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RESEARCH

USE OF SIMULATIONS IN THE TEACHING OF THE AIRWAY ASPIRATION TECHNIQUE: CONTROLLED RANDOMIZED CLINICAL TRIAL

O USO DA SIMULAÇÃO NO ENSINO DA TÉCNICA DE ASPIRAÇÃO DE VIAS AÉREAS: ENSAIO CLÍNICO RANDOMIZADO CONTROLADO

EL USO DE LA SIMULACIÓN EN LA ENSEÑANZA DE LA TÉCNICA DE ASPIRACIÓN DE VIAS AÉREAS: ENSAYO CLÍNICO RANDOMIZADO

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ABSTRACT

This study aimed to evaluate the effect of the use of simulations to teach lower airway aspiration. This is a randomized controlled clinical trial conducted at a federal public university in October 2016. The sample was composed of 33 students randomly assigned to intervention (n = 17) and control (n = 16) groups. The intervention evaluated the teaching of the lower airway aspiration technique using simulations (individual workshops and debriefing), and the control situation was represented by the teaching of the technique through the traditional method (expository class and group training). The outcomes evaluated were the theoretical and practical knowledge about the skill taught, whose maximum scores were, respectively, 19 and 29 points. Data were analyzed using descriptive and inferential statistics. In the theoretical knowledge, the average number of correct answers in the intervention group was 15.1 points and in the control group it was 15.5 points. In the practical evaluation, the mean score in the intervention group was 22.9 points and in the control group it was 20.8 points. There was no difference in the average of correct theoretical and practical knowledge about the ability taught between the intervention and control groups. However, students who participated in the simulated activities reported more confidence and reliability in the development of the technique in laboratory. We suggest the replication of the study with a larger sample for comparison of the findings. Brazilian Registry of Clinical Trials: RBR-8bsmyz.

Keywords: Nursing; Teaching; Clinical Trial; Simulation; Suction.

RESUMO

Estudo com o objetivo de avaliar o efeito do uso da simulação no ensino da habilidade de aspiração de vias aéreas inferiores. Trata-se de ensaio clínico controlado randomizado realizado em uma universidade pública federal em outubro de 2016. Amostra de 33 estudantes alocados mediante sorteio aleatório nos grupos intervenção (n=17) e controle (n=16). A intervenção avaliada foi o ensino da técnica de aspiração de vias aéreas inferiores utilizando a simulação (oficinas individuais e debriefing), e o controle foi o ensino da técnica pelo método tradicional (aula expositiva e treinamento em grupo). Os desfechos avaliados foram o conhecimento teórico e prático sobre a habilidade ensinada, cujas pontuações máximas eram, respectivamente, 19 e 29 pontos. Os dados foram analisados utilizando-se estatística descritiva e inferencial. No conhecimento teórico, a média de acertos do grupo intervenção foi de 15,1 pontos e no grupo-controle foi de 15,5 pontos. Na avaliação prática, a pontuação média no grupo intervenção foi de 22,9 pontos e no grupo-controle foi de 20,8 pontos. Não houve diferença na média de acertos no conhecimento teórico e prático sobre a habilidade ensinada entre os grupos intervenção e controle. Entretanto, alunos que participaram das atividades simuladas relataram mais confiança e segurança no desenvolvimento da técnica em laboratório. Sugere-se a replicação do estudo com amostra maior para comparação dos achados. Registro Brasileiro de Ensaios Clínicos: RBR-8bsmyz.

Palavras-chave: *Enfermagem; Ensino; Ensaio Clínico; Simulação; Sucção.*

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RESUMEN

Estudio con el objetivo de evaluar el efecto del uso de la simulación en la enseñanza de la técnica de aspiración de las vías aéreas inferiores. Se trata de un ensayo clínico controlado aleatorizado realizado en una universidad pública federal en octubre de 2016. Muestra de 33 estudiantes, asignados mediante sorteo aleatorio en los grupos intervención (n = 17) y control (n = 16). La intervención evaluada fue la enseñanza de la técnica de aspiración de las vías aéreas inferiores utilizando la simulación (talleres individuales y debriefing), y el control fue la enseñanza de la técnica por el método tradicional (clase expositiva y entrenamiento en grupo). Los resultados evaluados fueron el conocimiento teórico y práctico sobre la técnica enseñada, cuyas puntuaciones máximas eran, respectivamente, 19 y 29 puntos. Los datos fueron analizados utilizando estadística descriptiva e inferencial. En el conocimiento teórico, el promedio de aciertos del grupo intervención fue de 15,1 puntos y en el grupo control fue de 15,5 puntos. En la evaluación práctica, la puntuación media en el grupo intervención fue de 22,9 puntos y en el grupo control fue de 20,8 puntos. No hubo diferencia en el promedio de aciertos en el conocimiento teórico y práctico sobre la técnica enseñada entre los grupos intervención y control. Sin embargo, los alumnos que participaron en las actividades simuladas reportaron mayor confianza y seguridad en el desarrollo de la técnica en laboratorio. Se sugiere la replicación del estudio con una muestra mayor para la comparación de los hallazgos. Registro Brasileño de Ensayos Clínicos: RBR-8bsmyz.

