DO NO HARM, STAY CURRENT: IMMERSIVE TRAUMA CONTINUOUS MEDICAL EDUCATION FOR EMERGENCY MEDICINE POSTGRADUATE TRAINEES

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Abstract

Continuous medical education (CME) is an essential component of postgraduate education to improve trainees' competencies level to be at par with the current clinical practice thereby improving overall quality of patient healthcare delivery. As a postgraduate trainee in addition to being a part of hospital workforce, providing a compact CME session is essential albeit the learning challenges. Therefore, a framework for the trauma CME program was developed to integrate trainee-led immersive active learning (AL) activities based on our emergency medicine postgraduate training curriculum. It comprised of three components which were mini-conferences on trauma management principles updates; hands-on skill stations session utilizing pre-prepared learning packages, simulated scenarios, manikins and phantoms; and immersive trauma simulation on prehospital response, radio communication and patient resuscitation combined with formative assessments and debriefing session. Google Form platform was used to gather the trainees' self-appraisals of the learning experience. Feedbacks from the trainees revealed that the sessions were engaging and appropriate to their level of training. In conclusion, by incorporating AL activities into immersive trauma CME, it promotes trainees' engagement towards teaching and learning activities thus consolidating their knowledge and skills on handling trauma patients.

Keywords: Active learning; emergency medicine; immersive; simulation, student-centered

Abstrak

Pendidikan Perubatan Berterusan (CME) merupakan unsur penting dalam program pasca siswazah bagi memastikan tahap kompetensi pelatih setanding dengan amalan klinikal yang terkini. Ini seterusnya akan membantu meningkatkan kualiti penjagaan kesihatan pesakit. Walau bagaimanapun, mengimbangi keperluan untuk pendidikan berterusan adalah mencabar kerana pelatih pasca siswazah juga merupakan sebahagian dari tenaga kerja hospital. Oleh itu, adalah penting supaya sesi CME yang dijalankan itu padat tanpa menjejaskan pengalaman pembelajaran pelatih. Rangka kerja untuk program CME trauma telah dibangunkan di peringkat jabatan berdasarkan kurikulum program pasca siswazah perubatan kecemasan yang mengintegrasikan aktiviti pembelajaran aktif imersif yang berpusatkan pelatih. Ia dibahagikan kepada tiga komponen yang terdiri daripada persidangan mini mengenai prinsip dan pengetahuan terkini pengurusan pesakit trauma; sesi stesen kemahiran menggunakan scenario dan manikin atau model beserta pakej pembelajaran yang berkaitan; dan simulasi trauma imersif menggunakan senario klinikal yang melibatkan pra-hospital, komunikasi radio dan resusitasi pesakit yang digabungkan dengan penilaian formatif dan perbincangan berkumpulan. Penilaian kendiri pelatih terhadap pengalaman pembelajaran telah dikumpulkan melalui pelantar Google form. Majoriti pelatih bersetuju bahawa sesi CME yang dijalankan adalah menarik dan bersesuaian dengan tahap latihan yang diperlukan. Kesimpulannya, pembelajaran secara aktif dalam sesi CME trauma imersif menggalakkan penyertaan pelatih dalam aktiviti pengajaran dan pembelajaran. Ini seterusnya akan membolehkan pelatih memperkukuhkan tahap pengetahuan dan kemahiran mereka dalam pengurusan pesakit trauma.

Kata kunci: Pembelajaran aktif; perubatan kecemasan; imersif; simulasi; pembelajaran berpusatkan pelajar

1.0 INTRODUCTION

Continuous Medical Education (CME) is an important component of postgraduate medical education to ensure a culture of knowledge-based practice and evidence-based medicine is in place. CME is essential to ensure that healthcare workers stay updated on clinical practices as it is shown to improve physician performance and patient outcomes (Cervero & Gaines, 2015). Research evaluating CME effectiveness has indicated that case-based studies and multiple educational platforms are superior in improving patient health outcomes than isolated traditional didactic sessions (Davis & Galbraith, 2009; Shiang et al. 2020). However, balancing the need for learning activities and continuous education sessions poses a challenge as the trainees are also the actual workforce in our healthcare system. To address this, the learning

activities should be improvised to ensure our trainees received the necessary education and training.

