were sponsored by academic institutions. Regarding their previous history of trauma patient care–related training, 19 (61.3%) had received training in emergency patient care during medical school, while only six (19.4%) had undergone further training during their time in general practice. As for the training sessions, the vast majority of participants, 25 (80.6%), attended at least 80% of the sessions. Further details are provided in Table 2.

Table 2. Respondent characteristics: sex, subspecialty, previous trauma training, sponsoring institution, and attendance at trauma sessions (n=31)

Category	No. of participants (%)
Sex	
Male	26 (83.9)
Female	5 (16.1)
Subspecialty	
General surgery	9 (29.0)
Neurosurgery	7 (22.6)
Plastic and reconstructive surgery	6 (19.4)
Urology	4 (12.9)
Pediatric surgery	5 (16.1)
Trauma training during medical school	
Yes	19 (61.3)
No	12 (38.7)
Trauma training during general practice	
Yes	6 (19.4)
No	25 (80.6)
Sponsoring institution	
Ministry of Higher Education	22 (71.0)
Regional hospital	7 (22.6)
Federal Ministry of Health	2 (6.4)
Trauma sessions attendance (%)	
≥80	27 (87.1)
60–79	3 (9.7)
50–59	1 (3.2)

Satisfaction with the training was assessed across four categories. The first category, satisfaction with knowledge transfer, included four questions. A total of 96.8% of respondents agreed that their understanding of urgency in trauma care had improved. Additionally, approximately 84.0% and 93.6% of respondents reported increases in their knowledge of laboratory and imaging components of trauma patient evaluation, respectively. Moreover, 87.0% indicated an improvement in knowledge related to decision-making. The second category focused on changes in attitude regarding urgency in trauma care, with 96.7% of respondents noting a positive shift. The third category, changes in practice related to trauma care, was evaluated using three questions. Here, 93.5% of respondents observed improvements in their evaluation practices for trauma patients post-training. Additionally, 90.3% and 93.5% of respondents experienced improvements in their choice of investigations during trauma patient evaluation and in their decision-making, respectively. The final category assessed the value of the didactic component of the sessions with two questions. A total of 90.3% of respondents felt that the didactic sessions contributed to their scientific knowledge, and a similar proportion credited these sessions with improving their presentation skills (Figs. 1, 2). Overall satisfaction was measured on a scale from 0 to 10, with all respondents providing a score. The mean satisfaction score was 8.74 ± 0.96 (range, 6–10).

Finally, participants were asked to provide additional suggestions for improving the training program. Of the 31 respondents, 22 offered one or more recommendations. Twelve of these 22 respondents proposed increasing the number of practical sessions. Three respondents recommended that the training continue throughout the residency programs. Two respondents suggested that certification be awarded upon program completion, and one respondent advocated for a post-completion examination. Additionally, two respondents called for more sessions to be added to the training, and another two favored exclusively in-person sessions over online classes. One respondent each suggested including other surgical residency training programs from different hospitals, increasing the number of journal club sessions, and integrating the program permanently into the residency curriculum.

DISCUSSION

This study assessed trainees' self-reported changes in knowledge, attitude, and practices regarding trauma patient care following 5 months of weekly training in trauma management fundamentals. The findings indicated a positive impact across all evaluated outcomes. Over 80% of the participants attended at least 80% of the training sessions. For each knowledge-oriented item, the survey

