Implementation a Medical Simulation Curriculum in Emergency Medicine Residency Program

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Abstract- Applying simulation in medical education is becoming more and more popular. The use of simulation in medical training has led to effective learning and safer care for patients. Nowadays educators have confronted with the challenge of respecting patient safety or bedside teaching. There is widespread evidence, supported by robust research, systematic reviews and meta-analysis, on how much effective simulation is. Simulation supports the acquisition of procedural, technical and non-technical skills through repetitive practice with feedbacks. Our plan was to induct simulation in emergency medicine residency program in order to ameliorate our defects in clinical bedside training. Our residents believed that simulation could be effective in their real medical practice. They mentioned that facilitators' expertise and good medical knowledge, was the strongest point of the program and lack of proper facilities was the weakest.

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Introduction

Medical trainees are currently encountering a great shift in their teaching paradigm. The increasing amount and interchange speed of medical information make it difficult for medical education to stay current in its curriculum. Today, clinical medicine is focusing more on patients' safety and rights than on bedside teaching. Thus, unfortunately, a disconnection between classrooms and clinical environments is seen. Simulation-based training (SBT) (*in vitro* learning) is an effective method of multi tasks learning. It is characterized by a complex of different scenarios in a controlled environment like clinical skills centers. Repetition, feedback, direct supervision and self-evaluation are the main characteristics (1). It consists of defined outcomes for measurable learning and provides a predesigned situation with artificial models or mannequins, live actors or sophisticated medical devices and applications. SBT is often divided into 4 areas in terms of educational tools: a standardized patient, a screen-based computer, a partial-task simulator and high-fidelity mannequin simulator (2). As facilitators directly observe trainees' practice and give them feedbacks, learning would be accelerated. The simulation would give trainees the opportunity to understand their mistakes and alter their approach immediately in response to constructive criticism (2).

Up to now, the published work on medical simulation highlights that the main aim of it has been to improve the performance of trainees and thereby it will lead to better healthcare delivery and more patient safety (3). Several reviews have been published with the aim of demonstrating the effect of SBT, but although there is an increasing amount of data indicating the positive effect of simulation based medical education (SBME), research in this field is still in its infancy (4-13). Best Evidence Medical Education (BEME) review also describes simulation as a good learning technique that would provide the opportunity to plan according to the needs of different medical education systems (3).

As mentioned before, there is a growing body of evidence supporting the idea that clinical skills acquired in medical simulation training, would lead to improved patient care and outcomes. For example, the effect of simulation on improving patient care was observed in the management of difficult obstetrical deliveries (e.g., shoulder dystocia), laparoscopic surgery and

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bronchoscopy (10-12). Better patient outcomes by implementing SBT have been reported in several studies like postpartum outcomes (e.g., reduction in brachial palsy injury, neonatal hypoxic-ischemic encephalopathy) (10,13).

Ziv *et al.*, concluded that in order to optimize the use of SBME and overcome defects in an education program, SBME should be created in a receptive atmosphere with constructive feedbacks like video feedback and also debriefing. They suggested that the proper and careful development of SBME was an ethical imperative (14).

Ziv *et al*., also believed that SBME should reduce errors and improve medical care. In order to create such an environment, three integral aspects of the medical encounter should be carefully considered and simulated: the physical set-up, the human set-up and the medical tasks expected to be performed (15).

Emergency medicine (EM) residency program in Tehran University of Medical Sciences (TUMS) has consisted of a variety of different practical and theoretical aspects. We decided to apply SBT in the pre-existent curriculum in order to decrease our defects in clinical bedside training. In this article, we decided to show how we implemented this program thus presenting the evaluation part was not our aim.

Materials and Methods

We implemented a mandatory simulation program in EM residency curriculum of TUMS. Seventy-four EM residents of all 3 levels (PGY1, 2 and 3) participated in this new program. Residents had to take one predesigned simulated clinical shift each month in a simulated environment (Hakim Jorjani Simulated Hospital). Each month of simulation program was devoted to cover one of 10 major subjects in EM such as 1-resuscitation and airway management 2-trauma care 3-cardiopulmonary 4-Orthopedics 5-Pediatrics 6-toxicology and environmental disease 7-obstetrics and gynecology 8-internal medicine 9-Neurology 10-EM management and disaster. 3 different scenarios were designed and implemented each month.