***Palabras clave**: Enfermería; Enseñanza; Ensayo Clínico; Simulación; Succión.*

INTRODUCTION

The construction of Nursing knowledge and the way of transmitting it to students has evolved over the years, integrating knowledge from various areas and strengthening the autonomy of the profession. For this evolution, many challenges were met and they have encouraged researchers and nurses to develop new pedagogical approaches. Thus, active teaching and learning methodologies appear as a possibility to change the educational process, in which the learners become key actors in their learning process.

Associated with this paradigm shift in Nursing teaching, there is also a concern with ethical issues and patient safety that makes the use of simulations for professional training in the health area to gain prominence.[1,2] This is also a result of what has been identified by the Institute of Medicine of the United States in the report "To err is human" as to the risks associated with health care practices. Training teams through simulations has been recommended as a possible mean to minimize these events. In this sense, simulations have proved to be a pedagogical strategy with great potential, by allying modernity to consubstantial learning.[4,5]

A simulation is a technique that recreates a real situation in a controlled environment. Its purpose is to give the student the opportunity to practice, learn, evaluate, test and/or develop the understanding of human systems or actions in scenarios or mannequins, reproducing aspects of reality in an interactive way, stimulating the teaching-learning process.[2,6]

It can be described as a continuum that varies between the use of low, medium and high fidelity simulators, with the possibility to adapt several methods according to the specific learning outcomes and educational levels.[7] Thus, simulation-based teaching refers to a variety of activities using patient simulators, including devices, trained people, realistic virtual environments and role-playing, not just manipulated manikins.[1,8]

With realistic clinical scenarios, simulation-based educational interventions can empower students and professionals by assisting them in the development of cognitive, psychomotor and affective learning, to practice situations that are not usual in clinical practice, and provide a variety of authentic situations that threaten life. Therefore, simulations represent a useful pedagogical approach that offers students opportunities to practice their clinical skills and decision-making from varied experiences based on actual life without compromising the patients' well-being.[7]

Thus, simulations as a teaching method has gained importance in universities all over the world, becoming frequent in Nursing undergraduate training,[2] being gradually incorporated as an integral part of the curricula of the courses.[1]

In this context, in order to improve the teaching-learning process, professors of the nursing course of a public university in the countryside of Minas Gerais, Brazil, have been engaged in using simulations to teach technical skills inherent to the nursing practice. These skills include airway aspiration, a necessary procedure when patients cannot effectively clear airway secretions. The set of techniques include upper airway (oropharyngeal and nasopharyngeal), lower airway (orotracheal and nasotracheal) and artificial airway aspiration.[9]

In lower airway aspiration, a necessarily sterile technique must be used because the oropharynx and the trachea are considered sterile. A catheter is inserted through the nose or mouth into the trachea. The whole procedure, starting from insertion of the catheter up to its removal, should take at most 15 seconds.[9]

Because it is a complex, meticulous procedure involving a sterile technique, lower airway aspiration was one of the first procedures in which simulations were adopted as teaching methodology in the university under study. Students have reported that the use of simulation facilitates learning and that this methodology has aroused more interest in practical classes. However, scientific research has not yet been carried out to measure the effectiveness of this teaching strategy in the construction of theoretical and practical knowledge of students on skills to carry out lower airway aspiration. In view of these con-

siderations, the following question is raised: is there a difference in the theoretical and practical knowledge about lower airway aspiration when comparing the group of Nursing students that learned this technique through simulations as teaching method with that in which the traditional teaching method was used?

The present study aims to evaluate the effect of the use of simulations in the teaching of the ability to perform lower airway aspiration. The hypotheses tested were: H0: there is no difference in the theoretical knowledge about the lower airway aspiration technique between students who learned it through the traditional teaching methodology and those who learned it through simulations. H1: the theoretical knowledge of students about the lower airway aspiration technique is greater among students who learned it through the teaching method of realistic simulation. H0: there is no difference in the practical knowledge about the lower airway aspiration technique between students who learned it through the traditional teaching methodology and those who learned it through simulations. H1: the practical knowledge of students about the lower airway aspiration technique is greater among students who learned it through the teaching method of realistic simulation.

The justification of this study comes from the fact that the use of simulations in Nursing teaching has increased. They avoid unnecessary exposure of patients to iatrogenic errors and improve the use of the contact time between patients and students, leaving to the clinical field the learning of just those abilities which cannot be worked on simulators. Thus, studies are necessary to evaluate the effect of this teaching strategy in the construction of knowledge by students and in their acquisition of technical skills.