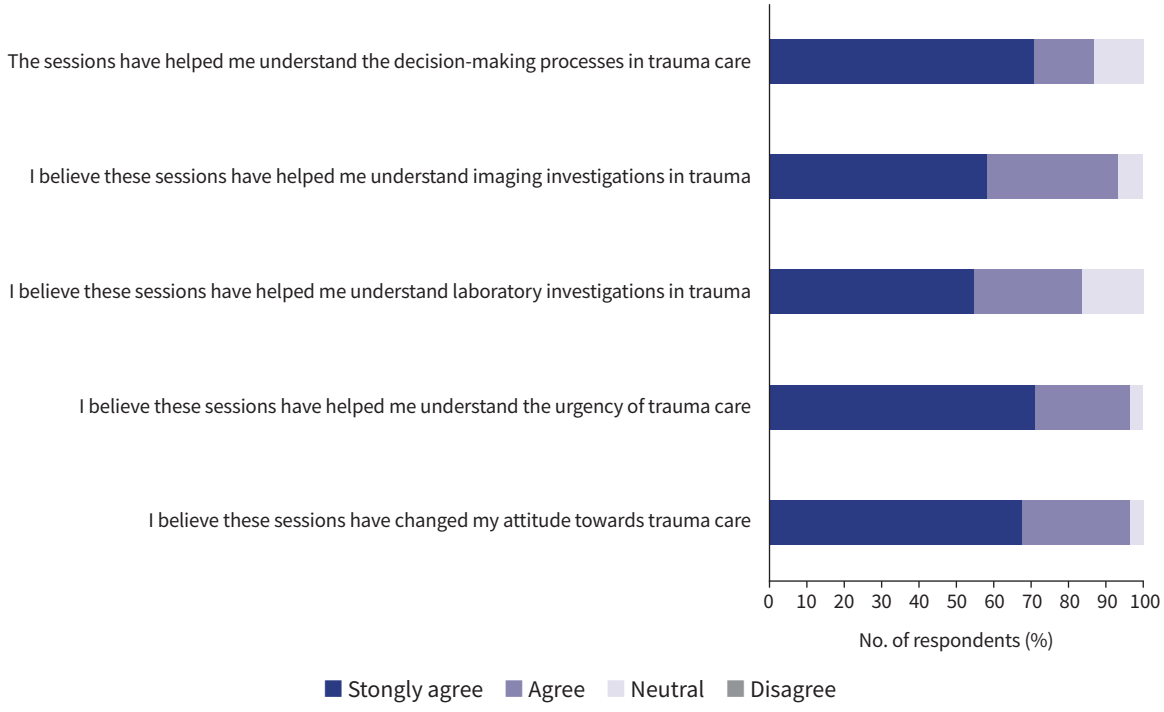

Fig. 1. Trainee responses regarding improvements in knowledge and attitude following trauma training.

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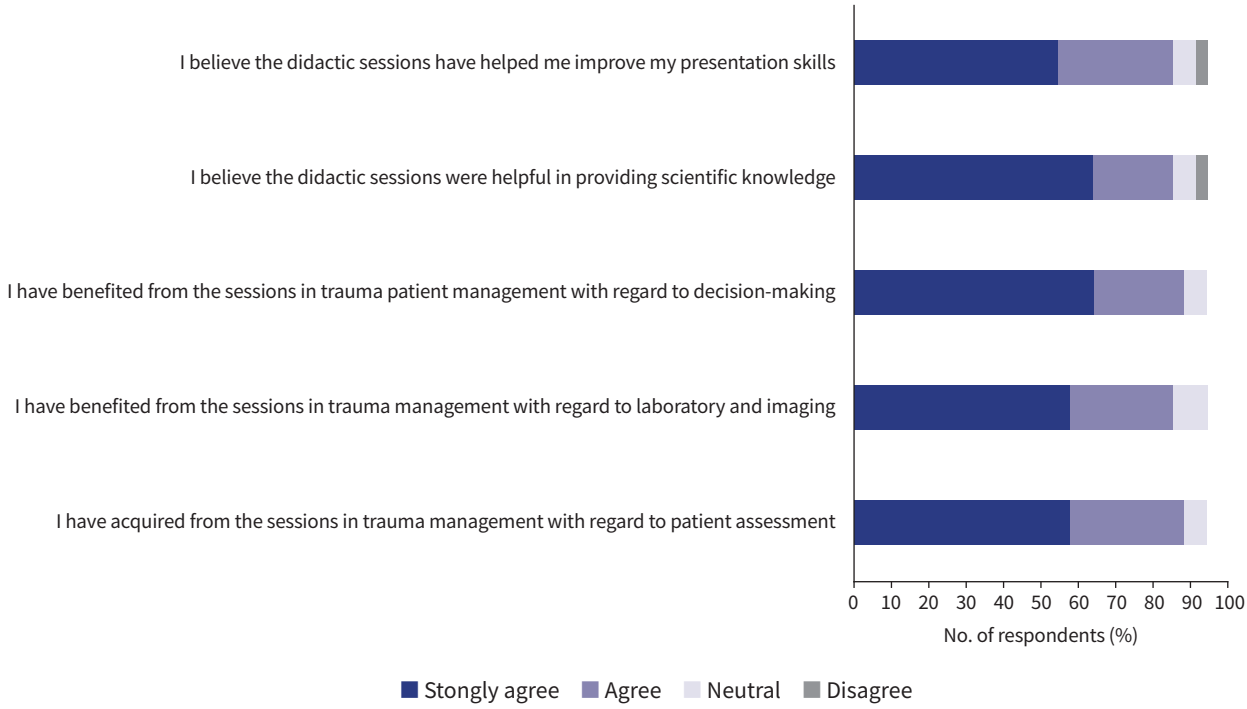

Fig. 2. Trainee responses regarding didactic sessions and trauma care practices following training.

data revealed reported improvements in at least 83% of respondents. More than 96% noted a change in attitude concerning the urgency of trauma care, while at least 90% indicated improvements in each practice related to trauma patient care. Overall, the trainees regarded the training very favorably.

