THREE-YEAR TEACHING EXPERIENCE IN SIMULATION EDUCATION

*Eszter Borján[1], Zoltán Balogh[1], Judit Mészáros[2]

[1]Department of Nursing, Faculty of Health Sciences, Semmelweis University, Budapest, Hungary
  Head of Department: Zoltán Balogh, PhD
[2]Faculty of Health Sciences, Semmelweis University, Budapest, Hungary
  Dean of the Faculty of Health Sciences: Prof. Judit Mészáros, PhD

Summary
Aim. The aim of this study was to determine our students' perception about a new educational tool, the high-fidelity simulator, and about the new teaching strategy of simulation.
Material and methods. 111 baccalaureate students participated in the study at Semmelweis University, Faculty of Health Sciences in Budapest, Hungary. A questionnaire was developed by the authors. The environment, the advantages of simulation, the difficulties during lessons, and the effectiveness of different teaching tools were evaluated by a modified Likert-type scale. Descriptive statistics were used to analyze survey responses.
Results. Our students recognized the advantages of simulation, but they did not have enough experience to realize all the benefits. Besides the advantages of using simulators there are some difficulties that educators have to resolve. Students are aware of the difference between the traditional and modern teaching strategies but they need more time to accept this new method completely.
Conclusions. Students of the 21st century require innovative teaching methods to prepare for real clinical practice. High-fidelity simulators can help to achieve the required learning outcomes in the most effective way.

Key words: simulation, nursing education, high-fidelity simulator, clinical practice, teaching methods

INTRODUCTION

The most common use of simulation is known from the military and aviation industry. The main advantage of simulation is the practice without risk in a lifelike environment (1-4). Teaching the students clinical skills is a core component of healthcare education. Prior to the 1950s, most skills were taught in classrooms and were practiced on patients. After the 1950s the technology was rapidly changing and educators began combining technology with basic human models (5, 6). Mrs. Chase was the first simulator to teach physical assessment to student nurses in the UK in the 1950s (4). In the 1960s the Resusci Anne for cardiopulmonary resuscitation and the Sim One, the first computer-controlled simulator, were developed (7, 8).

The level of simulators can be defined as low-, medium-, and high-fidelity. Low-fidelity simulators are static and demonstrate few features of realism. Medium-fidelity simulators are more realistic and show some lifelike phenomena, such as heart and breath sounds. High-fidelity simulators may have a physiological response to the provided care, medication and other treatment, for example fluid administration and oxygen therapy (9). Healthcare educators usually use low-, medium-, and high-fidelity simulators alternatively, always choosing the most appropriate tool to achieve the learning objective.

The most important aim of the development and use of simulators in medical and nursing education was to ensure patients' safety (1, 7). Hospital staff and patients expect competent professionals in healthcare education (10, 11). Simulation may help the students in transferring skills learned in simulation laboratories to clinical practice (12).

The METI (Medical Education Technologies, Inc.) Emergency Care Simulator (ECS) "arrived" at our faculty in the 2007-2008 academic year. First we offered it as an optional subject for nursing, physiotherapy, midwifery, and dietitian students and later started to integrate it into the curriculum for all baccalaureate students. Each of the students has an opportunity to practice basic assessment and basic skills with the simulator. Nursing and midwifery students have more possibilities to use the simulator in their curriculum to prepare for clinical practice using the METI PNCI (Program for Nursing Curriculum Integration) learning package. METI scenarios offer teachers and students complex clinical cases from different clinical fields. While using the human patient simulator we have experienced the benefits of this new teaching and learning strategy.

AIM OF THE STUDY

The purpose of this study was to find out our students' opinions about a new educational tool, the ECS simulator, and about the new teaching method of simulation.

The research questions of this study were as follows:

1. How do students evaluate the advantages of simulation education?
2. What do students think about the realism of environment and realism of cases in scenarios?
3. How do students evaluate difficulties when using the simulator?
4. Do students feel any difference between the effectiveness of various teaching tools and methods?

We wanted to determine factors that educators have to take into consideration in order to achieve the most effective teaching.

MATERIAL AND METHODS

This descriptive study examined the students' perceptions of simulation in healthcare education. The questionnaire was developed by the authors based on the literature and their previous survey asking students' opinion about simulation education.

The questionnaire included the following groups of questions: demographic data (age, gender, number of lessons, previous healthcare experience), realism of the environment, realism of the cases, advantages of simulation, difficulties during the lessons, effectiveness of different teaching tools, and open-ended questions (their assessment about the improvement of their knowledge, requests, suggestions).

We use a modified Likert-type scale to evaluate the environment, the advantages of simulation, the difficulties during the lesson and the effectiveness of different teaching tools. (see table 2) Data analysis was performed using the statistical program SPSS for Windows version 15.0.

