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COMPARISON BETWEEN SIMULATION METHODOLOGIES AND TRADITIONAL TEACHING IN PERMANENT EDUCATION PRACTICES WITH NURSES

COMPARAÇÃO ENTRE METODOLOGIAS DE SIMULAÇÃO E ENSINO TRADICIONAL NAS PRÁTICAS DE EDUCAÇÃO PERMANENTE COM ENFERMEIROS

COMPARACIÓN ENTRE METODOLOGÍAS DE SIMULACIÓN Y ENSEÑANZA TRADICIONAL EN PRÁCTICAS DE EDUCACIÓN PERMANENTE CON ENFERMERAS

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Objective: to compare the effects between the simulation methodology and the traditional class in the acquisition of nurses' knowledge about the Basic Human Need for Oxygenation. Method: cross-sectional study through Permanent Education activities with simulation methodology and traditional teaching with two groups of nurses. Four workshops were held in three stages: pre-test; simulation or exhibition class; Test. The Kolmogorov Smirnov test was defined for normality of the data, for comparison of the means of correct answers, the Student or Wilcoxon t-tests, and the confidence level of <0.05. Results: the total sample reached a higher average of correct answers in the post-test in all workshops, being the same in those of Orotracheal Tube and Tracheostomy. The first group reached a higher average of correct answers in the workshops on Oxygen therapy and Oximetry, and the second in the workshop on Airway Aspiration. Conclusion: it was not able to infer which methodology promoted greater knowledge acquisition among the groups.

Descriptors: Health Human Resource Training. Education, Nursing. Education, Nursing, Continuing. Simulation Training. Lecture.

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Objetivo: comparar os efeitos entre a metodologia de simulação e a aula tradicional na aquisição de conhecimentos de enfermeiros sobre a Necessidade Humana Básica de Oxigenação. Método: estudo transversal mediante atividades de Educação Permanente com metodologia de simulação e ensino tradicional com dois grupos de enfermeiros. Realizou-se quatro oficinas em três etapas: pré-teste; simulação ou aula expositiva; pós-teste. Definiu-se para normalidade dos dados o teste Kolmogorov Smirnov, para comparação das médias de acertos, os testes t de Student ou Wilcoxon, e nível de confiança de <0,05. Resultados: a amostra total alcançou maior média de acertos no pós-teste em todas as oficinas, sendo iguais nas de Tubo Orotraqueal e Traqueostomia. O primeiro grupo alcançou maior média de acertos nas oficinas sobre Oxigenoterapia e Oximetria, e o segundo, na oficina sobre Aspiração de Vias Aéreas. Conclusão: não se pôde inferir qual metodologia promoveu maior aquisição de conhecimento entre os grupos.

Descritores: Capacitação de Recursos Humanos em Saúde. Educação em Enfermagem. Educação Continuada em Enfermagem. Treinamento por Simulação. Aula.

Objetivo: comparar los efectos entre la metodología de simulación y la clase tradicional en la adquisición de conocimientos de enfermería sobre la Necesidad Humana Básica de Oxigenación. Método: estudio transversal a través de actividades de Educación Permanente con metodología de simulación y enseñanza tradicional con dos grupos de enfermeras. Se celebraron cuatro talleres en tres etapas: pre-prueba; clase de simulación o exhibición; Prueba. La prueba de Kolmogorov Smirnov se definió para la normalidad de los datos, para la comparación de las medias de las respuestas correctas, las pruebas t de Student o Wilcoxon y el nivel de confianza de <0,05. Resultados: la muestra total alcanzó un mayor promedio de respuestas correctas en el post-test en todos los talleres, siendo la misma en los de Tubo Orotracqueal y Traqueostomía. El primer grupo alcanzó un promedio más alto de respuestas correctas en los talleres de Oxigenoterapia y Oximetría, y el segundo en el taller de Aspiración de Vía Aérea. Conclusión: no fue capaz de inferir qué metodología promovió una mayor adquisición de conocimientos entre los grupos.

Descriptores: Capacitación de Recursos Humanos en Salud. Educación en Enfermería. Educación Continua en Enfermería. Entrenamiento Simulado. Clase.