One of the conventional ways for education in medical practice is by attending physical conferences. However, this eventually acts as a meeting point for gathering professional credits for renewal of licenses or membership. To overcome this, an onsite CME within the institution they are practicing, can facilitate the knowledge and skills acquisition within a limited time and resources (Whitcomb, 2002). To promote critical thinking, problem-solving ability and positive life-long attitude towards knowledge acquisition, an interactive learning platform which incorporates active learning (AL) instead of didactic one-way learning is the way forward.

The emergency medicine (EM) program, UKM currently has 129 trainees from year 1 to year 4. The program can only allocate 5 hours per week for a supervised CME session combined with other academic activities as the trainees are required to undergo multiple rotations at different departments or hospitals. Hence, it is important that the CME sessions are compact with maximum learning benefit without compromising the learning experience. With the traditional, didactic one-way learning of the CME sessions in which trainees were given topics to prepare and present, trainees found that attendance and interest were very low. This in return was reflected in their performances during the clinical duties.

A reform in the CME structure was planned which incorporates the suggestions for improvement from the trainees. Interactive CME sessions utilizing multiple methods of learning were the main focus of the transformation. A framework was planned based on the EM training curriculum in which was applied for the trauma CME, Figure 1. Thus, this is the ideal theme to try out this new approach as trauma management is an important core knowledge and competency to be acquired in the EM program. Furthermore, in 2022, transport accidents are the 5th leading cause of death and the leading cause of death among young population aged 0-14 years old (Department of Statistics Malaysia, 2022). The important role of the emergency department in the initial phase of acute trauma management makes it an important skill to be acquired by the EM trainees (Giannoudis et al. 2023).

This article describes a teaching and learning experience whereby the authors implemented a simulation exercise led by trainees to integrate theoretical knowledge and practical experience, with the aim of introducing and enhancing fundamental knowledge in the management of trauma patients among postgraduate EM trainees at Hospital Canselor

Tuanku Muhriz. The article aims to elucidate the pedagogical approach employed during the instructional and educational session, while also providing a justification for its implementation.

2.0 MATERIALS AND METHODS

The CME program was planned as a half-day weekly session in the month of June 2023. The initial stage started with outlining the learning outcomes and topics via a discussion session between the facilitators i.e. the lecturers and a group of trainees in charge of the trauma CME, Figure 1. Once the planning was finalized, Table 1, the trainees were then divided into smaller groups with designated sessions. The facilitators' roles were mainly to guide the trainees and to review the trainee-prepared learning materials.
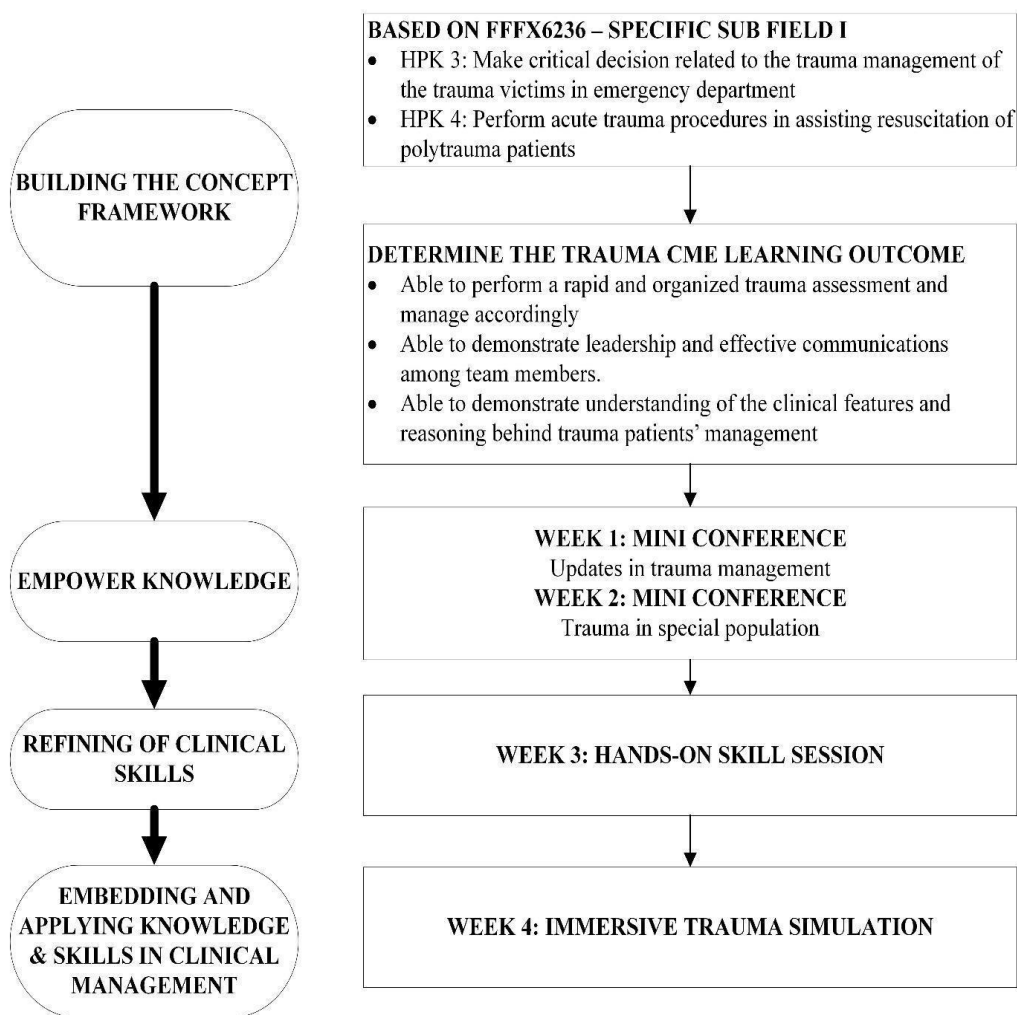

