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ORIGINAL ARTICLE

SIMULATED PATIENT VERSUS HIGH-FIDELITY SIMULATOR: SATISFACTION, SELF-CONFIDENCE AND KNOWLEDGE AMONG NURSING STUDENTS IN BRAZIL

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ABSTRACT

Objective: to assess and compare satisfaction, self-confidence and knowledge among Nursing students in the use of simulated patients and high-fidelity simulators. Method: a quasi-experimental study conducted in 2017 with 150 students from a private university The participants answered a pre-test to assess knowledge and participated in a lecture and in skills training. After the simulation, the students answered the Satisfaction with Simulated Clinical Experiences scale and the Satisfaction and Self-confidence in Learning and Knowledge scale. The data were analyzed based on non-parametric tests. Results: the students showed high rates of satisfaction (93.5 and 92.5), self-confidence (4.3 and 4.4) and knowledge gain (6.2 and 6.4). There were no significant differences in the comparison between the simulated patient group and the high-fidelity simulator group regarding satisfaction, self-confidence and knowledge. Conclusion: the findings showed that well-prepared settings can be obtained with lower costs, and with an effective impact on the students' learning.

DESCRIPTORS: Simulation; Patient Simulation: Training with High-Fidelity Simulation: Nursing Students; Learning.

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INTRODUCTION

Nursing training has been based on scientific evidence, in search for a competent, critical and reflective professional, capable of developing cognitive, technical and attitudinal skills[1]. In this context, evidence has shown that the use of technologies can be a strong ally in the improvement of teaching strategies that train nurses, both during their training and in their performance in health services[2].

Among the several technologies used for training in health, clinical simulation is a pedagogical strategy that provides experiential learning opportunities, capable of joining theory and practice, and must be stimulated in Nursing training so as to prepare the students for providing care to patients with safety and quality based on training, improvement and reflections in laboratories[3-4].

Clinical simulation is a strategy included in the active teaching methodologies, which awakens the student's motivation, enables reflection about the knowledge acquired and attributes meaning to it. In simulation, the feeling of motivation leads to satisfaction and self-confidence with the learning process[5-8].

Despite the increasing use of simulators, clinical simulation is not a new concept. Simulators have been incorporated into teaching since 1950. Initially, they consisted in static models used for skills learning; in the last decades, simulators have incorporated enough computing and robotics to bring them closer to several human functions[9].

However, the greater the demand for technology, the greater the cost of the simulators and the greater the need to train the professionals, so that they can effectively handle the technology, as well as adequate physical spaces prepared to meet the necessary requirements for simulated practices and bring them closer to the real clinical practice[10].

Given the financial problems of many educational and health institutions, the use of actors, students and/or other professionals, who play the role of simulated patients in simulated clinical practices, can be considered a good alternative, since it associates liveliness with activity and does not require onerous technologies. When associated to anatomical pieces, they characterize what we call mixed patients[11], favor procedures and confer verisimilitude to the simulated practices.

A number of studies show that, regardless the fidelity level or modality, clinical simulation contributes positively to learning[12]. However, the number of studies comparing the use of simulated patients to simulators is still scarce[13-15]. In this sense, there is difficulty comparing the gains in the teaching-learning process in Nursing training between these two strategies.

Consequently, this study aims at assessing and comparing satisfaction, self-confidence and knowledge among Nursing students in the use of simulated patients and high-fidelity simulators.

The following hypotheses were considered: 1) Null Hypothesis: there is no difference in the levels of satisfaction, self-confidence and knowledge of the Nursing students who participate in high-fidelity clinical simulation using the high-fidelity simulator versus the simulated patient; 2) Alternative Hypothesis: there is a difference in the levels of satisfaction, self-confidence and knowledge of the Nursing students who participate in high-fidelity clinical simulation using the high-fidelity simulator versus simulated patient.

METHOD

A quantitative study of a quasi-experimental nature. The population consisted of undergraduate Nursing students regularly enrolled in the sixth, seventh and eighth semesters of a private university in the inland of the state of São Paulo. The inclusion criteria were as follows: being an undergraduate Nursing student, over 18 years old, who had already attended the Nursing Assistance for Surgical Patients academic subject and completed all the stages proposed for the development of the study.

Sampling was non-probabilistic and by convenience. The students enrolled in the sixth, seventh and eighth semesters of the Nursing course were invited to participate in the research. For recruitment, a workshop entitled "Nursing Assistance for Stomized Patients" was conducted. The event was held on three consecutive days, disclosed on the institution page and with free enrollment. Subsequently, the enrolled participants were offered access to the theoretical content on the theme proposed for previous exploration. The material was elaborated following the theoretical framework[16-17].