Baccalaureate students were enrolled in the study at Semmelweis University, Faculty of Health Sciences in the fall semester of the 2010/11 academic year. 111 students completed the questionnaires; all of them could be evaluated.

Participants were chosen from nursing, midwifery and physiotherapy baccalaureate degree programs. These students have the closest connection with patients in practice, so we thought their perceptions were the most relevant. All students had human patient simulator experience. The demographic data are summarized in table 1.

The mean age was 21 years. The majority of the participants were women (95.5%).

The mean number of lessons in a semester was 11.4. Students were asked about their previous healthcare experience. Most of them (94.6%) had never met a real patient before the first occasion of the simulation.

RESULTS

Research Question 1: How do students evaluate the advantages of simulation education?

The survey question was: "***What is your opinion about the advantages of simulation?***"

Students evaluated the statements about the advantages of simulation by way of the modified Likert-type scale, from 1 = disagree to 5 = absolutely agree (table 2). These data are summarized in table 3. The mean score of these items was between 3.03 and 4.62. The most highly rated item was "practice without risk"; the physiotherapy students evaluated this with the highest mean score (4.62). Nursing and midwifery students also rated it highly (mean score = 4.44 by nurses, mean score = 4.48 by midwives). "Recognizing abnormal findings" (mean score = 4.4 by midwives) and "preparing for clinical practice" (mean score = 4.55 by physio-

Table 1. Demographic data.

	Number	Mean
Age distribution	N=111	21
	Number	**%**
Gender distribution Female Male	N=106 N=5	95.5 4.5
	Number	**Mean**
Number of lessons/semester	N=111	11.4
	Number	**%**
Previous healthcare experience None – students have never met a real patient Previous experience – clinical practice Previous working experience	N=105 N=4 N=2	94.6% 3.6% 1.8%

Table 2. Likert-type scale.

Agreement (modified)	Effectiveness (modified)
1= Disagree	1= Ineffective
2 = Limited agree	2 = Effective to some extent
3 = Agree	3 = Effective
4 = Strongly agree	4 = Very effective
5 = Absolutely agree	5 = The most effective

Table 3. Students' perception about the advantages of simulation.

Advantages	Nursing students N=39 Mean scores	Midwifery students N=45 Mean scores	Physiotherapy students N=27 Mean scores
Practice without risk	4.44	4.48	4.62
Getting to know rare clinical pictures	3.2	3.55	3.18
Recognizing abnormal findings	4.32	4.4	4.33
Help to understand physiology	3.82	3.51	3.88
Complexity of cases	3.87	3.68	3.74
Practice critical thinking	3.61	3.44	3.22
Practice decision making	3.5	3.33	3.4
Practice teamwork	3.19	3.11	3.18
Improving self-confidence	3.28	3.26	3.03
Improving manual skills	3.54	3.6	3.29
Preparing for clinical practice	3.71	3.91	4.55

therapy students) were also rated highly. Although we use the simulation to practice team work, this item did not receive very high mean scores (3.19 by nurses, 3.11 by midwives, and 3.18 by physiotherapists). The lowest rated statement was "improving self-confidence" (mean score = 3.03 by physiotherapists).

Research Question 2: What do students think about the realism of the environment and realism of cases in scenarios?

We asked participants about the realism of cases and the environment. Students used a modified Likert-type scale, from 1 = disagree to 5 = absolutely agree (table 2). The mean scores were between 3.17 and 3.92 (table 4). This very good result indicated that our students perceived a lifelike environment and cases. However, they did feel that the simulator was not a real patient, and there was a lot of difference between simulation and reality.

Research Question 3: How do students evaluate difficulties when using the simulator?

The survey question was: "*What kind of difficulties did you experience during the lessons?*"

We offered different options (table 5) and students used a modified Likert-type scale, from 1 = disagree to 5 = absolutely agree (table 2). Data are summarized in table 5.

The results show that the main problem is the "high number of students". This item was rated most highly by physiotherapy students (mean score = 3.51). As we can see, there were differences between the students in evaluation (mean score = 3.02 by midwives and mean score = 2.67 by nurses). This result might be explained by the different numbers of students during the lessons and by the different perceptions. The high number of participants during the simulation did not represent a problem for everyone.

Table 4. Students' opinion about the realism of environment and cases

Realistic	Nursing students N=39 Mean scores	Midwifery students N=45 Mean scores	Physiotherapy students N=27 Mean scores
Environment	3.35	3.68	3.92
Cases in scenarios	3.17	3.42	3.70

Table 5. Difficulties during the lessons from students' point of view.

