ORIGINAL ARTICLE

Improving the self-confidence level of medical undergraduates during emergencies using high fidelity simulation

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ABSTRACT

Introduction: Medical practice involves routinely making critical decisions regarding patient care and management. Many factors influence the decision-making process, and self-confidence has been found to be an important factor in effective decision-making. With the proper transfer of knowledge during their undergraduate studies, self-confidence levels can be improved. The purpose of this study was to evaluate the use of High Fidelity Simulation as a component of medical education to improve the confidence levels of medical undergraduates during emergencies.

Methodology: Study participants included a total of 60 final year medical undergraduates during their rotation in Medical Senior Posting. They participated in a simulation exercise using a high fidelity simulator, and their confidence level measured using a self-administered questionnaire.

Results: The results found that the confidence levels of 'Assessment of an Emergency Patient', 'Diagnosing Arrhythmias', 'Emergency Airway Management', 'Performing Cardio-pulmonary Resuscitation', 'Using the Defibrillator' and 'Using Emergency Drugs' showed a statistically significant increase in confidence levels after the simulation exercise. The mean confidence levels also rose from 2.85 to 3.83 ($p<0.05$).

Conclusion: We recommend further use of High Fidelity Simulation in medical education to improve the confidence levels of medical undergraduates.

KEY WORDS:
High Fidelity Simulation, Self-confidence, Medical Education

INTRODUCTION

An accurate and immediate diagnosis and management of critically ill emergency patients is of utmost importance.[1-5] Although many protocols were made to aid this process, there has been limited focus on the non-clinical skills of healthcare providers during emergencies. Among these skills, self-confidence remains as an important factor in effective decision making.[6] Imparting sound medical knowledge and providing ample opportunities for practical application during their undergraduate studies can improve the self-confidence level of future doctors. Although many methods have been tried over the years, medical simulation training has proved to be the most promising method to fulfill this skill.[7-10]

High Fidelity Simulation (HFS) in medical education provides an opportunity for students to practice and learn in an environment that is as close as possible to reality. This allows them to acquire knowledge and skills in a safe environment.[11,12] Although published researches have explored the role of medical simulation to improve the knowledge and confidence of medical doctors, not many have evaluated its role in the medical undergraduate curriculum.

The purpose of this study was to evaluate the use of HFS as a component of medical education to improve the confidence levels of medical undergraduates during emergencies.

MATERIALS AND METHODS

Study Setting

A full scale, high fidelity mannequin, model Laerdal 3G SimMan (Laerdal Medical Corporation, USA) was utilised in the Simulation Center of the Faculty of Medicine and Health Science, University Malaysia Sabah. The simulation lab where the exercise took place was simulated as a ward, with a vital signs monitor, a fully equipped resuscitation trolley and a manual defibrillator provided. A wall-mounted video camera was positioned to record student performance during the exercise and to assist in the debriefing session.

Population

Study participants included a total of 60 final year medical undergraduates during their Medical Senior Posting rotation.

Measurements

The students completed a pre-test assessment prior to starting the simulation module. The pre-test assessment consists of 20 multiple-choice questions testing the students' understanding of assessment and management of an emergency, which included Advanced Life Support (ALS) management. There were six questions to assess their confidence levels in various components of emergency assessments and providing emergency care (Assessment of an Emergency Patient, Diagnosing Arrhythmias, Emergency Airway Management,

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Table I: Self-confidence levels of medical undergraduates before and after the emergency simulation module

	Mean Pre-test	Mean Post-test	Sig
Mean Confidence	2.85 ± 0.50	3.83 ± 0.45	0.000
Assessment of an emergency patient	3.27 ± 0.84	3.85 ± 0.68	0.001
Diagnosing arrhythmias	2.73 ± 0.63	3.68 ± 0.66	0.010
Emergency airway management	2.93 ± 0.82	3.60 ± 0.67	0.012
Performing cardio-pulmonary resuscitation	3.22 ± 0.64	4.60 ± 0.49	0.000
Using the defibrillator	2.58 ± 0.81	4.07 ± 0.63	0.001
Using emergency drugs	2.33 ± 0.86	3.25 ± 0.75	0.004

Performing Cardio-pulmonary Resuscitation, Using the Defibrillator and Using Emergency Drugs). A Likert-scale were used to assess their self-confidence in each component. These questions were made and discussed thoroughly with a team of medical specialist after evaluating the given emergency scenario. After the simulation exercise and debriefing session, the students completed a post-test assessment, which was identical to the pre-test questionnaire, the same self-confidence questions and a module evaluation survey.

Study Design

A medical management algorithm was constructed and was based on core concepts identified by the team of lecturers of UMS. The algorithm was programmed into the computerised simulation mannequin, which will respond physiologically based on the student's action in managing the patient. Prior to implementation, the simulation exercise was piloted among five 4th year medical undergraduates, revised and then finalised by a team of lecturers. The faculty was trained to observe students, complete a performance checklist, and provide feedback immediately following each session.