MATERIAL AND METHODS

This is a randomized controlled clinical trial. In clinical trials, the investigator applies an intervention and notes its effects on the outcomes.10 In this work, the independent variable was the simulated class and the outcomes were the theoretical and practical knowledge about upper airway aspiration. The study was developed at a Public Federal University in the countryside of Minas Gerais, Brazil, in September 2016. At this institution, the undergraduate nursing course began in 2009 and, in the search for innovative teaching methods to streamline and improve the teaching-learning process, teachers have engaged in the use of simulations to teach skills inherent to the nursing practice since the second semester of 2015.

The study population was composed of all students regularly enrolled in the course entitled Nursing Skills II, in 2016, offered in the second semester of the second year of the undergraduate Nursing course, , totaling 33 students. The sample was non-compulsory and composed of students who accepted to participate in the study. The choice of students in this semester of the course is due to the fact that they are attending to Nursing Skills II classes. The present study focuses on the teaching of nursing interventions used to deal with nursing diagnoses identified in patients, which means that students have for the first time contact with the lower airway aspiration technique.

Students regularly enrolled in the Nursing Skills II course who were seeing the course for the first time and who experienced simulations as methodology to teach Nursing skills were included in the study. Students with previous training as Nursing technicians or who had previous experience or knowledge about the subject studied were excluded, because they could provide confusing information because it would not be possible to analyze whether the theoretical and practical knowledge of these students would be related to the teaching methodologies addressed in this research.

The researcher invited all the students in the class personally in a single moment during the activities of the Nursing Skills II course. In that moment, the schedule for realization of the project was also presented, planned to involve three moments in the course. Students were assured that if they refused to participate in the study they would not have any negative consequence in their teaching-learning process, and they could participate in all activities but their data would not be included in the study. Thus, all students enrolled in the course met the inclusion/exclusion criteria, and there was no sample loss. The sample consisted of 33 students.

The students who made up the sample were randomized into two groups: control and intervention. Students in the control group (CG) were taught in a traditional way. The students in the intervention group (IG) were taught lower airway aspiration using realistic simulations as teaching method. For randomization, a table of random numbers generated by the MiniTab software was used. Each number in the list with assignment to the CG and IG, numbered sequentially from one to 33, was individually placed inside an opaque envelope and this was closed. The manipulation of numbers was performed by an individual outside the study, ensuring that all students were equally likely to be assigned to the intervention or control groups.

The sequential teaching steps of teaching activities in the CG were: a) expository/dialogued theoretical class; b) practical laboratory class with demonstration of the lower airway aspiration technique by the teacher in a low-fidelity mannequin; c) group training in laboratory under the teacher's supervision.

The sequential steps of teaching activities in the IG were: a) expository/dialogued theoretical class; b) practical laboratory class with demonstration of the lower airway aspiration technique by the teacher in a low-fidelity mannequin; c) development of a simulated scenario in which students should evaluate the clinical situation and make a clinical decision about the need for aspiration and the type of aspiration required. In

all cases, the patient had diffuse bilateral snoring and was unable to cough or breathe deeply, which indicated the need for lower airway aspiration; d) *debriefing* for students to explain the feelings they experienced at the scene, the positive points put into practice, what could have been done differently, and what aspects they learnt and would take to future clinical practice. It is noteworthy that the simulated scenario was previously validated by the teachers involved in the research regarding the characterization, availability and arrangement of material resources, evaluation forms and execution time which was 20 minutes on average starting with the introduction of the students into the simulated environment and contextualization of the scenario until the disposal of materials used and organization of the environment.

It is noteworthy that steps 1 and 2 were identical for the two groups. The teaching activities for the CG took place on a Monday and Tuesday morning, totaling eight hours, while activities for the IG took place on a Thursday and Friday morning in the same week and with the same duration of the CG. These were the days and times in which the classes of the Nursing Skills II course took place. After the end of the teaching activities, on the Friday afternoon, all students were submitted to evaluative activities in order to check if there was difference in the theoretical and practical knowledge acquired by students in the two groups on lower airway aspiration.

The instrument for theoretical evaluation (written test) consisted of 19 questions that addressed skills to perform lower airway aspiration and the student should indicate whether the statements were true or false. The test was prepared by the researchers based on the bibliographic references adopted for preparation of classes.[8] Each correct answer was scored one point. The maximum total score was 19 points.

