Original Article

Perception of Simulation-based Learning among Medical Students in South India

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Abstract

Background: Traditional methods of educating medical students are no longer sufficient in the current era largely influenced by multimedia. Simulation-based techniques may play a pivotal role in bridging this educational gap. **Aim:** This study was conducted to explore the perception of medical students towards simulation-based learning (SBL). **Subjects and Methods:** This cross-sectional study was conducted in May 2013 in a private medical college in Mangalore, Karnataka, India. A total of 247 participants from fourth, sixth, eighth semester and internship were chosen by convenience sampling method. Attitudinal data on perception towards SBL were collected using a self-administered questionnaire with responses in a 5-point Likert's scale. **Results:** The mean age of students was 21.3 (standard deviation 1.9) years, and males constituted 55.5% (137/247). Most participants 72.5% (179/247) had favorable perceptions of SBL, with scores of92–118 out of a possible 118 points. Favorable perception towards SBL was seen significantly more among female students ($P = 0.04$) and senior MBBS students of sixth and eighth semesters ($P = 0.05$). Nearly, all students (90.7%; 224/247) agreed that simulation supports the development of clinical skills. As many as 29.6% (73/247) agreed that real patients might be replaced with simulated patients in practical examinations. **Conclusion:** SBL was perceived as favorable by a large number of participants in this study indicating a bright prospect for its implementation in the medical curriculum.

Keywords: Interns, Medical students, Perception, Simulation-based learning

Introduction

The current medical education training system regarding clinical care of patients in terms of history taking, physical examination, diagnosis and management in medical schools has been reported to be inadequate by students even after graduation.[1] Not seeing a number of important diagnosis during training periods could pose a significant knowledge gap which eventually gets carried forward to internship and would eventually affect patient care.[2,3]

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Use of simulation in teaching medicine could be a solution to bridge this knowledge gap.[1] Simulation is an instructional process that substitutes real patient encounters with artificial models created by screen-based computer simulations, partial-task simulators and high-fidelity whole body mannequins. Simulators replicate patient care scenarios in a realistic environment and also have the benefit of enabling repetition of the same scenario in a controlled environment. This allows practice without risk to the patient thereby minimizing chances of medical error. Furthermore, the recording and feedback options in modern simulators make them a useful tool for student assessment.[4,5] Simulation-based learning (SBL) can also provide an ideal background for learning and improving teamwork skills and behavioral skills. These skills are essential for trainees as health care delivery has become increasingly a multidisciplinary activity.[6-8] It is therefore not surprising that prior research has favored integration of SBL into the formal medical curriculum.[9,10]

Health services and academic institutions around the world are now recognizing the importance of SBL and are establishing more of skills labs in simulated clinical settings. Professional and regulatory organizations have also begun to accept teaching hours spent on simulation-based practice as a proxy for some clinical placements or operative skills.[11-14]

In spite of advancements in the field of SBL elsewhere, it has so far not been formally introduced in medical colleges in our settings. With this background, this study was conducted to explore the perception of medical students in South India towards SBL.

Subjects and Methods

This cross-sectional study was done in a private medical college in Mangalore city in May 2013. The ethical approval for conducting this study was obtained from Institutional Ethics committee. Permission to conduct the study was subsequently obtained from the head of the institution. A sample size of 178 was determined using a confidence level of 95% with 15% degree of precision of the expected proportion and an estimated minimum prevalence of favorable perception toward SBL to be 50%. Adding a nonresponse rate of 10%, the final minimum sample size was calculated as 196. Students were chosen from the fourth, sixth, eighth semester and housemanship through convenience sampling method so that the sample will have a representation of second, third, final phase medical students and junior doctors of this institution. The students were briefed about the objective of the study and written informed consent was taken for their participation. Only students who have heard about SBL were invited to participate in this study.

A pretested self-administered semi-structured questionnaire was used for data collection which contained questions on demographic information and perception towards SBL.