Difficulties	Nursing students N=39 Mean scores	Midwifery students N=45 Mean scores	Physiotherapy students N=27 Mean scores
High number of students/lesson	2.67	3.02	3.51
Unreality	2.89	3.06	2.92
Using medical terminology	2.41	3.11	2.29
Lack of knowledge	2.59	3.24	3.0
Lack of practice	3.17	3.13	3.33
Recognizing abnormal findings	2.55	3.08	2.44
Communication/patient	3.4	2.46	2.88
Communication/team	3.07	2.53	3.07

Another highly scored difficulty was "lack of practice". The mean scores were 3.33 for physiotherapy students, 3.13 for midwives, and 3.17 for nurses. Nursing students felt that "lack of knowledge" (mean score = 3.24) and "using medical terminology" (mean score = 3.11) was hard. They also evaluated the difficulties in "communication with patient" (mean score = 3.4) highly. "Communication with the team" was difficult for physiotherapy (mean score = 3.07) and nursing students (mean score = 3.07) as well.

Research Question 4: Do students feel any difference between the effectiveness of various teaching tools and methods?

Students were asked to rate the effectiveness of the different teaching tools and methods. Participants evaluated the four items (table 6) using a modified Likert-type scale, from 1 = ineffective to 5 = the most effective (table 2). Results are summarized in table 6.

The lowest rated item was in the three groups "Power Point presentation" (mean score = 3.56 by nurses, 3.22 by midwives and 3.55 by physiotherapy students). The most highly rated teaching method was "practice with high-fidelity simulator" according to midwifery students (mean score = 4.62). Interestingly, physiotherapy students evaluated "practice on each other" with higher scores (mean score = 4.44) than "practice with high-fidelity simulator" (mean score = 4.22). Nursing students rated "practice with high-fidelity simulator" with higher scores (mean score = 4.42) than "practice on each other" (mean score = 4.2). "Practice with low-fidelity simulator" also received high scores from the three groups (mean scores were between 3.85 and 3.91).

DISCUSSION

The aim of our study was to evaluate the students' opinions about the human patient simulator and about the new teaching and learning strategy of simulation. Numerous studies can be found in the literature about the advantages of simulation in healthcare education. We examined these benefits from our students' point of view. We also studied the difficulties during the simulation and the differences between the various teaching strategies considering students' perceptions.

This innovative teaching strategy allows students to practice all aspects of nursing in a realistic environment without harming patients. Our students agreed with this statement, which was the most highly rated item in our study. Students can practice complete care including assessment, technical skills, teamwork, communication and management (4, 6, 7, 13, 14). Moreover, teachers can present cases with common complications and also rarely seen situations (15). Active participation in realistic clinical simulations may promote critical thinking, decision making and problem solving skills in students (3, 7, 9, 13, 16, 17, 18).

Students have an opportunity for self-reflection and assessment during the simulation; they can see the effect of their actions and realize if their action achieves the desired effect (4, 8, 19). Many studies show that simulation increases students' self-confidence (3, 18, 20), although in our survey this was the lowest rated statement. In our opinion students did not have enough time to recognize this advantage.

Using high-fidelity simulators can help students to understand physiology and the complexity of cases helps synthesize their knowledge. In the debriefing (discussion after the simulation) students are given an opportunity to talk about their experiences and receive immediate feedback from the teacher (2, 4, 9, 17).

Our results indicate that students recognized the advantages of this new method, but they did not have enough experience to realize all the benefits.

Besides the benefits of using simulators there are some difficulties that educators have to be aware of. The lack of realism in the simulation experience and the patient's missing responses could be a problem for the students (9, 15).

From our students' point of view the main problem was the high number of students during the lessons. The optimal number of students during the lessons is 4 or 6. However, we usually have to work with 10 or more students.

Other difficulties arise from the lack of practice in simulation. This is not a surprising result. Simulation is a new method for our students and most of them have not had real clinical practice before. As we see, students feel the difference between the traditional and the modern teaching strategies but they need more time to accept the new methods completely. This process is a challenge for educators and they also have to take responsibility for their students.

CONCLUSIONS

Nurse educators have realized that the students of the 21st century need an innovative method to prepare for clinical practice. Nowadays in healthcare education it is not enough to teach physical assessment and techni-

Table 6. Students' opinion about the effectiveness of various teaching methods.

Teaching tools and methods	Nursing students N=39 Mean scores	Midwifery students N=45 Mean scores	Physiotherapy students N=27 Mean scores
Power Point presentation	3.56	3.22	3.55
Practice with low-fidelity simulator	3.89	3.91	3.85
Practice on each other	4.2	4.4	4.44
Practice with high-fidelity simulator	4.42	4.62	4.22

cal skills to students; it is also necessary to teach them to think critically. Human patient simulators can help us to reach the required learning outcomes in the most effective way. □

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Correspondence to:
*Eszter Borján
Semmelweis University, Faculty of Health Sciences,
Department of Nursing
1085 Budapest, Vas u. 17.
tel.: +36 (1) 4865930; fax: 4865931
e-mail: eborjan@gmail.com