Introduction

The science of care produced by nurses to the person, family and community permeates the various circumstances of the health and disease process and the various health care environments. However, in all care provided there is the concern to perform it correctly and at the appropriate time, meeting the basic human needs that are in imbalance in that client. This principle of nursing was addressed by Wanda Horta in her theory of Basic Human Needs (BHN), in which she states that nursing assists the human being in meeting their basic needs through physical-chemical, biological and psychosocial knowledge and principles[1].

In order to provide care with safety and quality, it is important that nurses constantly participate throughout their career in educational activities, in order to improve themselves professionally and personally, because it is known that scientific knowledge is changeable and periodically new research brings new evidence[2]. Thus, the knowledge acquired by the health professional in the health training institution is not sufficient to prepare him to follow the new recommendations of his area of activity, and in-service training should take place on a regular basis[3]. Therefore, learning spaces are opportunities for the professional to learn, review, practice, update and develop concepts, practices and knowledge.

Among the tools for promoting professional training is Permanent Education (PE), which is a practice that proposes educational actions based on the problematization of the health work process, supported by the critical, problematizing and reflexive pedagogical principle, and constitutes a proposal to overcome the deficiencies of training of human resources in health by integrating teaching into the field of work and, thus, to allow learning through interaction[4-6].

It is clear that there is currently a search for the breaking of socially accepted paradigms and for the translation of scientific evidence into

actions to provide quality and safety assistance. This requires that forms of in-service education be able to integrate theory and practice, which is also a principle of practice based on scientific evidence[3,5-6]. In this sense, active teaching methodologies, such as simulation, have been gaining ground by placing students at the center of educational actions and encouraging the construction of knowledge collaboratively. However, despite the new social demands to make education a more active and less passive process, the traditional methodology, which prioritizes the transmission of information and the teacher is the one who occupies the central role, is still used[7].

Usually, the traditional teaching model assigns the student a passive position of viewer and the teacher is considered the only one capable of transferring their knowledge, and for this, uses unidirectional communication. On the other hand, in the simulation methodology, the student has the opportunity to actively participate, reflect and evaluate the processes involved in his education, as he recreates scenarios that simulate professional practice in a controlled, protected and realistic environment that brings him closer to the reality of his/her daily life[7-8].

This study is part of an extension project developed in the hospital units of a municipality in the Zona da Mata Mineira, since 2017. This project aimed to evaluate the use of realistic simulation in the construction of competencies in the professional practice of the nursing team. The topics addressed comprised professional nursing practice and followed a schedule addressing the main nursing problems according to the basic human needs affected, in the light of Wanda Horta's theory. After the training workshops, an evaluation of the activity was performed; at that moment, some nurses expressed discomfort in participating in simulated activities, suggesting the traditional methodology during training. Following the schedule of workshops, the Oxygenation BHN would be the theme to be addressed in subsequent training. Considering that the problems related to Oxygenation BHN are of great relevance to the professional practice of nurses and taking into account that diseases of the respiratory system occupy the second causes of hospitalizations in Brazil and are responsible for 19.5% of deaths during these hospitalizations[9], it was decided to define this BHN as a theme to compare the acquisition of knowledge using different methodologies.

Although the study was developed outside the current context of the COVID-19 pandemic, it is clear the need for nurses to be trained to provide care to the client with imbalance in the Oxygenation BHN, thus confirming the relevance of this theme.

Although the study was developed outside the current context of the COVID-19 pandemic, it is clear the need for nurses to be trained to provide care to the client with imbalance in the Oxygenation BHN, thus confirming the relevance of this theme.

Method

This is a cross-sectional study with a quantitative approach, developed between 2018 and 2019, in two hospitals in a municipality in the inside of Minas Gerais, Brazil. The criteria verification list Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) was used[10].

The study was conducted with 36 nurses working in several sectors of 2 hospitals in a city in the inside of Minas Gerais, among them: Adult and Neonatal Intensive Care Unit, Emergency Care Unit, Emergency And Emergency Unit, Medical and Surgical Clinic, Hemodialysis, Maternity and Hospital Technical Responsibility. This sample was selected in a non-probabilistic way, but in a conventional way, of voluntary participation. Nurses who worked in the hospital at the time of data collection were included in the study and those whose checklists had no answers or erasures were excluded from the sample.