Before starting the simulation module, the 5th year undergraduates spent some time with a clinical instructor to familiarise themselves with the mannequin and the layout of the simulation centre. They were also given a brief explanation regarding the Advanced Life Support (ALS) guidelines and allowed time for skill practice on a task trainer.

After completing the pre-test assessment, groups of five students were given 15 minutes to complete a simulation scenario using the high-fidelity mannequin (Laerdal 3G SimMan).

A brief history was provided featuring a patient in respiratory distress. Students were instructed to perform an assessment of the patient, which included history taking and physical examination. They were also instructed to generate a differential diagnosis and initiate management. The mannequin is programmed to deteriorate in oxygen saturation, which eventually produced arrhythmias. The mannequin was programmed to react to student interventions.

After the simulation exercise, the students were debriefed by a lecturer with the help of video playback. Immediately after the debriefing, the students completed a post-test assessment, which was identical to the pre-test assessment.

Data Analysis

Data analysis for the knowledge questions was conducted using a paired t-test comparing pre- versus post-test. Statistical significance was set at $p<0.05$. The confidence questions were analysed using a 5-point Likert scale (1-very low to 5-very high).

RESULTS

Sixty final year medical students consisting of 36 males and 24 females attended the HFS Medical Emergency exercise. The average age of the students was 22. All of them had completed a series of basic lectures and practical sessions on emergency resuscitation in the last 4 years of medical school.

The confidence levels of each component were evaluated; Assessment of an Emergency Patient, Diagnosing Arrhythmias, Emergency Airway Management, Performing Cardio-pulmonary Resuscitation, Using the Defibrillator and Using Emergency Drugs. All components showed a statistically significant increase in confidence levels after the exercise. The overall mean confidence levels also rose from 2.85 to 3.83 ($p<0.05$). The results are presented in Table I. There was also a significant increase in correct test answers between pre- and post-simulation module, from 68.6% to 82.5% ($p<0.05$).

The written feedback from the participants was very encouraging. Several of them acknowledged the increase in their self-confidence levels.

- 'I feel more confident now'
- 'I didn't think simulation can make me feel confident'
- 'I am ready for the real emergency now'

Some of the participants also expressed their satisfaction with the simulation exercise.

- "This module is very good to improve my skills as a doctor'
- 'I do hope we can have simulation more often in our medical studies'

DISCUSSION

Our study shows that a High Fidelity Simulation exercise in emergency medicine is effective in improving the self-confidence levels of medical undergraduates in dealing with medical emergencies. The knowledge of emergency medicine and resuscitation can also be improved using this method of teaching.

Confidence plays an important role in the clinical performance of a doctor. The common problem medical undergraduates' face when they begin working as doctors is

lack of self-confidence during emergencies.[13-14] This may be due to the lack of clinical experience they obtained during their undergraduate studies, especially during emergencies. In most teaching hospitals in the region, emergencies are attended by the senior doctors, tagged by several junior staff. The medical students rarely get an opportunity to be the first responder in an emergency. HFS exercises like this creates a scenario similar to a real emergency yet in a safe learning environment. This gives them an opportunity to practice, learn from their own mistakes, and improve themselves. This method will eventually raise their confidence levels when dealing with a similar scenario in real life.

A large percentage of the feedback from the participants was suggestions to expand the current curriculum to include simulation in all clinical postings. These postings included paediatric, obstetrics and orthopaedics. However, it must be emphasised that medical simulation must be preceded by lectures and other self-guided learning modules. It would not be beneficial for students to be thrown into an emergency scenario without acquiring the basic knowledge and skills required to deal with that emergency. For this reason, the learning objectives of the simulation exercises must be clearly emphasised and explained prior to the simulation session. The simulation session should not be used as a place to learn new knowledge.

It must be reemphasised that HFS is not a tool to replace real clinical work at the hospital. Medical simulation is merely the bridge from novice medical students to confident doctors, prepared to effectively manage real patients.

LIMITATIONS

As this was an initial small-scale study, there were several limitations. The first limitation is the small sample size. We only recruited final year undergraduates, as we needed to ensure that the participants had the necessary knowledge of resuscitation before performing a simulation exercise. Another limitation was that longitudinal follow-up of the self-confidence levels would be useful but was not done. The retention of self-confidence and knowledge of resuscitation after several months of the exercise would further fortify the use of HFS in medical undergraduate studies. Other studies that could be beneficial would be an assessment of medical officer's self-confidence levels after an exposure of medical simulation during their undergraduate studies, and the usefulness of HFS in improving non-technical skills such as communication and teamwork.

CONCLUSION

In conclusion, we recommend further use of HFS in medical education to improve the self- confidence levels of medical undergraduates. The support of multi-disciplinary departments is much needed to create better utilization of HFS.

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