The workshop took place on August 9th, 10th and 11th, 2017. On the first day, the students answered the instrument for collecting sociodemographic data and assessing knowledge, followed by an expository-dialog class given by a specialist in stomatherapy, lasting one hour and 30 minutes.

The sample consisted in 150 students who met the inclusion criteria. The students received an identification number and were divided into two groups, as follows: a) Simulated Patient Group (SPG): comprised by students undergoing skills training, high-fidelity clinical simulation, with the use of a simulated patient; b) High-Fidelity Simulator (HFS): comprised by students undergoing skills training and high-fidelity clinical simulation, with the use of a high-fidelity simulator (SIM MAN 3G Laerdal®). For division of the groups, the course semester in which the students were enrolled was considered, so as they were homogeneous.

The groups were subdivided into subgroups of 10 students and, at a scheduled time, they performed skills training followed by a simulated clinical setting and debriefing[18].

The didactic laboratories were duly equipped with low-fidelity simulators composed of MDF plates, with biscuit stoma, collecting devices, adhesive bases and multiple adjuvants for intestinal stomas (protective barrier in powder and pastes, skin film former, adjustable elastic belt, clips, adhesive remover, activated carbon filter and thickener for effluents). For skills training, a committee made up by specialists previously trained by the researchers was assembled.

After skills training, the subgroups were directed to conduct the simulated clinical setting. The setting proposed for the activity was built based on the theoretical framework[16-17], validated by a group of nine specialists in clinical simulation and stomatherapy. A Content Validity Index (CVI) equal to or greater than 0.8 was considered[19].

The environments of the simulated clinical settings – either with a simulated patient or with a high-fidelity simulator – were prepared with the same furniture resources. The following was observed: a) the high-fidelity simulator and the simulated patient were characterized with appropriate clothing for the hospital environment; b) for making the stoma located on the left lateral region of the abdomen, close to the transumbilical line, latex was used for fixation; as well as artistic makeup mass; red paint and artificial blood; c) the colostomy bag feces were prepared with a characteristic odor from fermented foods.

When conducting the scenarios, in each of the subgroups two students assisted the patient, led by a facilitator (pre-briefing, briefing and debriefing). The other students monitored the setting following an evaluation checklist. The situations lasted approximately 15 minutes and, at the end, the students participated in a structured debriefing[18] session lasting from 25 to 30 minutes.

After solving the situation, the students answered the Scale of Satisfaction with

Simulated Clinical Experiences (*Escala de Satisfação com as Experiências Clínicas Simuladas*, ESECS)(5), the Scale of Satisfaction and Self-Confidence in Learning (*Escala de Satisfação e Autoconfiança na Aprendizagem*, ESAA)[20], and the Instrument for sociodemograpic characterization and knowledge assessment, all described below.

The knowledge assessment instrument (pre- and post-tests) consisted of 10 multiple-choice questions with an overall score of 10 points, which addressed care with the ostomy bag, characteristics of the effluents, aspects of the peristomal skin, complications and guidelines referring to self-care, elaborated based on the theoretical frameworks[16-17, 21].

ESECS has 17 10-point Likert-type items, subdivided into the following three dimensions: Practice dimension, Realism dimension and Cognitive dimension[5]. On the other hand, ESAA has 13 5-point Likert-type items, divided into two dimensions (satisfaction and self-confidence in learning), developed by the National League for Nursing (NLN), translated and validated for Portuguese[20].

After collection, the data were double coded into Excel spreadsheets, and exported and analyzed in the SAS 9.2 (Statistical Analysis Software) program. The ESAA and ESECS dimensions were calculated based on the validation articles[5,20]. In the case of ESAA, the dimensions were calculated based on the mean of the answers to the corresponding items. In the case of ESECS, on the other hand, the dimensions were calculated in the form of percentages, obtaining a value between zero and 100.

For the comparisons between the groups in relation to ESAA, ESECS and knowledge (pre- and post-test), the analysis of covariance (ANCOVA) was proposed, which, in addition to comparing groups, allows for the adjustment of covariates. A significance level of 5% was adopted for all the comparisons.

In relation to the ethical aspects, it is emphasized that this study was approved by the Research Ethics Committee, under opinion No. 1,771,330.

RESULTS

Of the 150 participants, 72 (48%) were allocated to the Simulated Patient Group and 78 (52%) to the High-Fidelity Simulator Group. The female gender prevailed with 136 (90.7%). The mean age was 26.2 years old (SD±7), with minimum and maximum ages of 19 and 51, respectively. Most of them were in the sixth semester; 64 (42.7%), and 112 (74.7%) were active students. However, 31 (20,7%) had work experience in Nursing(nursing assistants or technicians). All, 150 (100%), had previous experience with simulation; 92 (61.3%) with simulated patients. Preference for active learning methods was stated by 89 (59.3%) participants.