Each group of nurses (G1 and G2) corresponds to one of the hospitals in which the project was developed. PE workshops were held in 2018 in one of the hospitals (G1) using the simulation method. The workshops in the second hospital (G2) began in 2019 using the traditional methodology with an exhibition class.

The simulation workshops (G1) took place in the Laboratory of Nursing Skills Practices of a federal public university. This space is intended for theoretical-practical classes and is equipped with hospital beds, low fidelity mannequins, as well as hospital materials and equipment that are essential for the simulation of nursing interventions. The simulations were performed by a student and a professor of the nursing course, who performed the clinical evaluation and demonstration of the procedures, that is, they simulated the nursing activities, while the participants observed.

For the execution of the simulation workshops, the scenario of an infirmary was created. All the essential materials of an infirmary were available for the development of health care activities. The client, who needed nursing care, was represented by a low-fidelity mannequin and/or a standardized patient, depending on the procedure. With these strategies, we sought to immerse the participants in their care practices as nurses.

The traditional teaching workshops (G2) were held through exhibition classes in a meeting room of one of the hospitals participating in the study. The content of the workshops was taught by a professor of Nursing Skills at a federal public university, with the help of projected slides.

In the workshops, for both groups, the topics addressed were based on Wanda Horta's Theory of Basic Human Needs. Oxygenation BHN was used as a central theme. As programmatic content, the procedures of oxygen therapy, pulse oximetry, care with orotracheal tube (OTT) and tracheostomy (TCT), aspiration of the upper and lower airways were defined. A PE workshop was held for each procedure and for each group.

A checklist questionnaire was applied with questions related to the theme of training, immediately before (pre-test) and after (post-test) each E workshop, in order to evaluate the professionals' previous knowledge about the topics addressed and whether there was knowledge acquisition after participation in the educational activity. The pre-test and post-test questionnaires were elaborated by the researchers responsible for the study, based on bibliographic references of the discipline of Nursing Skills, using as basic bibliography the book Nursing Fundamentals[11] and contemplated questions related to clinical, technical and procedure knowledge. The pre-test and post-test questionnaires were elaborated by the researchers responsible for the study, based on bibliographic references of the discipline of Nursing Skills, using as basic bibliography the book Nursing Fundamentals[11] and contemplated questions related to clinical, technical and procedure knowledge.

The average time of each workshop was one hour, being 20 minutes reserved for the application of the questionnaires (10 minutes for the pre-test before the workshop and 10 minutes for the post-test at the end of the workshop) and the rest of the time for the simulation or exhibition class. The days and times of the workshops were established according to the availability of the professionals and the scale elaborated by the coordination of the nursing service of the hospitals.

The statements contained in the questionnaires (checklists) of each workshop, which the participants should classify as "true", "false" or "do not know", were grouped into constructors according to the subject they adressed (Chart 1).

Chart 1 – Constructs of questionnaires and number of pre- and post-test questions applied in continuing education workshops on the Basic Human Need for Oxygenation.

Workshop 1 - Oxygen Therapy (n=25)	
Construct 1 (n= 6)	Knowledge about indication and technical knowledge
Construct 2 (n= 9)	Care in the procedure
Construct 3 (n= 10)	Clinical knowledge
Workshop 2 - Pulse Oximetry (n=18)	
Construct 1 (n= 9)	Clinical knowledge
Construct 2 (n= 9)	Technical knowledge
Workshop 3 - Airway aspiration (n= 25)	
Construct 1 (n= 17)	Technical knowledge
Construct 2 (n= 5)	Upper airway aspiration precautions
Construct 3 (n= 3)	Lower airway aspiration precautions
Workshop 4 - Orotracheal Tube and Tracheostomy Care (n= 20)	
Construct 1 (n= 5)	General knowledge about advanced airway
Construct 2 (n= 10)	Care with the OTT
Construct 3 (n= 5)	Care with the TCT

Source: Created by the authors.