BUILDING THE CONCEPT FRAMEWORK

BASED ON FFFX6236 – SPECIFIC SUB FIELD I
- HPK 3: Make critical decision related to the trauma management of the trauma victims in emergency department
- HPK 4: Perform acute trauma procedures in assisting resuscitation of polytrauma patients

DETERMINE THE TRAUMA CME LEARNING OUTCOME
- Able to perform a rapid and organized trauma assessment and manage accordingly
- Able to demonstrate leadership and effective communications among team members.
- Able to demonstrate understanding of the clinical features and reasoning behind trauma patients' management

EMPOWER KNOWLEDGE

WEEK 1: MINI CONFERENCE
Updates in trauma management
WEEK 2: MINI CONFERENCE
Trauma in special population

REFINING OF CLINICAL SKILLS

WEEK 3: HANDS-ON SKILL SESSION

EMBEDDING AND APPLYING KNOWLEDGE & SKILLS IN CLINICAL MANAGEMENT

WEEK 4: IMMERSIVE TRAUMA SIMULATION

Figure 1. Trauma CME conceptual framework

2.1 TRAUMA MINI-CONFERENCE

The trauma CME started with two half-day mini-conferences on updates in trauma and trauma management in the special population. The topics were chosen based on the trainees' needs and requirements to empower their knowledge on trauma management. Table 2 listed the topics that were covered in which were delivered by clinical experts in the trauma field. The organization of these sessions, done by the allocated trainees, would expose them to the experience on how to plan and run a conference. It was held as a hybrid meeting, in which was streamed live using an online platform to make it accessible for our trainees who were unable to attend these conferences physically.

Table 1. Immersive CME components

Components	Description
Mini conference	Interactive mini lectures delivered face-to-face by invited clinical experts. Topics include updates and pitfalls in clinical practice and trauma management in the special population.
Essential skills in trauma management	Trainee-led practical session of imaging interpretation and emergency procedures. Prior to the CME session, learning materials and video links were distributed among trainees.
Immersive trauma simulation Video	A 30-seconds video on the injury mechanism.
Simulated patients (SP)	3 manikins were brought in accordingly for the allocated trainees' team to assess and manage. The manikins were mocked-up with various injuries which correspond to the findings of the scenarios prepared.
Quiz	Questions on pathophysiology and principles of management using Microsoft Forms platform presented as key featured questions/short essay questions.

Debriefing	Discussion session for each case (simulation and quiz) using debriefing principles led by facilitators.

Table 2. Topics covered in mini-conference

Conference theme	Topics
Updates in trauma management	Thoracic trauma
	Head & neck trauma
	Pediatric trauma
	Pitfalls in current trauma management
	Damage control resuscitation & surgery
Trauma in special population	Thermal injuries
	Abdominal and pelvic trauma
	Perimortem LSCS in trauma
	Geriatric trauma
	Challenges in existing trauma team

2.2 HANDS-ON CLINICAL SKILL STATION

The third session involved five trainee-led, hands-on stations covering the essential skills needed in trauma management i.e. cricothyroidotomy, pericardiocentesis, chest tube, intraosseous and hemostatic suture as well as imaging in trauma, Figure 2. These stations used manikins, phantoms and simulated scenarios. Learning outcomes of each station were discussed between the facilitators and the allocated group of trainees during the session planning.