The questionnaire was subjected to a pilot trial on 10 students before it was distributed in its final form. Each response for the question meant to assess perceptions towards SBL was given responses “strongly disagree,” “disagree,” “neutral,” “agree,” and “strongly agree” on a Likert’s scale with scores ranging from 1 to 5 points respectively. Scoring was done in the reverse order for negative questions on perception. Cumulative scores from 38 to 64 was considered poor, 65–91 as neutral and 92–118 as favorable level of perception.

Incompletely filled questionnaires were excluded from the analysis. The data entry and analysis were done using Statistical Package for Social Sciences software package (SPSS Inc., Chicago, IL, USA) version 16. Chi-square test was used to find out the association of demographic variables with the perception level among participants. $P \leq 0.05$ was taken as a statistically significant association.

Results

Of the total 265 participants who took part in this study completely filled in questionnaires were returned by 247 participants. Among these 247 participants, about half were males 55.5% (137/247). Mean age of students was 21.3 (standard deviation 1.9) years (95% confidence interval being 21.1 years to 21.5 years). Most participants had a favorable perception about SBL 72.5% (179/247) and the rest had a neutral perception 27.5% (68/247). None of the students had poor perception towards SBL. Age of students was not influencing their perception towards SBL ($P = 0.82$). Favorable perception towards SBL was seen significantly higher among female students ($P = 0.04$) and senior MBBS students of sixth and eighth semesters ($P = 0.05$) [Table 1].

Nearly, all students (90.7%, 224/247) felt that simulation can support the development of clinical skills. But most students felt that repeated use of SBL in medical training would adversely affect communication skills, team behavior, ethical values and feeling of empathy to real patients. Although most participants believed that SBL can create a highly realistic, safe and reproducible learning environment, majority were not in favor of replacing real patients in clinical examinations with simulators. Most participants were also concerned about the cost associated with simulation equipments. However, majority did not feel that use of SBL will any way minimize role of teachers in training process nor did they think that teachers would minimize their efforts in training students by use of simulators [Table 2].

Table 1: Association between sociodemographic variables with perception towards SBL among participants

Socio-demographc characteristics	Neutral perception (%)	Good perception (%)	Total
Age (years)			
≤19	11 (24.4)	34 (75.6)	45
20-21	30 (29.7)	71 (70.3)	101
22-23	18 (29)	44 (71)	62
≥24	9 (23.1)	30 (76.9)	39
	χ^2=0.912, P=0.82		
Gender			
Males	45 (32.8)	92 (67.2)	137
Females	23 (20.9)	87 (79.1)	110
	χ^2=4.36, P=0.04		
Nationality			
Indians	61 (27.2)	163 (72.8)	224
Foreigners	7 (30.4)	16 (69.6)	23
	χ^2=0.107, P=0.74		
Term of study			
4th semester	46 (34.8)	86 (65.2)	132
6th semester	7 (17.1)	34 (82.9)	41
8th semester	9 (18.7)	39 (81.3)	48
Internship	6 (23.1)	20 (76.9)	26
	χ^2=7.9, P=0.05		
Total	68	179	247

SBL: Simulation-based learning

Table 2: Distribution of perception scores on various aspects of SBL among medical students (*n*=247)