At the end of each workshop, the questionnaires were corrected by the researchers who attributed the value one for each hit, and for each error or answer "I don't know" the value zero. These data were tabulated in a Microsoft Excel spreadsheet, version 2007, and later analyzed by the Statistical Package for the Social Sciences (SPSS) software, version 20. Descriptive statistics analyses were performed to obtain the mean as a measure of central tendency and standard deviation as a measure of variability. The Kolmogorov Smirnov test was used to verify the normalities of the data. Student's t-test was continued when there was normal distribution and the Wilcoxon test when there was no normal distribution, to compare the means of hit. The confidence level of <0.05 was set.

The study was conducted after obtaining the approval of the Human Research Ethics Committee of the *Universidade Federal de Viçosa*, under Opinion n. 2,415,206, of December 2017, and followed the guidelines and regulatory standards of research involving human beings as it deals with Resolution n. 466/2012 of the National Health Council. The Informed Consent Form (ICF) was submitted, clarified and signed by all study participants. The nurses were identified with the initials of the first and last names in the pre and post-test (checklists) to ensure the anonymity of the participants.

Results

The participants were 36 nurses. The average participation in G1 workshops was 21 nurses and G2 was 10 nurses (Table 1). There was loss of follow-up, so that not all professionals participated in all workshops. It is believed that the largest number of participants in G1 was due to the encouragement of a rest granted by the hospital for professionals who participated in all scheduled PE activities. Another factor that contributed to the loss of the sample was the incomplete completion, erasures or non-identification of the checklists with the initials of the first and last names, and these questionnaries were excluded from the study.

Table 1 – Number of participants per workshop and per group. Minas Gerais, Brazil – 2018-2019. (N=36)

Workshop	Group 1	Group 2	n
Oxygen therapy	22	14	36
Pulse oximetry	22	14	36
Airway aspiration	19	6	25
Orotracheal tube and tracheostomy	21	6	27

Source: Created by the authors.

The mean scans of pre- and post-tests of the total sample and groups per workshop and their respective constructs (Tables 2 and 3) were analyzed.

Table 2 – Average of correct answers in the pre-tests and post-tests in the workshop and in its constructs per total sample. Minas Gerais, Brazil - 2018-2019

Workshops	Total sample		p
	Pre-test Mean ±sD	Post-test Mean ±sD	
1- Oxygen Therapy	17.05±2.96	20.44 ±2.07	**<0.001(1)**
Construct 1 (n=6)	3.08 ±0.96	4.16 ±0.97	**<0.001(2)**
Construct 2 (n=9)	6.41 ±1.49	7.47 ±1.25	**<0.001(2)**
Construct 3 (n= 10)	7.55 ±1.62	8.80 ±1.03	**<0.001(2)**
2- Pulse Oximetry	13.66 ±2.20	15.75 ±1.36	**<0.001(1)**
Construct 1 (n= 9)	7.25 ±1.20	7.97 ±0.84	**0.001(2)**
Construct 2 (n= 9)	6.41 ±1.50	7.77 ±1.04	**<0.001(1)**
3- Airway aspiration	16.08 ±2.61	20 ±3.12	**<0.001(1)**
Construct 1 (n= 17)	11.24 ±1.58	13.88 ±2.20	**<0.001(1)**
Construct 2 (n= 5)	3.12 ±0.92	3.56 ±0.76	0.05(2)
Construct 3 (n= 3)	1.72 ±0.84	2.56 ±0.71	**<0.001(2)**
4- Orotracheal tube and tracheostomy	14.85 +2.93	16.33 +1.68	**0.02(1)**
Construct 1 (n= 5)	3.25 +1.02	3.29 +0.91	0.93**(2)**
Construct 2 (n= 10)	7.92 +1.83	9.07 +1.14	**0.003(2)**
Construct 3 (n= 5)	3.66 +1.00	3.96 +0.80	0.37(2)

Source: Created by the authors.

sD standard deviation;
(1) t Test; (2) *Wilcoxon*.

