Intermediate Fidelity Simulation to Learn Emergency Management: Views of Medical Undergraduates in a Metropolitan University in Sri Lanka

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Introduction

The transition from first two years of preclinical phase to clinical phase of undergraduate training is a challenging period for the medical students. They develop clinical skills from third to final years by rotating between various clinical clerkships. Students are expected to gain the required level of clinical competence through tee rotations to work as clinicians upon graduation. However, in the management of emergencies, the medical students' exposure is limited to being peripheral observers, and the management of emergencies is mostly confined to theoretical classroom-based teaching (Gordon, et al., 2001), which is the idea for providing the optimal patient care but far from the ideal in educational perspective. Researchers, therefore, have explored the place of simulation to facilitate medical undergraduates to learn clinical skills related to management of common medical emergencies.

Simulation is widely employed globally in training healthcare professionals including medical undergraduates (Morgan & Cleave-Hogg, 2002). In undergraduate curricula, training students using high fidelity simulators were very successful as it encourages the provision of feedback (Gordon, et al.,2001; Morgan & Cleave-Hogg, 2000). Simulation has also been recognized as an effective educational strategy to reduce medical errors, particularly in the management of medical emergencies (Berwick & Leape, 1999). The literature provides ample evidence on the role of simulation-based learning in improving knowledge and skills of learners in the management of emergencies (O'Flynn & Shorten,2009; Okuda, et al., 2009). However, Sri Lanka has lagged behind other countries in incorporating simulation-based learning in undergraduate medical curricula. This could probably be due to high costs associated with high-fidelity simulators (Bradley, 2006; Maran & Glavin, 2003).

This study aims to evaluate the place of low cost, instructor driven, intermediate-fidelity simulator-based training in developing the skills of managing medical emergencies among medical undergraduates.

Methodology

The simulation-based training on the management of medical emergencies was piloted among 80 volunteering fourth-year medical students of the Faculty of Medicine, University of Kelaniya. They had already undergone eight-week clerkships in medicine and had attended the emergency treatment unit, medical wards and lectures in management of common medical emergencies prior to the commencement of the simulation sessions. The students participated in training on the management of four common medical emergencies at the clinical skills centre as small groups of 6-8. Each group underwent 2 hour sessions per scenario. The participating students were allowed to withdraw from the sessions at any time. Students were reassured that they were not expected to perform beyond their abilities and their performance would not affect their assessments. An intermediate fidelity simulator consisting of a full body mannequin and instructor driven responses was used in the study which differs from model driven high fidelity simulators complete with automated responses.

Four common medical emergencies were presented to the students: haematemesis, anaphylaxis, acute severe asthma and cardiac arrest. The students were presented with the problem by the facilitator following which students were given time to plan their responses. The facilitator observed

while the students managed the emergencies as groups of 6-8. The facilitator assisted the students when in need, acting as a nurse, thereby preventing inappropriate treatment or prompting initiation

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of necessary treatment. This prevented simulator death as simulator death could be stressful to the students and could affect the learners negatively. The scenarios were followed by a debriefing session where the students clarified any concerns.

The students responded to a paper-based self-administered questionnaire at the end of the session which included two parts: Part 1 included items on student perceptions on the simulation-based training activity using a rating scale from 1-5 (1=strongly disagree and 5=strongly agree). The items explored the safety of the learning environment, working as a team, improvement in self-confidence to manage similar situations during practice, application of theory into practice, improvement in knowledge and skills on managing medical emergencies and overall views on simulation based training. Students also rated their level of confidence in dealing with medical emergencies prior to and after the simulation-based learning session on a scale of 1-5, where 1=beginner and 5=master; Part 2 of the questionnaire included open-ended questions with general written comments which sought their opinion on the use of simulation-based learning in undergraduate medical education.

The data gathered from the questionnaire were analyzed using descriptive statistics. The open-ended questions were coded and analyzed for recurring themes.

Results and Discussion

All 80 students responded to the questionnaire. Students rated the simulation-based learning session very positively (Table 1). The students felt safe in the simulated learning environment and indicated that the session helped to improve their knowledge and skills with regard to management of medical emergencies.