After both parties achieved mutual agreement on the learning outcome and running of the session, each skill station would be assigned to a trainee who would be responsible to prepare all the needed equipment and learning materials. The facilitator then would review the learning package (learning outcome and procedures checklist and YouTube video links), after which was distributed to other trainees via email or Whatsapp group. During the session, the trainee in-charge would demonstrate each procedure followed by a trainee-guided practice session. The facilitator would be on standby and facilitate if necessary during the session.

Figure 2. Trainee-led hands-on skill session

2.3 IMMERSIVE TRAUMA SIMULATION EXERCISE

The trauma CME culminated into an immersive trauma simulation combined with a quiz and debriefing session, Table 2. Briefing on the learning outcomes and division into three groups consisting of four members per group were performed prior to starting the session. Other attending trainees acted as an observer and would be actively engaged later in the quiz and debriefing session. Briefing also included the synopsis and flow of the session i.e. a motor vehicle accident involving three polytrauma patients, hence each group needed to manage a patient.

A 30-seconds video of a car accident involving a family was shown in the beginning of the immersive trauma simulation exercise. The scenario then progresses to prehospital response, radio communication and patient resuscitation in which each trainee team were called forward to manage the allocated patients. Two independent assessors who are Emergency Physicians not involved in trauma CME were invited in which the trainees' performance on examination technique, clinical management and team dynamics were evaluated using a checklist. Microsoft Forms platform was used to deliver a quiz. The

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questions were designed as key featured questions and short notes essays by the facilitators. It is unique for each case with the aim to assess the trainees' knowledge on each patient's management. All trainees which include the team members actively involved in the simulation and the observant trainees were required to take part. A guided debriefing session ended the CME which was led by the facilitator. Discussion points include any observation during the simulation exercise, answers to the quiz, misconceptions and the do's and don'ts of trauma management, Figure 3.

2.4 CME SESSION EVALUATION METHOD

A feedback form was distributed via Google Form to the trainees upon completion of the last CME session i.e. the immersive trauma simulation exercise. A four-point Likert scale (strongly disagree, disagree, agree and strongly agree) was used to gauge the trainees' perception towards the CME teaching activities (course preparation, introduction, moulage, quiz, debriefing and skill mastery). Perception is defined as the process of students preference towards the teaching learning method. The results were reported descriptively as numbers (N) and percentage (%).

Figure 3. (A) Immersive trauma simulation session, (B): trauma simulation exercise, (C): quiz session, (D): debriefing session

3.0 RESULTS

The practical skill session was attended by 50 trainees and 30 trainees attended the immersive trauma simulation CME session. The study managed to obtain 10 trainees' self-appraisals of their learning experience on the immersive trauma simulation CME. All of them agreed that the immersive simulation exercise was very engaging and the content and complexity level of the cases were appropriate. However, five trainees were still not confident to be a team leader with one trainee who claimed no increase in trauma management knowledge, Table 3. Nonetheless, all trainees agreed that they were confident to perform a primary survey on a trauma patient. Written feedback included "very informative, clinical application of knowledge" and "make more CME with interactive sessions like this".

Table 3. Trainees self-appraisal's learning experience on the immersive trauma simulation

Item	Strongly disagree N (%)	Disagree N (%)	Agree N (%)	Strongly agree N (%)
1. Learning outcomes were clearly stated	0 (0)	0 (0)	0 (0)	10 (100)
2. Content is appropriate to the course	0 (0)	0 (0)	5 (50)	5 (50)
3. The exercise is very engaging & interesting	0 (0)	0 (0)	4 (40)	6 (60)
4. The complexity of cases is appropriate	0 (0)	0 (0)	4 (40)	6 (60)
5. I am able to actively participate in this session	0 (0)	1 (10)	5 (50)	4 (40)
6. The take home messages were clear	0 (0)	0 (0)	5 (50)	5 (50)
7. I am confident to perform primary survey	0 (0)	0 (0)	5 (50)	5 (50)
8. I still don't have the confidence to be a team leader	1 (10)	4 (40)	4 (40)	1 (10)
9. My knowledge on trauma management has increased	0 (0)	1 (10)	5 (50)	4 (40)
10. I am able to provide clinical reasoning of my management in a trauma patient if asked	0 (0)	0 (0)	6 (60)	4 (40)