Table 3 – Average of correct answers in the pre-tests and post-tests in the workshop and in its constructs by group 1 and group 2. Minas Gerais, Brazil – 2018-2019

Workshops	Group 1 (Simulation)		p	Group 2 (Traditional methodology)		p
	Pre-test Mean ±sD	Post-test Mean ±sD		Pre-test Mean ±sD	Post-test Mean ±sD	
1- Oxygen Therapy	17.04 ±3.22	20.63 ±1.70	**<0.001(1)**	17.07 ±2.61	20.14 ±2.59	**<0.001(1)**
Construct 1 (n=6)	3.13 ±1.12	4.27 ±1.03	**0.001(1)**	3.00 ±0.67	4.00 ±0.87	**0.02(2)**
Construct 2 (n=9)	6.40 ±1.59	7.54 ±1.33	**0.004(2)**	6.42 ±1.34	7.35 ±1.15	**0.02(1)**
Construct 3 (n= 10)	7.50 ±1.53	8.81 ±0.95	**<0.001(1)**	7.64 ±1.82	8.78 ±1.18	**0.01(1)**
2- Pulse Oximetry	14.13 ±1.95	15.59 ±1.50	**<0.001(1)**	12.92 ±2.43	16.00 ±1.10	**<0.001(1)**
Construct 1 (n= 9)	7.63 ±1.09	8.22 ±0.86	**0.01(2)**	6.64 ±1.15	7.57 ±0.64	**0.03(1)**
Construct 2 (n= 9)	6.50 ±1.40	7.36 ±0.90	**0.007(1)**	6.28 ±1.68	8.42 ±0.93	**0.002(2)**
3- Airway aspiration	16.10 ±2.57	20.15 ±3.40	**<0.001(1)**	16.00 ±2.96	19.50 ±2.16	**0.02(1)**
Construct 1 (n= 17)	11.21 ±1.54	14.05 ±2.39	**<0.001(1)**	11.33 ±1.86	13.33 ±1.50	**0.03(1)**
Construct 2 (n= 5)	3.15 ±0.95	3.52 ±0.84	0.14(1)	3.00 ±0.89	3.66 ±0.51	0.17(1)
Construct 3 (n= 3)	1.73 ±0.80	2.57 ±0.76	**0.001(2)**	1.66 ±1.03	2.50 ±0.54	0.14(1)
4- Orotracheal tube and tracheostomy	15.33 +2.15	16.33 +1.42	0.05(1)	13.16 +4.66	16.33 +2.58	0.19(1)
Construct 1 (n= 5)	3.47 +0.98	3.23+0.83	0.32(2)	2.50 +0.83	3.50 +1.22	0.11(1)
Construct 2 (n= 10)	8.04 +1.43	9.23 +0.83	**0.006(2)**	7.50 +3.01	8.50 +1.87	0.22(1)
Construct 3 (n= 5)	3.80 +0.81	3.85 +0.79	0.95(2)	3.16 +1.47	4.33 +0.81	0.23(1)

Source: Created by the authors.

sD standard deviation.
(1) Teste t; (2) *Wilcoxon*.

In the oxygen therapy workshop, the mean number of correct answers in the post-test of the total sample was higher than in the pre-test (p<0.001) in all constructs. In group stratification, G1 and G2 also obtained a higher mean of statistically significant correct answers in the post-test in all constructs.

In the Pulse Oximetry (SpO2) workshop, the mean correct answers in the post-test of the total sample in construct 1 (p=0.001) and 2 (p<0.001) were higher than that of the pre-test, as observed in the evaluation of groups 1 and 2.

In this workshop, the majority of G1 participants missed, in the post-test, one of the nine questions of Construct 2, Technical Knowledge. This question related the delay of reading oxygen saturation to the circulatory and/or ventilator alterations of the client. In G2, the majority missed in the pre and post-test a question of the nine of Construct 1, clinical knowledge, this issue, which associated low oxygen saturation with the need for oxygen therapy.

In the Airway Aspiration workshop, the total sample presented a higher mean number of correct answers in the post-test compared to the pre-test (p<0.001), and this also occurred in its constructs 1, Technical knowledge (p<0.001), and 3, Lower airway aspiration care (p<0.001). In construct 2, Upper airway aspiration care, the differences were not significant (p=0.05), but the mean post-test was also higher.