The setting proposed for the activity was built based on the theoretical framework about stomas[16-17], validated by a group of nine specialists in clinical simulation and stomatherapy. The CVI of the setting evaluation by the experts was 1.0 and that of the knowledge assessment instrument was 0.9.

Table 1 presents the sociodemographic profile, the previous experience with the topic and the learning method.

Table 1 - Distribution of the Nursing undergraduate students by group regarding gender, age, occupation, preference in relation to learning modalities, training, previous activity in lab, and previous experience with the theme. Ribeirão Preto, SP, Brazil, 2017

	Simulated Patient Group n (%)	High-Fidelity Simulator Group n (%)
Participants	72 (48,0)	78 (52,0)
Gender		
Female	65 (90,2)	71 (91,0)
Male	7 (9,8)	7 (9,0)
Age		
Mean	26,4	26
Standard Deviation	±7,8	±6,1
Mode	22	21
Minimum	20	19
Maximum	50	51
Semester		
Sixth	35 (48,6)	29 (37,2)
Seventh	7 (9,7)	25 (32,0)
Eighth	30 (41,7)	24 (30,8)
Occupation		
Student	49 (68,0)	63 (80,8)
Student or working in the Nursing area	13 (18,1)	8 (10,3)
Student or working in another area	10 (13,9)	7 (8,9)
Preference in relation to learning modalities		
Expository-dialog class	33 (45,8)	28 (35,9)
Active teaching-learning methodologies	39 (54,2)	50 (64,1
Training		
Nursing assistant	3 (4,2)	15 (19,2)
Nursing technician	5 (6,9)	8 (10,2)
Higher Education in another area	1 (1,4)	2 (2,5)
No previous training	63 (87,5)	53 (68,1)
Experience with clinical simulation and stomas		
Previous activity in simulation lab	72 (100,0)	78 (100,0)
Skills training*	69 (95,9)	74 (94,8)
Setting with high-fidelity simulator*	36 (50,0)	45 (57,7)
Setting with simulated patient*	46 (63,9)	46 (58,9)
Previous event about stomas	12 (16,7)	12 (15,4)
Previous stoma-related assistance	21 (29,2)	19 (24,3)

*There was more than one answer per subject.

Source: The authors (2017).

Table 2 shows the scores obtained in the ESECS, ESAA and Knowledge Assessment scales (pre- and post-test). Internal consistency of the instruments was verified by means of Cronbach's alpha, with the following results: ESECS (0.870), ESAA (0.807).

Table 2 - Values obtained by the undergraduate Nursing students of the Simulated Patient and High-Fidelity Simulator groups, according to the ESECS*, ESAA†, and Knowledge Assessment scales (pre- and post-test) and the skills assessment checklist. Ribeirão Preto, SP, Brazil, 2017

	Mean (SD)		Minimum		Maximum	
	SPG‡	HFSG§	SPG‡	HFSG§	SPG‡	HFSG§
ESECS*						
General	93,5±5,4	92,5±6,5	72,3	67,6	100	100
Practice	91,8±6,9	89,6±8,6	66,6	56,6	100	100
Realism	95,3±6,6	95,5±6,1	76	76	100	100
Cognitive	95,5±5,2	95,8±5,9	80	80	100	100
ESAA†						
General	4,3±0,3	4,4±0,3	3	3,3	5	5
Satisfaction	4,6±0,4	4,6±0,4	3	3,4	5	5
Self-confidence	4,1±0,4	4,3± 0,4	2,5	3,2	5	5
Assessment of the Theoretical Knowledge						
Pre-test	4,7±1,75	5,1±1,63	1	1	9	9
Post-test	6,2± 1,52	6,4±1,54	2	2	9	9

*ESECS - *Escala de Satisfação com as Experiências Clínicas Simuladas* (Scale of Satisfaction with Simulated Clinical Experiences); †ESAA - *Escala de Satisfação e Autoconfiança no Aprendizado* (Scale of Satisfaction and Self-Confidence in Learning); SPG‡: Simulated Patient Group; HFSG§: High-Fidelity Simulator Group.
Source: The authors (2017).

When comparing the groups (Simulated Patient Group and High-Fidelity Simulator Group), it was possible to observe that there were no statistically significant differences (p-value<0.05) in the ESECS and ESAA results, which confirms the null hypothesis (no difference in the satisfaction and self-confidence levels of the Nursing students participating in a high-fidelity clinical simulation using the high-fidelity simulator versus the simulated patient). This comparison is presented in Table 3.