Training in emergency trauma care at the medical school level has been associated with sustained improvements in trainees' knowledge, attitude, and skills [10,11]. Evidence also indicates increased confidence among trainees following such programs [12]. Furthermore, when emergency trauma care courses are offered to medical doctors in general practice or nonsurgical specialties, significant improvements in participants' knowledge, attitudes, and practices have been observed [13,14]. Our findings indicated that participants had limited exposure to emergency trauma care training programs, particularly after graduating from medical school. Given the variability in training exposure, formal training at the junior residency level is essential. The high rates of self-reported improvements in knowledge, attitude, and practices among participants in this study highlight the importance of such training.

Although the necessity of trauma training for surgical residents is not questioned, implementation remains challenging. Internationally provided courses on trauma care, such as ATLS, are often inaccessible and prohibitively expensive for African doctors [15]. Courses like Primary Trauma Care have been demonstrated to improve patient care and reduce mortality rates, and these programs are relatively accessible in low income countries [16]. However, they do not specifically target surgical residents, instead primarily focusing on nonoperative trauma care knowledge and skills. Additionally, their reliance on foreign aid raises concerns about long-term sustainability [17]. Surgical residency programs in developing countries should offer trauma courses tailored to their specific trauma demographics. These courses should be thorough, cost-effective, and sustainable. Our pilot trauma program could serve as a valuable option for this demographic. It provides emergency trauma care training and covers the basics of specific organ management, supporting a broader skill set than those provided by the ATLS and Primary Trauma Care programs.

During the COVID-19 pandemic, most residency programs were compelled to shift to online formats for training [18,19]. Our pilot program transitioned to online delivery for the latter half of the training, strictly following the established lesson plan. Despite this change, only two of the 31 respondents expressed negative feedback. The use of online platforms for these sessions is advantageous, as it enables the inclusion of trauma and critical care expertise from other academic institutions when the host faculty lack such resources. However, the substantial number of requests

for more practical training sessions suggests that a hybrid approach, incorporating both online and in-person elements, would be preferable for this program. Furthermore, programs considering the adoption of this curriculum should assess the potential financial implications of integrating additional practical sessions.

Strengths and limitations

This study had several strengths. For one, it was a quality improvement pilot program designed to address an existing problem by leveraging available resources. The program demonstrated high attendance among nearly all trainees, with data collected from approximately 90% of participants. Additionally, the study evaluated previous trauma training experiences and gathered suggestions for improving future iterations of the program. However, the study also had certain limitations. It was structured to evaluate self-reported improvements in knowledge, attitude, and practices following the completion of the training program. This approach was chosen for two reasons. First, the trainees' prior knowledge and practices were not assessed before the program began, which meant that no baseline was available for comparison. Second, the trainees were assumed to have had varying levels of exposure to trauma before entering the residency program, so using an objective exam to assess knowledge and practices could have introduced bias due to these differences. Another notable weakness of the study was its scope; it was a single-institution study that included only one cohort of first-year residents and relatively few female participants.

Conclusions

In this pilot study, students with no or suboptimal prior training in trauma care were enrolled in a 5-month integrated trauma patient care program during their first year of residency. The participants reported highly favorable responses to the training, noting self-reported improvements in knowledge, attitude, and practices regarding trauma patient care. The program can be implemented using existing faculty members and can be delivered in either an online or in-person format without high attrition rates.

ARTICLE INFORMATION

Author contributions

Conceptualization: SK; Data curation: SK; Formal analysis: MSG; Methodology: MSG; Project administration: SK; Visualization: SK; Writing–original draft: SK; Writing–review & editing: all authors. All authors read and approved the final manuscript.

Conflicts of interest

The authors have no conflicts of interest to declare.

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Data availability

Data analyzed in this study are available from the corresponding author upon reasonable request.

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