G1 obtained the highest mean number of correct answers in the post-test of this workshop (p<0.001) and in its constructs 1 (p<0.001) and 3 (p=0.001). G2 also obtained a higher average of correct answers in the post-test in this workshop (p=0.02) and in its construct 1 (p=0.03). In G1, most nurses missed two questions of construct 1, technical knowledge (about the need or not of using sterile glove to perform aspiration of upper and lower airways and the appropriate order to perform the procedure, that is, to start it by the lower airways), and one of the five questions of construct 2, Care in the aspiration of the upper airways, in the post-test (on the measurement of the catheter that will be introduced into the airways to perform aspiration).

While in G2 most participants missed three questions also of construct 1 (on cough stimulation, the repositioning of the oxygen therapy device between aspirations and synchronization of the insertion of the aspiration catheter with the inspiration of the client) and a question of construct 2, being the same question that G1 also obtained a higher number of errors.

In the OTT and TCT care workshop, a statistical difference was observed only between the means of pre- and post-test correct answers in the workshop (p=0.02) and in its construct 2, Care with the OTT,(p=0.003) in the total sample analysis. Nevertheless, the average number of correct answers in the post-test was higher than that of the pre-test in the workshop and in its constructs.

When analyzing G1 in this workshop, it was observed that he obtained a higher average of correct answers in the post-test, however the difference was not significant (p=0.05). The mean number of correct answers in the post-test was lower than that of the pre-test in Construct1, General knowledge about advanced airway (p=0.32). In constructs 2, Care with the OTT (p=0.006), and 3, Care with the TCT (p=0.95), the mean number of correct answers was higher in the post-test, but there was a difference only in Construct 2. G2 obtained a higher mean of correct answers in the post-test in relation to the pre-test in the workshop and in its constructs 1, 2 and 3; however there was no statistical difference.

In the post-test of this workshop, the majority of the participants in G1 and G2 missed two questions related to general knowledge about advanced airway. One of the issues that caused errors for nurses in G1 and G2 addressed the need for sterile technique for the care and maintenance of an artificial airway. G1 also maintained the error in the question about the recommended insufflation pressure of the endotracheal tube baler. And G2 erred in an issue that related the nursing diagnosis of "Ineffective airway clearance" to the possible need for endotracheal intubation.

In order to identify which group, simulation or traditional, obtained the highest average of correct answers after the PE workshops, a comparison was made between the means of correct answers in the pre and post-test between the groups (Table 4).

Table 4 – Comparison between the average of correct answers and by constructs in the pre-test and post-test of the groups. Minas Gerais, Brazil – 2018-2019. (N=36) (continued)

Workshops	Pre-test		p	Post-test		p
	Group 1	Group 2		Group 1	Group 2	
1- Oxygen Therapy	17.04 ±3.22	17.07 +2.61	0.98(1)	20.63 ±1.70	20.14 +2.59	0.49(1)
Construct 1 (n=6)	3.13 ±1.12	3.00 ±0.67	0.88(2)	4.27 ±1.03	4.00 ±0.87	0.45(2)
Construct 2 (n=9)	6.40 ±1.59	6.42 ±1.34	0.96(2)	7.54 ±1.33	7.35 ±1.15	0.57(2)
Construct 3 (n= 10)	7.50 ±1.53	7.64 ±1.82	0.80(1)	8.81 ±0.95	8.78 ±1.18	0.92(1)
2- Pulse Oximetry	14.13 ±1.95	12.92 ±2.43	0.11(1)	15.59 ±1.50	16.00 ±1.10	0.35(1)
Construct 1 (n= 9)	7.63 ±1.09	6.64 ±1.15	**0.01(2)**	8.22±0.86	7.57 ±0.64	**0.01(2)**
Construct 2 (n= 9)	6.50 ±1.40	6.28 ±1.68	0.88**(2)**	7.36 ±0.90	8.42 ±0.93	**0.002(2)**

Table 4 – Comparison between the average of correct answers and by constructs in the pre-test and post-test of the groups. Minas Gerais, Brazil – 2018-2019. (N=36) (conclusion)