Table 3 - Comparison between the Simulated Patient and High-Fidelity Simulator groups regarding the values obtained in ESECS and ESAA. Ribeirão Preto, São Paulo, Brazil, 2017

Dimension	Mean		Comparison between groups SPG‡ - HFSG§		
	SPG‡	HFSG§	Estimated difference*	CI (95%)	p-value <0,05
ESECS					
ESECS - General	93,5	5,4	1,02	-4,09	0,33
ESECS - Practice	91,8	6,9	2,22	-5,32	0,1
ESECS - Realism	95,3	6,6	-0,21	-4,32	0,85
ESECS - Cognitive	95,5	5,2	-0,54	-3,78	0,57
ESAA					
ESAA - General	4,3	4,4	-0,06	-0,26	0,4
ESAA - Satisfaction	4,6	4,6	0,01	-0,3	0,91
ESAA - Self-confidence	4,1	4,3	-0,1	-0,31	0,22

*ESAA - *Escala de Satisfação e Autoconfiança no Aprendizado* (Scale of Satisfaction and Self-Confidence in Learning) †ESECS - *Escala de Satisfação com as Experiências Clínicas Simuladas* (Scale of Satisfaction with Simulated Clinical Experiences); ‡CI – Confidence Interval; SPG‡: Simulated Patient Group; HFSG§: High-Fidelity Simulator Group.
Source: The authors (2017).

Table 4 shows the comparison of the study variables (semester attended) in the pre- and post-test knowledge assessment values. There was a statistically significant difference in pre- and post- test knowledge, regardless of the group and of the semester the student was attending. It was discovered that knowledge gain can be considered identical in both groups.

Table 4 - Comparison between the Simulated Patient and High-Fidelity Simulator groups in the values of the pre- and post-test Knowledge Assessment per semester attended. Ribeirão Preto, São Paulo, Brazil, 2017 (continues)

	Mean grade (SD)		Estimated difference	CI (95%)	p-value
	Pre-test	Post-test			
Sixth semester					
SPG‡	4,54 (1,79)	6,17(1,65)	1,63	1,12; 2,14	<0,01
HFSG§	4,97 (1,55)	6,1 (1,42)	1,14	0,58; 1,70	<0,01
Seventh semester					
SPG‡	5 (1,63)	6,29(0,76)	1,29	0,14; 2,43	0,03
HFSG§	4,6 (1,5)	6,36(1,52)	1,76	1,16; 2,36	<0,01
Eighth semester					
SPG‡	5 (1,76)	6,27(1,53)	1,27	0,72; 1,82	<0,01
HFSG§	5,96 (1,63)	6,83(1,69)	0,88	0,26; 1,49	<0,01

GENERAL					
SPG‡	4,78 (1,75)	6,22(1,52)	1,39	0,94; 1,85	<0,01
HFSG§	5,15 (1,64)	6,41(1,55)	1,26	0,91; 1,60	<0,01

SPG‡: Simulated Patient Group; HFSG§: High-Fidelity Simulator Group.
Source: The authors (2017).

Table 5 presents the comparison of knowledge between the Simulated Patient and High-Fidelity Simulator groups and the ESAA and ESECS factors, in which it is evidenced that, regarding the satisfaction and self-confidence levels, there is a statistical difference between the groups post- and pre-test.

Table 5 - Comparison of the pre- and post-test knowledge and the factors of the ESAA* and ESECS† scales. Ribeirão Preto, SP, Brazil, 2017

Knowledge (post – pre-test) Variable	**Estimate**	**CI‡ (95%)**	**p-value**
SPG‡ - HFSG§	0,37	-0,24; 0,87	0,15
ESAA* – Satisfaction	-0,88	-1,50; -0,25	<0,01
ESAA* – Self-confidence	0,62	0,02; 1,22	0,04
ESECS† – Practice	2,22	-0,44; 4,88	0,1
ESECS† – Realism	-0,21	-2,37; 1,95	0,85
ESECS† – Cognitive	-0,54	-2,43; 1,35	0,57

*ESAA - *Escala de Satisfação e Autoconfiança no Aprendizado* (Scale of Satisfaction and Self-Confidence in Learning) †ESECS - *Escala de Satisfação com as Experiências Clínicas Simuladas* (Scale of Satisfaction with Simulated Clinical Experiences); ‡CI – Confidence Interval; SPG‡: Simulated Patient Group; HFSG§: High-Fidelity Simulator Group.
Source: The authors (2017).