4.0 DISCUSSION

The elements that make up Active Learning (AL) are critical reflection, intentional engagement and purposeful observation (Graffam, 2007). Immersive learning, a component of active learning, involves integrating technology with traditional education methods to create a more realistic and engaging learning experience. This approach provides artificially created content or environments that accurately replicate real-life scenarios, allowing learners to acquire new skills and techniques in a controlled environment (Mills et al. 2018). A study on virtual patient training for spinal injury in trauma showed comparable knowledge acquisition to traditional classroom methods, while also improving engagement, stimulation, general perception, and expectations (Courteille et al. 2019). This approach was chosen for the CME to allow students to engage in clinical educational experiences in a controlled environment.

To effectively prepare medical students for the unpredictable and high-stress nature of trauma care, a scoping review has highlighted the need for a combination of low-, medium-, and high-fidelity training (Larraga-García, Quintana-Díaz & Gutiérrez, 2022). Low-fidelity simulations allow for repetitive practice of technical skills in a controlled environment whilst high-fidelity simulations, using advanced technology and realistic patient scenarios, provide a more immersive and challenging learning experience. The incorporation of scenario-based resuscitation and moulage enhances the realism and learning experience for the trainees, ultimately improving their performance during trauma scenarios (Thistlethwaite et al. 2012; Yii et al. 2021). The assessment of simulation exercise performance and knowledge also provides valuable feedback to the trainees, allowing them to identify areas for improvement and further enhance their skills. Overall, this structured CME program provides a controlled environment for learning activities that combines both technical and non-technical skills training in trauma.

In contrast to expensive simulation training models for example 3-dimensional printed models or commercial standard models sold commercially, low-tech models, manikins and standardized patients are acceptable alternatives for training and continuous education in resource-limited settings (Irfanullah et al. 2023). These options are more feasible for middle-to-low income countries as it offers a sustainable solution due to lesser financial investment. Furthermore, encouraging trainees to develop their own learning modules and construct training models using readily available materials promotes autonomy and reduces the need for additional manpower to run the CME session. This approach indirectly fosters AL and engagement among trainees during the CME session. Adapting trainee-led approaches in our CME sessions also provide a feasible and effective way of learning. Studies have shown that

trainee-led cum peer-led training is equally effective as health professional-led or educator led-training. The learning could occur in an informal and more relaxing environment which allows better communication and effective educational exchange (Glynn et al. 2006; Fujiwara et al. 2011; Guraya & Abdalla, 2020).

Simulation training has been documented to play a positive role in increasing clinical skills competencies, critical thinking skills and self-confidence (Cant & Cooper, 2010; Guerrero, Ali & Attallah, 2022). The feedback revealed majority trainees claimed increased trauma management knowledge and were confident to perform primary surveys. However, nearly half of them did not have the confidence to lead a trauma resuscitation. Trauma resuscitation consisted of multiple levels of tasks complexities which required a skilled leader to lead and coordinate the team members. To develop these leadership skills, a specific simulation-based team leadership training program should be conducted in addition to continuous exposure in a clinical setting (Ford et al. 2016; Fernandez et al. 2020). This however, was not addressed in the CME sessions which mainly concentrated on empowerment of trauma knowledge and strengthening of trauma clinical skills.

Despite well-known benefits of AL-like immersive learning there is slow uptake in its incorporation in medical education due to multiple factors like cost, extensive planning and organization as well as human resources (Bucklin et al. 2021; Irfanullah et al. 2023). By empowering trainees to take ownership of the learning experience in the AL-like immersive modules these perceived drawbacks should be addressed. Integrating multiple strategies of learning in the CME such as didactic approach, trainee-led and competency-based activities ensured a more positive environment of learning. An education system which promotes a positive learning atmosphere will optimally prepare the trainees for independent practice on the clinical floor as well as increase their motivation for self-learning (Dijkstra et al. 2015; Bucklin et al. 2021).

5.0 CONCLUSION

An immersive learning experience is one of the methods that enable postgraduate trainees to apply and consolidate their knowledge on clinical practice. It provides an environment that accurately replicates real situations in order to learn and refine clinical skills and techniques. Trainees became active participants who are responsible for their learning experience hence an increased engagement in the planned CME sessions.

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