Workshops	Pre-test		p	Post-test		p
	Group 1	Group 2		Group 1	Group 2	
3- Airway aspiration	16.10 ±2.57	16.00 ±2.96	0.93(1)	20.15 ±3.40	19.50 ±2.16	0.66(1)
Construct 1 (n= 17)	11.21 ±1.54	11.33 ±1.86	0.87(1)	14.05 ±2.39	13.33 ±1.50	0.49(1)
Construct 2 (n= 5)	3.15 ±0.95	3.00 ±0.89	0.72(1)	3.52 ±0.84	3.66 ±0.51	0.70(1)
Construct 3 (n= 3)	1.73 ±0.80	1.66 ±1.03	0.92(2)	2.57 ±0.76	2.50 ±0.54	0.59(2)
4- Orotracheal tube and tracheostomy	15.33 +2.15	13.16 +4.66	0.11(1)	16.33 +1.42	16.33 +2.58	1.00(1)
Construct 1 (n= 5)	3.47+0.98	2.50 +0.83	**0.04**(2)	3.23+0.83	3.50+1.22	0.55(2)
Construct 2 (n= 10)	8.04 +1.43	7.50 +3.01	0.93(2)	9.23+0.83	8.50 +1.87	0.47(2)
Construct 3 (n= 5)	3.80 +0.81	3.16 +1.47	0.37(2)	3.85 +0.79	4.33+0.81	0.23(2)

Source: Created by the authors.

(1) Student's t test; (2) Mann-Whitney test.

When comparing the previous knowledge between the two groups, it can be observed that in workshop 1, Oxygen therapy, there were no statistical differences in relation to the mean number of correct answers in the pre-test of the workshop in its entirety and in its constructs between G1 and G2. In Workshop 2, Pulse oximetry, only in the evaluation of construct 1, Clinical knowledge, the mean number of correct answers in the pre-test of G1 was higher and statistically significant in relation to G2 (p=0.01). As in workshop 1, in workshop 3, Airway aspiration, no statistical differences were observed either. And in workshop 4, Care with OTT and TCT, only construct 1, General knowledge about advanced airway, presented statistical significance, in which G1 presented higher mean of correct answers (p=0.04). These data prove the homogeneity of the groups in relation to their previous knowledge.

Regarding the knowledge acquired after PE, evaluated by post-test, it can be observed that, in workshop 1, Oxygen therapy, and in its constructs (knowledge about indication and technical knowledge, care in the procedure and clinical knowledge), no statistical differences were found in the comparison of the mean number of correct answers of the groups. However, it is noted that the simulation (G1) achieved better results in the performance of nurses in the post-oxygen therapy test when compared to the traditional methodology group (G2).

In the workshop on pulse oximetry, a difference was found only in the analysis of its constructs, in which G1 obtained the highest mean in construct 1, Clinical knowledge (p=0.01), and G2, in construct 2, Technical knowledge (p=0.002). G1 nurses who experienced pulse oximetry simulation had better performance in the clinical knowledge construct. On the other hand, the nurses from G2 who participated in the traditional class achieved better performance in the construct referring to the technique of this procedure.

In workshop 3, on airway aspiration, and in its constructs (technical knowledge, care in upper airway aspiration and care in lower airway aspiration), no differences were found in the post-test between the groups. G2, which used the traditional methodology, obtained a higher average of correct answers in the post-test of the workshop and in the construct on care in the aspiration of upper airways. On the other hand, teaching about technical knowledge and care in lower airway aspiration showed better results when the simulation methodology was used (G1).

No differences were also found in workshop 4, Care with the OTT and TCT. However, it was observed that, in the tot care construct, G2, which used the simulation, reached higher

means of correct answers in the post-test. While, for the teaching of general knowledge about advanced airways and TCT care, the traditional methodology (G1) reached higher averages of correct answers in the post-test.

G1 and G2 presented higher average of correct answers in the post-test in relation to the pre-test in most workshops and in their respective constructs. The exception of this finding was construct 1 of workshop 4, in which G1 presented lower average of correct answers in the post-test. In the comparison between the groups, it was observed that the nurses in G1 (simulation) achieved higher means of correct answers in the post-test in most constructs of the PE workshops.