DISCUSSION

The study compared satisfaction, self-confidence and knowledge among Nursing students with the use of a simulated patient and a high-fidelity simulator in the care provided to stomized patients. The results show that there was no statistically significant difference between both clinical simulation modalities adopted. In addition to that, they also show that both strategies are effective means to promote learning.

Assessing students' satisfaction with the pedagogical strategies used is an important indicator of the teaching process quality. Students satisfied with knowledge acquisition presented higher rates of self-confidence and motivation to learn, impacting on the quality of the educational process[5]. Thus, it is relevant that Higher Education Institutions (HEIs) study the use of tools that value significant learning and its evidence.

In ESECS, the three domains ("Practice dimension", "Realism dimension" and

"Cognitive dimension") presented high scores in both groups. It is believed that the high level of satisfaction with the simulated experience may have contributed to greater gains in satisfaction and self-confidence. In this study, the physical and material resources, the participation of specialists and the simulation stages were meticulously respected, which led to successful activity scenarios, regardless of the method.

The results support other research studies that assessed students' satisfaction and self-confidence and that used the clinical simulation strategy with the use of simulated patients and simulators[13-15].

A study involving 62 Nursing students[22] compared the use of the medium-fidelity simulator and the simulated patient, and identified high scores in the students' satisfaction and self-confidence; however, the simulated patient group obtained higher satisfaction and self-confidence scores.

Regarding knowledge gain, it was significantly higher after the simulated practices in both groups, regardless of the semester attended. When comparing knowledge between the groups and the ESAA and ESECS factors, it is perceived that, among the students who presented higher satisfaction levels, there was less improvement in knowledge; however, those who showed better self-confidence had greater knowledge gains.

The findings corroborate the idea that self-confidence is strongly related to knowledge. Students need self-confidence to be successful in entering the clinical practice in health. However, a study[23] drew the attention to the fact that self-confidence cannot be an acceptable replacement measure for knowledge, and should not be used as the only or prime variable to assess students' understanding of concepts.

Simulation allows developing clinical skills, reflective-critical judgment and performance assessment, through feedback to the students, which contributes to self-knowledge and to the development of self-confidence[24-25].

For the simulated clinical practice to be successful and arouse the students' interest, realism is of great relevance in order to allow veracity, critical thinking and decision-making skills. Several studies show that the use of simulated patients is perceived as very close to real patients, and provides greater satisfaction and self-confidence with the educational process, as it makes it significant[11,15].

However, simulated patients imply limitations for the conduction of some procedures. In this sense, the use of simulators coupled to simulated patients can be resorted to as a strategy to overcome such limitations.

High-fidelity simulators also have limitations in terms of realism, but they help to link theoretical knowledge to practice, in addition to reflective critical thinking and decision-making. On the other hand, activities using a high-fidelity simulator can lead the student to focus exclusively on the task and lose the spectrum of the patient's global needs[26].

It is notorious that HEIs, seeking to promote the use of active learning methods in the curricula, have promoted high investments in clinical simulation centers, with high costs and with many technological resources. In addition to the high cost involved, in many places these resources are underused, with low acceptance by professors and students, and disconnected from the pedagogical and political project[10].

Simulation implies varied costs depending on the resources used. These resources are determined by the learning objectives, so that they can maximize the educational results[27]. In this study, the high-fidelity simulation using a simulated patient and moulage was a low-cost simulated scenario, which did not depend on technological resources to contribute knowledge, satisfaction and self-confidence to the students.

It is important to highlight that clinical simulation is associated with creativity and teaching dedication in its elaboration and execution. This is a high-potential tool, provided

that it is used correctly and grounded on the theoretical principles and guidelines. The need to support teacher training as with transforming potential for training in health stands out.

A possible limitation of this study is the choice of the setting's objective. The fact that the simulated setting did not involve the need to perform any invasive procedure may have contributed to not finding statistical differences between the modalities. However, the results are relevant, as they show high levels of satisfaction, self-confidence and knowledge gain in both groups, after the simulated practices.

For further studies, the recommendation is to use settings in line with the learning objectives, as well as their verification within the scope of the various health care areas and fulfillment of all the clinical simulation stages.

CONCLUSION

Well-prepared simulated strategies lead to positive outcomes, both with the use of onerous resources (high-fidelity simulators) and by resorting to more accessible resources (simulated patients). In this study, there were no significant differences in the comparison between the simulated patient group and the high-fidelity simulator group regarding satisfaction, self-confidence and knowledge in clinical settings of care for stomized patients.

The findings of this study contribute to the Nursing science by showing that well-prepared clinical settings can be obtained with lower costs and exert an impact on the students' learning, however, they require attributes such as creativity in the elaboration and execution of the pedagogical strategy.

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