After the theoretical evaluation, the students were submitted to a practical evaluation. Each student performed the lower airway aspiration technique and was evaluated using a checklist that contained 29 items covering all the steps to be undertaken in the technique. Each item was analyzed as "totally performed (TP)", "partially performed (PP)" or "not performed (NP)" by the student. The checklist was prepared by the researchers following the bibliographic references adopted for preparation of classes.[9,10] As in the theoretical evaluation, each correct answer was scored one point and the maximum total score was 29 points.

The evaluation of practical knowledge of the students was carried out by two nurses who are collaborators of the course in which technical nursing skills are taught. To standardize the assessment, they were trained by the teacher responsible for delivering the content, which was considered the gold-standard of the study. In the training, the gold-standard teacher demonstrated the step-by-step technique of lower airway aspiration, just as it would be taught to the students. Then, two other researchers who are also teachers carried out a sequence of aspiration cases in which, for each case, there was prior agreement of the items that should be correctly performed. The nurses observed the scene and conducted the evaluation based on the checklist prepared for the practical evaluation. The agreement between evaluators and the gold-standard was measured through the application of the Kappa index.[11] Evaluators were only considered fit to apply the checklist when they obtained a near-perfect agreement with the gold-standard teacher, that is, a Kappa index above 0.8. This agreement was obtained with the accomplishment of 10 clinical cases. In order to ensure blindness in the evaluation, the nurses responsible for applying the checklist did not have access to the information regarding to which group (intervention or control) belonged the evaluated student.

Data were stored in a database in the *Excel* software and were analyzed in the SPSS statistical software, version 21.0. For descriptive analysis, simple frequency distribution tables and measures of central tendency were used (mean and median with respective standard deviations). The Student's t-test for independent samples was used to check the difference between the mean of correct answers in the theoretical evaluation and the mean of correct answers in the practical evaluation between the intervention and control groups. The level of significance (α) adopted was 5%.

The research was approved by the Research Ethics Committee of the competent University (C.A.A.E.54221916.9.0000.5153) and registered in the virtual platform for registration of experimental and non-experimental studies "Brazilian Registry of Clinical Trials (ReBEC)" under number RBR-8bsmyz.

RESULTS

Thirty-three students participated in the study, mostly females (30-88%) with a mean age of 21 ± 1.10 years and a median of 21 years. According to the eligibility criteria, the students were distributed in 17 in the intervention group and 16 in the control group. There was no sample loss. The distribution of study participants is shown in Figure 1.

It was observed that in the evaluation of theoretical knowledge, the mean score, based on the number of correct answers, of the control group was 15.5 (81.5%) points (median: 16.0, 13-18) and of the intervention group was 15.1 (79.4%) points (median: 16.0, 12-18). In the evaluation of practical knowledge, the mean score in the control group was 20.8 (71.7%) points (median: 19.5, 14-27) and in the intervention group was 22.9 (78.9%) points (median: 23.0, 17-29). There was no significant difference between the mean number of correct answers between the control and intervention groups in theoretical knowledge ($p = 0.50$) and practical knowledge ($p = 0.10$) (Table 1).

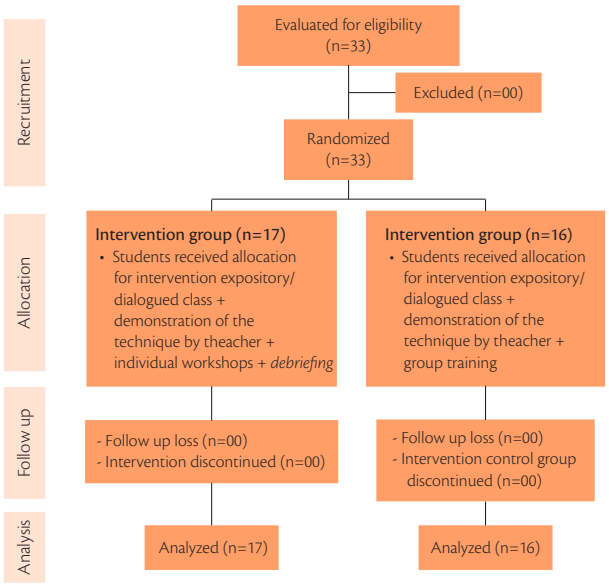

Figure 1 - Flowchart of study participants: initial and final inclusion. Viçosa, MG, Brazil, 2016.

Although no difference was found between the intervention and control group in the mean score of theoretical knowledge about the airway aspiration technique, the groups presented different scores in the evaluated items. Of the 19 items analyzed, only three (16%) were correctly assessed by 100% of the students in the intervention group, while eight items (42%) were correctly assessed by all the students in the control group. All questions with a 100% of correct answers in the intervention group were also correct in the control group. In the control group, the question with the lowest score was the 16 (3-18%) which referred to "irrigation of the catheter with saline solution 0.9% and repetition of the procedure, if necessary, no more than twice in the same session". Also in this question was found the greatest discrepancy between percentages of correct answers of the intervention and control group (34.1%). In the intervention group, the questions less correctly answered were the 3 and 13 (6-5.3%), which referred, respectively, to the " evaluation of the ability of the patient to cough and breathe deeply to determine the type of aspiration to be performed" and the "moment of insertion of the catheter and application of the suction required to remove the secretion". Table 2 presents the number of correct answers of each question evaluated in the theoretical knowledge about the upper airway aspiration technique.