Questions on various aspects of SBL	Number of students who strongly agreed/ agreed (%)	Number of students with neutral response (%)	Number of students who disagreed/ strongly disagreed (%)	Mean score (SD)
Can simulation support the development of clinical skills?	224 (90.7)	12 (4.9)	11 (4.4)	4.25 (0.74)
Can simulation help to see and manage even the rarest of cases in medicine?	167 (67.6)	53 (21.5)	27 (10.9)	3.78 (0.92)
Do you think SBL can help to address the following problems faced by students during clinical postings?				
Minimize standing hours	187 (75.7)	41 (16.6)	19 (7.7)	3.95 (0.89)
Reduce overcrowding	201 (81.4)	29 (11.7)	17 (6.9)	3.99 (0.83)
Reduce learners' fatigue	188 (76.1)	40 (16.2)	19 (7.7)	3.91 (0.89)
Overcome the problem of uncooperative patients	195 (78.9)	36 (14.6)	16 (6.5)	4.04 (0.89)
Solve the problem of getting patients during exams	161 (65.2)	52 (21.1)	34 (13.7)	3.74 (1.04)
Minimize the stressful learning environment usually seen in wards	162 (65.6)	49 (19.8)	36 (14.6)	3.73 (1.04)
Overcome language barrier	175 (70.9)	39 (15.8)	33 (13.3)	3.89 (1.06)
Will constant usage of SBL lead to deterioration in communication skills with the patients?	187 (75.7)	40 (16.2)	20 (8.1)	3.95 (0.93)
Do you feel that repeated practice of the procedure in SBL will improve the performance of the user?	164 (66.4)	66 (26.7)	17 (6.9)	3.83 (0.9)
Do you feel that SBL might improve patient safety?	133 (53.8)	80 (32.4)	34 (13.8)	3.59 (0.6)
Do you feel that SBL can replace live patients in practical examination?	73 (29.6)	57 (23.1)	117 (47.3)	2.71 (1.21)
Do you think that SBL will hamper the role of team efforts by minimizing role identity in an emergency situation?	166 (67.2)	56 (22.7)	25 (10.1)	3.69 (0.91)
Do you believe that the feedback provided by SBL at the end is better than that of bedside teaching?	88 (35.6)	91 (36.8)	68 (27.6)	3.1 (1.1)
Do you feel that SBL should be integrated into the medical educational curriculum?	170 (68.8)	57 (23.1)	20 (8.1)	3.81 (0.88)
Will SBL help to increase the confidence levels of students while dealing with real patients?	161 (65.2)	48 (19.4)	38 (15.4)	3.67 (1.48)
Do you feel that SBL can be used as an adjuvant for clinical practice and not as a replacement to it?	195 (78.9)	38 (15.4)	14 (5.7)	4.09 (0.92)
Do you feel that SBL makes learning medicine easier?	180 (72.9)	55 (22.3)	12 (4.8)	3.86 (0.78)
Do you feel that SBL can create a highly realistic, safe and reproducible learning environment?	137 (55.5)	54 (21.9)	56 (22.6)	3.46 (1.07)
Do you feel that SBL will minimize the role of the teacher?	86 (34.8)	60 (24.3)	101 (40.9)	2.88 (1.2)
Do you feel that SBL will be relatively costly than employing a trained resource person for training?	143 (57.9)	75 (30.4)	29 (11.7)	3.64 (0.97)
Do you feel that importance of ethical issues will be reduced by repeated usage of SBL?	157 (63.6)	67 (27.1)	23 (9.3)	3.91 (3.32)
Do you feel that the teacher will minimize his or her efforts in clinical teaching if SBL becomes a part of the medical curriculum?	134 (54.3)	66 (26.7)	47 (19.0)	3.48 (1.06)
Do you feel that SBL should replace the use of animals in medical experiments?	150 (60.7)	59 (23.9)	38 (15.4)	3.67 (1.12)
Do you feel that more of SBL will minimize the empathy among doctors towards patients?	130 (52.6)	68 (27.5)	49 (19.9)	3.49 (1.1)

SBL: Simulation-based learning, SD: Standard deviation

Of the 247 participants, 20 had undergone formal training in at least one simulation-based procedure. The most common procedure in which training was received was in life support 60% (12/20). Most of these students underwent training at private hospitals 70% (14/20) and most were trained by specialists 65% (13/20) [Table 3].

Discussion

Medical training in the current era is multimodular and SBL may play a pivotal role in improving training standards in medical schools. In this study, nearly three-fourth of students had a favorable perception about SBL indicating a bright prospect for its acceptance if implemented in future as a part of training.