Table 1. Responses to the questionnaire

Question	Median	Inter-quartile range (IQR)	Range
(a) was the learning environment safe?	4	4-5	4-5
(b) were you encouraged to work as a team?	5	4-5	4-5
(c) did the session improve your confidence to participate in the clinical setting?	4	4-5	4-5
(d) did the session helped you to put theory into practice?	5	4-5	4-5
(e) did the session improve your knowledge on management of medical emergencies?	4	3-4	2-4
(f) did the session improve your skills on management of emergencies?	4	4-5	4-5
(g) was the simulation session a valuable experience?	5	4-5	4-5

1=Strongly disagree, 2=Disagree, 3=Neither agree nor disagree, 4=Agree, 5=Strongly agree

74 (92.5%) students felt an increase in their self-competency with regard to management of medical emergencies following the simulation-based learning session where they rated competency with 1=beginner to 5=master. 34 (42.5%) students felt their competency level increased from level 2 to level 3 while 17 (21.2%) students felt their competency level increased from level 1 to level 3. The mean increase in competency was 1.2 which was statistically significant (p<0.001). 50 (62.5%)) students felt the competency level increase by 1 level but 6 (7.5%) students indicated their competency level did not change with the simulation session. Table 2 shows the change in competency following the simulation-based learning sessions.

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Table 2. Change of competency levels after simulation-based training

Competency level before	Competency level after			
	1	2	3	4
1 (N=31)	2 (6.4%) (unchanged)	12 (38.7%)	17 (54.9%)	0
2 (N=44)	0	3 (6.8%) (unchanged)	34 (77.2%)	7(16%)
3 (N=5)	0	0	1(20%) (unchanged)	4(80%)
4 (N=0)	0	0	0	0

74 students responded to the open ended questionnaire with a response rate of 92.5%. With regard to use of simulation in undergraduate medical curricula, all students were positive with comments such as "excellent", "interesting", "useful" and "wonderful". Table 3 shows the students' opinion on the uses of simulation-based learning on their education.

Table 3. The students' opinion on use of simulation in undergraduate medical education

Written comment groupings		Student responses (%)
Overall assessment	Interesting	56 (70.0)
	Useful	42 (52.5)
Theory into practice	Hands on experience	26 (32.5)
	Good practice	44 (55.0)
Teaching utility	Useful learning tool	33 (41.2)
	Encourage learning	25 (31.2)
	Promote team work	23 (28.5)
Future goals	Need more sessions	31 (38.5)
	Make it mandatory	10 (12.5)
	Start from first year	39 (48.7)

87.5% (n=70) students expressed simulation helped them to put theory into practice (typified by the comments 'can have hands on experience" and "gave an opportunity to practice". 31 (38.5%) students felt they should have more simulation sessions in the curriculum and 10 (12.5%) students felt simulation sessions should be made mandatory. 39 (48.7%) students felt they should start simulation-based leaning sessions from the first year onwards "to get the feel of being a doctor".

In this study, the students rated the simulation-based learning as a valuable experience. The students were encouraged to apply theoretical knowledge to practice in management of medical emergencies and found a safe environment to practice their skills. Students felt their self-assessed competency improve with simulation-based learning session and appeared to have increased level of confidence to deal with medical emergencies. They wanted more exposure with simulation-based learning sessions and felt they should start simulation sessions early in the undergraduate curriculum. Simulation-based learning allows students to actively engage and learn through practice in a safe environment. It helps students to improve both knowledge and skills, complying with similar studies.

Studies conducted previously among medical students have found that students value simulation-based leaning highly (Gordon, et al.,2001; Morgan & Cleave-Hogg, 2000; Weller, 2004). Our study

confirmed their findings and confirm that the positive attributes of simulation based medical education transcends different institutions and countries across the world.

This study differs from the rest as previous studies have used high-fidelity and medium fidelity simulators. McGaghie, et al. (2010) points out the significance of conducting research to assess the level of simulator fidelity required to achieve learning outcomes. The present study demonstrated similarly high levels of satisfaction among the students as observed in the above studies with the use of an instructor driven intermediate fidelity simulator. This emphasize the feasibility of using low technology, low cost simulators effectively and satisfactorily in undergraduate medical curricula. This is of importance specially in the Sri Lankan context where high fidelity simulators are a costly and an unaffordable method of education.

Conclusion

This study demonstrated that medical students value simulation-based learning as a useful educational experience. Simulation-based learning allows students to practice in a safe learning environment and provides opportunity to integrate theoretical knowledge and practice while improving both self-confidence and competence. An instructor-driven intermediate-fidelity simulator can be used effectively in Sri Lankan undergraduate medical education. However, this study was limited to the students' self-assessment and their opinions. More research is needed to explore the skill transfer to real practice setting to justify the use of simulation-based learning in medical curricula.

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