Regarding the students' performance in the evaluation of practical knowledge, there was also no difference in the mean number of correct answers between the intervention and control group. Table 3 presents the number of correct answers of each question evaluated in the evaluation of practical knowledge about the upper airway aspiration technique.

In the analysis of Table 3, it is noteworthy that in the intervention group, in all items evaluated, most of the students performed the procedure in a totally or partially correct manner. In the control group, the item 2 - "evaluation of the ability of the patient to cough and breathe deeply" - was not performed correctly by the majority (11 - 68.7%) of the students. Of the 29 items analyzed, only two (6.9%) were completely correctly performed by 100% of the students in the intervention and control group. These items related, respectively, to "reporting the nasotracheal route as preferred for aspiration" and "discarding the materials used during the procedure". All students in the intervention group "switched on the vacuum network and confirmed that it was working properly". In the control group, all students performed the item "recording of the procedure" correctly.

DISCUSSION

In this study, no statistical difference was found in the theoretical and practical knowledge acquired by the students of the groups who learned the technique of airway aspiration through two different teaching methods. We observed that the students' performance, both in the theoretical and practical evaluation, occurred in a varied way, reaching a higher percentage of correct answers in some items than in others.

As regards the evaluation of theoretical knowledge, close results were verified in both groups. This may have happened because the structure of the instrument for written evaluation was based on the content addressed in the theoretical class and previously presented in an identical way for all the students of both groups. In the practical evaluation, so statistically significant difference was seen; the intervention group presented absolute mean scores slightly higher than the control group.

Table 1 - Theoretical and practical knowledge evaluated in the control and intervention group. Viçosa, MG, 2016

Evaluated knowledge	Group	N	Mean†	Median	SD‡	t*	p-value
Theoretical	Control	16	15.5	16.0	1.46	0.66	0.50
	Intervention	17	15.1	16.0	1.79		
Practical	Control	16	20.8	19.5	3.43	1.68	0.10
	Intervention	17	22.9	23.0	3.59		

Legend: † Maximum score that could be obtained in theoretical and practical assessments, respectively, 19 and 29 points; ‡Standard deviation; * t-student test
Source: Data collected in the survey.

Table 2 - Number of correct answers in each question of the theoretical evaluation per group studied. Viçosa, MG, 2016

Question evaluated	IG† (n=17)		CG‡ (n=16)	
	n	%	n	%
Question 1				
The purpose of the aspiration technique is to clean the airway to ensure the effectiveness of gas exchange.	16	94.1	16	100.0
Question 2				
The frequency of aspiration should be pre-determined by the nurse based on the evaluation of the patient's respiratory pattern.	16	94.1	16	100.0
Question 3				
To determine the type of aspiration, it is necessary to evaluate the patient's ability to cough and breathe deeply.	6	35.3	4	25.0
Question 4				
Suspected or confirmed facial trauma or surgery, hemorrhagic disorders or airway irritation are contraindications for aspiration.	16	94.1	16	100.0
Question 5				
Nasotracheal aspiration is indicated for patients who are coughing but cannot eliminate pulmonary secretion.	14	82.4	13	81.3
Question 6				
Before performing the procedure, hands must be hygienized, the material collected and the procedure explained to the patient.	14	82.4	15	93.8
Question 7				
In order to perform the procedure, the patient must be positioned in the supine position when possible.	17	100.0	16	100.0
Question 8				
The patient's chest must always be protected with a compress or a towel.	13	76.5	10	62.5
Question 9				
The nurse must wear a mask and goggles every time the aspiration procedure is performed.	16	94.1	16	100.0
Question 10				
The nurse must turn on the vacuum or portable aspirator and confirm if aspiration is being done properly.	16	94.1	16	100.0
Question 11				
The nurse must open and prepare the sterile materials and use sterile gloves to perform the procedure.	17	100.0	16	100.0
Question 12				
If the patient is in oxygen therapy, the nurse must maintain the oxygen concentration according to the medical prescription.	14	82.4	15	93.8
Question 13				
The aspiration catheter must be inserted during aspiration, applying the suction required to remove the secretions.	6	35.3	6	37.5
Question 14				
The catheter must be inserted until resistance is encountered or until the patient has a cough reflex.	12	70.6	11	68.8
Question 15				
After resistance happens or the patient coughs, suction should be applied and the catheter withdrawn with rotational movements within no more than 15 seconds.	13	76.5	14	87.5
Question 16				
During the procedure the catheter should be irrigated with 0.9% SS and the procedure repeated if necessary, no more than twice in the same session.	9	52.9	3	18.8
Question 17				
Nasopharyngeal and oropharyngeal aspiration is performed if necessary.	11	64.7	15	93.8
Question 18				
After finishing the procedure, the nurse must turn off the vacuum and leave the end of the stent protected.	13	76.5	14	87.5
Question 19				
The nurse must record the procedure by noting the volume and appearance of the aspirated secretion, as well as the patient's evaluation before and after the procedure.	17	100.0	16	100.0