Ten of the EM faculties gathered voluntarily and in the very first sessions, we reviewed principles of SBME and scenario writing. During 48 regular sessions, we designed and reviewed 30 scenarios (3 scenarios per month). Topics were chosen from the most common and important issues in EM. After determining the blue print, one faculty member was dedicated to designing each specific scenario. Developed scenarios were presented in the peer review sessions. Each scenario included educational materials (power point presentations and videos), main context containing primary and secondary objectives, needed facilities, description and timing of events, paraclinical findings, references and finally facilitator guide. While revision, we made appropriate changes to cases by adding pertinent medical points extracted from the latest guidelines, articles, and textbooks. We spent about 1000 person-hour for this designing process. Final approved scenarios and required references were rendered to a group of 19 EM faculty members one month earlier and conducted the following month under their direct supervision.

On each simulation day, 6 to 8 residents from all levels, accompanied by a faculty member as a facilitator, were assigned to participate in an 8-hour shift (7:30 am to 3:30 pm) according to their pre-designed schedule. In the beginning, residents were divided into two groups. While one group was playing as the performers, the other took the role as the critics and pointed out all mistakes. Residents had to change their roles in the repeated performance of that scenario. When implementing one scenario, facilitators read out the whole story to residents, played all the necessary roles and gave extra information gradually at the appropriate time. Residents were allowed to carry out the scenario in the way they diagnosed and chose to manage patients, even if it was wrong. Facilitators were instructed not to intervene in the whole process.

Videos were taken from each scenario. In the end, the whole performance was reviewed, and residents discussed their wrong and right practices. At this point, the critics could express their opinions. In a debriefing session, the facilitator wrapped up the case by means of slides and educative videos and reflected residents' mismanagement or misdiagnosis to them. In the second performance, the critics tried to play the whole scenario correctly one more time.

In each scenario, different tools of simulation had been applied. They might be role playing, low to high fidelity mannequins, task trainers, and screen-based simulators. Thus we conducted a hybrid simulation. We spent almost 1000 person-hour for this implementing process.

The scenario number 2 and 3 were also played in the same manner.

On each simulation day, residents talked to their faculty members in a friendly atmosphere, at lunch or tea breaks.

Results

We collected residents' point of view about each session by a predesigned form (Table 1). All residents gave their ideas about each item in an ordinal qualitative scale from 1 (very high) to 5 (very low). Mean, median with 95% confidence interval (CI) are shown in the table below.

Table 1. The evaluation form of scenarios

Items	Mean	CI*	Median
How much was the discussed scenario compatible with your educational needs?	4.84	4.80-4.88	5
How much the discussed scenario simulated the real clinical situation?	4.46	4.38-4.53	5
How much was the discussed scenario effective in increasing your theoretical knowledge?	4.67	4.61-4.73	5
How much was the discussed scenario effective in increasing your practical skills?	4.59	4.52-4.66	5
How much was the discussed scenario effective in increasing your decision-making ability?	4.61	4.54-4.67	5
How much helpful did you find the training tools and facilities?	4.10	4.00-4.19	4
How much was the facilitator teaching quality effective in increasing your capabilities?	4.80	4.81-4.89	5
How much useful did you find the discussed scenario in general?	4.72	4.67-4.78	5

*Confidence interval

Residents believed that our facilities and training tools were not sufficient. They mentioned this factor as the biggest drawback of the program. They pointed out that facilitators were conversant with the scenarios and it was the strongest part of the program.

We should emphasize that as further studies are needed to validate all these results, the evaluation process we did, was not sufficient to show the effect of simulation and this was not our goal in this study.

Discussion

Only a small number of studies were identified that compare the effectiveness of SBME versus traditional clinical education. Many studies are of the belief that SBME is superior to traditional clinical education for the acquisition of a wide range of medical skills, yet respecting patient safety.