Favorable perception towards SBL was seen significantly more among senior MBBS students of sixth and eighth semesters. This could be because of increase in course requirements felt during final years which is when students begin to actually feel the need to see a variety of cases. Studies done elsewhere reported that students felt simulation models make learning

Table 3: Distribution of training details of students in various simulation-based procedures (*n*=20)

Training characteristics	Number	Percentage
Type of procedure		
Basic life support	6	30
Advanced life support	6	30
Management of normal labor	3	15
Animal experiments	3	15
Surgical procedures	4	20
Place of training		
Government hospital	3	15
Private hospital	14	70
Private clinics	3	15
Trainer particulars		
Medical officers	3	15
Specialist	13	65
Parents who were practitioners	4	20

medicine easier and felt SBL was indeed an interesting experience which was similar to our observations.[15-17] In another study done in USA, 85% medical students felt simulations would be an excellent experience in training.[18]

In the present study, most students felt SBL would solve the problem of limited availability of patients, would provide a varied learning experience by representing a wide variety of patient problem and will provide an opportunity to learn rare clinical cases as also reported by other studies.[19-21]

Participants in other studies felt that simulation was good at providing opportunities for deliberate practice without putting patients at risk which was similar to our observations.[3,6,18,22]

In other studies, participants felt that modern simulators can present simulations that were closer to real-life situations which was similar to opinion of most of our participants.[23-25] However in a study done among medical students in USA, only 38% of them were impressed by the realism created by simulators.[18]

Participants in several other studies felt that simulation exercises would improve teamwork and behavior studies which was different from our observations where majority students felt that it deteriorates communication skills and team efforts.[1,26]

Participants in other studies felt SBL was a reliable tool for assessing learners by providing good feedback on performance ("built in" to a simulator or provided *post-hoc* by viewing a videotape of SBL) which too was felt differently by most of our participants.[1,6,22,27]

Participants in few studies also felt that learners can take responsibility of their own educational progress in SBL leading to the benefit of uniform educational outcomes despite different rates of learner educational progress. SBL thus helps in adaptability to multiple learning strategies and improves the confidence level of its users as felt by most of our participants too.[22,28]

Just as in our study, in other studies too, participants wanted integration of SBL into the medical education curriculum so as to ensure continuity between simulated and clinical learning environments.[6,18,22,28]

Several studies have observed that knowledge, attitude and performance were found to actually improve among medical students following the implementation of SBL.[1,4,6,29]

Simulations were found to improve competency in procedures like pediatric resuscitation, high-risk antepartum obstetric scenario, bedside cardiology, advanced cardiac life support skills among students and residents.[25,30-32] Furthermore, studies have found that medical and public health students taught by simulators perform significantly better than students trained with traditional exercises and practice.[9,23,33] Therefore, it can be inferred that simulation enhances performance to a greater degree than clinical experience alone as perceived by most of our participants too.

Studies have shown that poorly designed simulation and inadequate instruction can promote negative learning, for example,if physical signs are missing then students may neglect to check for these. SBL may also encourage shortcuts, such as omitting patient consent and safety procedures, or it may foster artificial rather than genuine communication skills.[6] Most of our participants too felt that overuse of SBL could hamper ethical values among users. Another important limitation of simulators perceived by majority of our participants was the cost of equipment similar to that reported by 66% participants in a study done in USA.[18]

Conclusion

Implementation of SBL in medical colleges has been perceived favorably by a large number of participants, particularly female students and senior medical students. While the use of SBL is likely to expand with the modernization of medicine and the advent of new technologies and methods, policy development is needed to ensure its coordinated and cost-effective implementation.

Strengths

Very few studies have been done with regards to the role of simulators in training medical professionals and what students perceived of such type of teaching methods. Such innovative teaching methods will help to improve the quality medical care that meets the health needs of individuals, families and communities.

Limitations

This was a single center study and participants were chosen by convenience sampling. Hence findings may not

be generalizable to other settings. Even though SBL was perceived positively by students, it remains unclear whether the skills acquired with this teaching methodology transfer to the real-world settings such as improvement in patient care. Further research is needed to evaluate these aspects.

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