Legend: † IG: Intervention Group; ‡ CG: Control Group.
Source: Data collected in the survey.

Table 3 - Results regarding the total, partial or non-realization of each item of the practical evaluation per group studied. Viçosa, MG, 2016

Item Rated	Intervention Group						Control Group					
	PT†		PP‡		NP*		PT		PP		NP	
	n	%	n	%	n	%	n	%	n	%	n	%
The student evaluated the respiratory pattern.	12	70.5	1	5.8	4	23.5	11	68.7	2	12.5	3	18.7
The student evaluated the ability to cough and breathe deeply.	15	88.2	2	11.7	0	0.0	5	31.2	0	0.0	11	68.7
The student reported the nasotracheal route as preferred for aspiration	17	100.0	0	0.0	0	0.0	16	100	0	0.0	0	0.0
The student positioned the patient in semi-Fowler position.	16	94.1	0	0.0	1	5.8	14	87.5	0	0.0	2	12.5
The student sanitized his/her hands.	16	94.1	0	0.0	1	5.8	12	75.0	1	6.2	3	18.7
The student separated the materials needed.	13	76.4	4	23.5	0	0.0	9	56.2	7	43.7	0	0.0
The student explained the procedure to the patient.	13	76.4	2	11.7	2	11.7	13	81.2	2	12.5	1	6.2
The student protected the patient's chest with a towel.	14	82.3	1	5.8	2	11.7	13	81.2	0	0.0	3	18.7
The student checked and set up the aspiration system and filled the vial with distilled water.	15	88.2	1	5.8	1	5.8	14	87.5	1	6.2	1	6.2
The student turned on the vacuum network and confirmed that it was working properly.	17	100.0	0	0.0	0	0.0	13	81.2	0	0.0	3	18.7
The student wore the PPE.	15	88.2	2	11.7	0	0.0	11	68.7	4	25.0	1	6.2
The student opened and prepared the materials in sterile field (tub, latex, catheter).	11	64.7	5	29.4	1	5.8	9	56.2	6	37.5	1	6.2
The student put on the sterile glove without contaminating it.	11	64.7	4	23.5	2	11.7	15	93.7	1	6.2	0	0.0
The student took the stent with the non-dominant hand and the catheter with the dominant hand.	10	58.8	4	23.5	3	17.6	12	75.0	0	0.0	4	25.0
The student regulated the pressure of the vacuometer from 100 to 150 mmHg.	10	58.8	1	5.8	6	35.2	10	62.5	3	18.7	3	18.7
The student lubricated the catheter with SS 0.9% and tested whether the system is aspirated.	13	76.4	2	11.7	2	11.7	12	75.0	3	18.7	0	0.0
The catheter was inserted during inspiration without applying aspiration.	13	76.4	2	11.7	2	11.7	14	87.5	1	6.2	1	6.2
The student advanced with the catheter until finding resistance, and pulled from 1 to 2 cm.	12	70.5	0	0.0	5	29.4	12	75.0	0	0.0	4	25.0
The student applied aspiration, withdrawing the catheter with rotating movements.	14	82.3	2	11.7	1	5.8	11	68.7	2	12.5	3	18.7
The student aspirated SS to clean the catheter and the stent	11	64.7	0	0.0	6	35.2	6	37.5	3	18.7	4	25.0
The student turned off the vacuum gauge.	12	70.5	0	0.0	5	29.4	6	37.5	0	0.0	10	62.5
The student disconnected the suction system from the catheter.	16	94.1	0	0.0	1	5.8	14	87.5	1	6.2	1	6.2
The student wrapped the catheter in the glove of the dominant hand.	14	82.3	0	0.0	3	17.6	15	93.7	1	6.2	0	0.0
The student left the end of the stent protected.	13	76.4	1	5.8	3	17.6	11	68.7	3	18.7	2	12.5
The student assessed the patient's breathing pattern.	11	64.7	5	29.4	1	5.8	4	25.0	12	75.0	0	0.0
The student made the patient comfortable and safe.	10	58.8	6	35.2	1	5.8	6	37.5	5	31.2	5	31.2
The student threw away the materials.	17	100.0	0	0.0	0	0.0	16	100.0	0	0.0	0	0.0
The student sanitized his/her hands.	14	82.3	0	0.0	3	17.6	13	81.2	0	0.0	3	18.7
The student recorded the procedure.	15	88.2	0	0.0	2	11.7	16	100.0	0	0.0	0	0.0

Legend: † PT = Totally Performed; ‡ PP = Partially Performed; * NP = Not Performed.
Source: Data collected in the survey

This result can be explained by the fact that the simulation allows the incorporation of know-how, for it allows the students to live experiences close to the reality, to make decisions, execute them and evaluate them.