McGaghie *et al*., in 2010, published their critical review of simulation-based medical education (SBME) from 2003 to 2009 and they reported 12 top features of SBME: 1-Feedback 2-Deliberate practice 3-Curriculum integration 4-Outcome measurement 5-Simulation fidelity 6-Skill acquisition and maintenance 7-Mastery learning 8-Transfer of practice 9-Team training 10-High-stakes testing 11-Instructor training and 12-Educational and professional context (4).

Issenberg *et al*., in 1999, studied SBME and showed that by means of simulation technology, learners could acquire and practice clinical skills without using live patients (5).

Issenberg *et al*., again in 2005, did a systematic review spanning 35 years and concluded that simulation could facilitate learning when it was conducted in repetitive practice with feedbacks and different levels of difficulty and also integrated throughout the entire curriculum (1).

McGaghie *et al*., in 2011, in a meta-analysis of twenty years, from 1990 to 2010, compared the effectiveness of traditional clinical education versus SBME and they found that SBME was superior to traditional education in gaining skills with specific clinical goals (6).

Bilotta *et al*., in 2013, presented that SBT should be entered in residency training program. They showed positive effects of simulation in patient safety and medical care (7).

Mathai SK in 2014, evaluated implementation a resident-led medical simulation curriculum in internal medicine. Their survey revealed high satisfaction rate for the program (8).

Our study showed us that the new program could help us to compensate for the lack of educational opportunities felt in the bedside training to some extent. Our residents' standpoints were that simulation could be of avail for them when practicing and learning medicine.

We have decided to design new scenarios to discuss new cases for the next year. While working on the topics

of other specialties related to EM, it would be better to consult with our colleagues from other disciplines and ask them to participate in our program and review scenarios. In this study, we confronted with limitation in facilities and resources most obviously in simulated patients and high-fidelity mannequins. We wish we could apply more modern technologies and tools in implementing simulation in the next year.

We strongly believe that the impact and utility of SBME in Iran are likely to thrive in the near future. More thematic researches are needed in different fields to guide facilitators best in applying this new method of education.

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References

1. Issenberg SB, McGaghie WC. Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. Med Teach 2005;27:10-28.
2. Gaba DM, Howard, SK. Simulation-based training in anesthesia crisis resource management (ACRM): a decade of experience. Simul Gaming 2001;32:175-93.
3. McKimm J. Essential s imulation in c linical e ducation. In: Forrest K, McKimm J. Essential Simulation in Clinical Education. 3th edition. John Wiley & Sons, Ltd, England, 2013:1-10.
4. McGaghie WC, Issenberg SB. A critical review of simulation-based medical education research: 2003-2009. Med Edu 2010;44:50-63.
5. Issenberg SB, McGaghie WC. Simulation technology for health care professional skills training and assessment. JAMA 1999;28:861-6.
6. McGaghie WC, Suker JR. Does simulation-based medical education with deliberate practice yield better results than traditional clinical education? A meta-analytic comparative review of the evidence. Acad Med 2011;86:706-11.
7. Bilotta FF, Werner SM. Impact and implementation of simulation-based training for safety. Sci World J 2013;20:1-6.
8. Mathai SK, Miloslavsky EM. How we implemented a resident-led medical simulation curriculum in a large internal medicine residency program. Med Teach 2014;36:279-83.
9. Okuda Y. The utility of simulation in medical education: what is the evidence? Mt Sinai J Med 2009;76:330-43.
10. Draycott TJ, Crofts JF. Improving neonatal outcome through practical shoulder dystocia training. Obstet Gynecol 2008;112:14-20 .
11. Seymour NE, Gallagher AG. Virtual reality training improves operating room performance: results of a randomized: a double-blinded study. Ann Surg 2002;236:458-63 .
12. Blum MG, Powers TW. Bronchoscopy simulator effectively prepares junior residents to competently perform basic clinical bronchoscopy. Ann Thorac Surg 2004;78:287-91 .
13. Draycott T, Sibanda T. Does training in obstetric emergencies improve neonatal outcome? BJOG 2006;113:177-82.
14. Ziv A, Wolpe PR. Simulation-based medical education: An ethical imperative. Acad Med 2003;78:783-8.
15. Ziv A, Ben-David S. Simulation based medical education: An opportunity to learn from errors. Med Teach 2005;27:193-9.