Similarly, in a randomized clinical trial conducted with 16 students from the eighth semester of the undergraduate nursing course of a public university in the countryside of the state of São Paulo whose objective was to teach airway management with laryngeal mask to nursing students, there was also no statistically significant difference between the control and intervention group (p = 0.71). The authors concluded that, regardless of the teaching strategy employed, knowledge about the subject studied had been incorporated by students.[12]

With a similar goal, another clinical trial evaluated whether simulation-based teaching was more effective than traditional methods to train nurses and physicians in an obstetrics residency program with regard to skills for handling critical obstetric situations. The participants were distributed into simulation (three hours of activities in a simulation laboratory) and didactic (three hours of lectures, videos and demonstrations) groups. All participants performed pre- and post-class tests with closed questions. After one month, all the participants were filmed in a labor situation to have their performance evaluated. The results showed that there was no statistically significant difference between groups in the theoretical evaluation questionnaires. As for performance in childbirth care, the group submitted to simulations obtained higher scores of correct answers.[13]

In contrast, a meta-analysis including 40 articles that examined the effect size of educational nursing interventions based on the use of simulations and comparing the size of the effect according to the level of fidelity of the simulators showed effectiveness in several learning domains. Subgroup analyses revealed that effects sizes were higher in the use of high-fidelity simulation (0.86), followed by medium-fidelity simulation (1.03) and standardized patients (0.86), and lower in low-fidelity simulations and hybrids. In terms of cognitive results, the effect size was higher for high-fidelity simulation (0.50). Regarding the affective outcome, high–fidelity simulation (0.80) and standardized patients (0.73) had the largest effect sizes. The results suggest that educational nursing interventions based on simulations have strong effects, mainly in the psychomotor domain.[7]

In this study, although no statistically significant difference was found between the intervention and control group, the use of simulation can be considered a teaching strategy that favored the teaching-learning process of the airway aspiration technique. It was observed in the students' statements during the *debriefing* that they were convinced about the acquisition of skills and competences, especially in the affective, emotional and self-confidence domains. The *debriefing* is considered in the literature as an important component of simulations that generates positive and facilitating effects in the teaching-learning process, in view of what it is a recommended activity.[7] It was noticeable that there are spheres linked to knowledge that are most likely to be evaluated in their subjective aspects and which are as important in the teaching-learning process as the objective items evaluated in this study.

The situation of laboratory practice becomes new to the students and it has the presence of stressors such as the presence of the teacher, colleagues and researchers. However, we believe that the simulation was a strategy that minimized these factors in students in the intervention group.[14] The literature shows that the use of simulation promotes a better performance of students, as well as a significant increase ($p < 0.05$) in self-confidence in the execution of nursing techniques.[15]

The application of theoretical and practical evaluations should be considered a bias in the present study. For students in the control group, theoretical and training classes were held on Monday and Tuesday mornings, and the theoretical and practical evaluations were performed on the Thursday afternoon of the same week. On the other hand, the students of the intervention group participated in the theoretical class and the simulation activity on Thursday and Friday mornings and the theoretical and practical evaluations took place on the Friday afternoon of the same week. This time interval may have allowed the students in the control group to review the theoretical content learned, enabling them to obtain a higher average of correct answers in the theoretical evaluation. As the intervention group participated in the simulation activity in the morning and right in the afternoon of the same day did the evaluations, they may not have studied the theoretical content. However, the time interval between the simulation of the technique and the realization of the practical evaluation was shorter, justifying the greater number of correct answers.

CONCLUSION

There was no statistically significant difference in the average number of correct answers in the theoretical and practical evaluation of knowledge about lower airway aspiration among students in the intervention and control group. It was not possible to state, based on the statistical analysis, that the use of the simulation promoted better results than the traditional methodology to teach this skill. However, it was possible to observe that, irrespective of the teaching strategy used, the students acquired knowledge about the subject worked, which was evidenced by the percentage values of correct answers both in the theoretical and in the practical evaluation.

The use of the best evidence in clinical practice qualifies and ensures quality nursing care, implies the constant updating of professionals and requires teaching-learning strategies that stimulate participation and improvement. Because they represent an active and meaningful teaching-learning method, simulations have been considered a good strategy to be used in various activities. Simulations bring students closer to practice and do not treat them as passive receivers of knowledge.

The sample size is a limitation of the present study, and also the bias of the time for data collection in the intervention and control group. We suggest the replication of the study with a larger sample for comparison of the findings.

REFERENCES

1. Oliveira SN, Prado ML, Kempfer SS. Utilização da simulação no ensino da enfermagem: revisão integrativa. REME - Rev Min Enferm. 2014[cited 2017 May 24];18(2):487-95. Available from: http://www.reme.org.br/artigo/detalhes/941

2. Baptista RCN, Martins JCA, Pereira MFCR, Mazzo A. Simulação de alta-fidelidade no curso de enfermagem: ganhos percebidos pelos estudantes. Referência. 2014[cited 2017 May 24];IV(1):135-44. Available from: http://www.scielo.mec.pt/scielo.php?script=sci_arttext&pid=S0874-02832014000100015&lng=pt.
3. Kohn L, Corrigan J, Donaldson M, editors. To err is human: building a safer health system. Washington (DC): National Academies Press; 2001.
4. Teixeira CRS, Pereira MCA, Kusumota L, Gaioso VP, Mello CL, Carvalho EC. Evaluación de los estudiantes de enfermería sobre el aprendizaje con la simulación clínica. Rev Bras Enferm. 2015[cited 2017 May 20];68(2):311-9. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0034-71672015000200311&lng=en.
5. Costa RRO, Medeiros SM, Martins JCA, Menezes RMP, Araújo MS. O uso da simulação no contexto da educação e formação em saúde e enfermagem: uma reflexão acadêmica. Espaç Saúde. 2015[cited 2017 May 20];16(1):59-65. Available from: http://www.uel.br/revistas/uel/index.php/espacoparasaude/article/view/20263/pdf_63
6. Abreu AG, Freitas JS, Berte M, Ogradowski KRP, Nestor A. O uso da simulação realística como metodologia de ensino e aprendizagem para as equipes de enfermagem de um hospital infanto-juvenil: relato de experiência. Ciênc Saúde Coletiva. 2014[cited 2017 May 10];7(3):162-6. Available from: http://revistaseletronicas.pucrs.br/ojs/index.php/faenfi/article/view/17874/12495
7. Kim J, Park JH, Shin S. Effectiveness of simulation-based nursing education depending on fidelity: a meta-analysis. BMC Med Educ. 2016[cited 2017 Aug 10];23(16):152. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4877810/
8. Shin S, Park J, Kim JH. Effectiveness of patient simulation in nursing education: meta-analysis. Nur Educ Today. 2015[cited 2017 Aug 10];35:176-82. Available from: http://dx.doi.org/ 10.1016/j.nedt.2014.09.009
9. Perry AG, Potter PA, Desmarais PL. Guia completo de procedimentos e competências de enfermagem. 8ª ed. Rio de Janeiro: Elsevier; 2015.
10. Polit DF, Beck CT. Fundamentos de pesquisa em enfermagem: avaliação de evidências para a prática da enfermagem. 7ª ed. Porto Alegre: Artmed; 2011.
11. Perroca MG, Gaidzinski RR. Avaliando a confiabilidade interavaliadores de um instrumento para classificação de pacientes: coeficiente Kappa. Rev Esc Enferm USP. 2003[cited 2016 July 20];37(1):72-80. Available from: https://www.revistas.usp.br/reeusp/article/view/41330
12. Pedersoli CE, Pedersoli TAM, Faro ACM, Dalri MCB. Ensino do manejo da via aérea com máscara laríngea: estudo randomizado controlado. Rev Bras Enferm. 2016[cited 2017 June 19];69(2):368-74. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0034-71672016000200368&lng=en
13. Daniels K, Arafeh J, Clark A, Waller S, Druzin M, Chueh J. Prospective randomized trial of simulation versus didactic teaching for obstetrical emergencies. Simul Healthc. 2010[cited 2017 June 28];5(1):40-5. Available from: https://www.ncbi.nlm.nih.gov/pubmed/20383090
14. Silva APSS, Cogo ALP. Aprendizagem de punção venosa com objeto educacional digital no Curso de Graduação em Enfermagem. Rev Gaúcha Enferm. 2007[cited 2017 June 28];28(2):187-92. Available from: http://seer.ufrgs.br/RevistaGauchadeEnfermagem/article/view/3162
15. Meska MHG, Mazzo A, Jorge BM, Souza-Junior VD, Negri EC, Chayamiti EMPC. Urinary retention: implications of low-fidelity simulation training on the self-confidence of nurses. Rev Esc Enferm USP. 2016[cited 2017 Aug 20];50(5):8317. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0080-62342016000500831&lng=en.