Discussion

It is expected that continuing education prepares nurses to act as a promoter of the integral health of the human being. The integration between teaching and service, the central role of continuing education, gains prominence for being configured as spaces of action and reflection that integrate work and education, thus ensuring the application of knowledge and science in daily professional life[12].

In this study, no statistical difference was found between the simulation groups and traditional class regarding the acquisition of knowledge about Oxygenation BHN, demonstrated by the number of correct answers in the questionnaires applied, but it was found that both groups increased their average of correct answers after participation in continuing education activities.

The contents addressed in the workshops – Oxygen Therapy, Pulse Oximetry Assessment, Nursing Care for patients with orotracheal tube and tracheostomy, and Nursing care in airway aspiration – are procedures and interventions that are within the list of activities routinely performed by nurses and are nursing care related to Oxygenation BHN. They involve skills that permeate technical knowledge and clinical knowledge. The mastery of fundamental clinical skills, such as communication, physical examination, clinical reasoning, the application of care and quality care, are necessary for the nursing education process, and the authority over these skills depends on their adequate and continuous learning[13].

In oxygen therapy, oxygen is provided at concentrations higher than that available in ambient air (21%) with the objective of improving oxygenation, decreasing or preventing hypoxemia, and preventing or correcting hypoxia. The methods for oxygen supplementation are diverse, each of which has an oxygen supply flow, and advantages and disadvantages of its use[14].

Despite the significant difference between the pre-test and the post-test of both groups (Table 3), with higher mean scans in the post-test of the Oxygen therapy workshop and in its constructs, it was possible to identify that both groups maintained the error in questions of construct 1, Knowledge about indication and technical knowledge. These issues addressed the use of oxygen supply devices and their indications.

The persistence of error of these questions, in the pre and post-test, indicates that both the simulation and the traditional class did not provide the construction of knowledge about the indication and technical knowledge of Oxygen therapy for most participants. Therefore, focus on these issues should be focused on addressing this theme in PE activities with nurses, because despite the benefits when using it well, excess oxygen can cause undesirable effects on the patient's body.

Thus, the supply of excess oxygen can lead to reduced cardiac output, vasoconstriction, inflammation and oxidative stress. In addition, the routine supply of supplemental oxygen to non-hypoxemic patients increases the cost of medicinal gas, humidification and the devices for its administration. For the patient, oxygen therapy can be irritating and lead to adverse results, such as epistaxis (nasal cannulas), claustrophobia (facial mask), pharyngitis, odinophagia and tracheal stenosis (endotracheal tube)[15].

The oxygen delivery device should be routinely monitored to ensure that it is in the correct position and well tolerated by the patient[15]. Nurses should be aware of the risks that the individual in oxygen therapy is subject to and promote nursing care to eliminate or decrease them, as well as ensure appropriate therapy.

The pulse oximeter is a non-invasive device that performs indirect SpO2 measurement. By emitting wavelengths of light that are absorbed differently by oxygenated and deoxygenated hemoglobins, the photodetector detects differences in light absorption, and the oximeter calculates oxygen saturation[14]. As seen, pulse oximetry is an important parameter for monitoring patients, especially those using supplemental oxygen.

In the present study, it was possible to conclude, after analyzing the errors of each group in the questions of the Pulse Oximetry workshop constructs, that the nurses who participated in the simulation presented difficulties in questions related to technical knowledge of pulse oximetry, while those who participated in the traditional class evidenced difficulties related to clinical knowledge of the procedure.

It was observed that knowledge about the functioning of oxygen therapy devices, as well as pulse oximeter and SpO2 reference values, which may indicate the use of supplemental oxygen, need to be improved, as these were issues addressed in issues where most nurses presented error in the workshops of oxygen therapy and oxygen saturation. Therefore, understanding how equipment works is part of technical knowledge and is essential for them to be used correctly and deliver reliable, safe and effective results.

The clinical knowledge addressed in the issue with high error index related the value of SpO2 to the need for oxygen therapy. In addition to the numerous losses caused by inadequate oxygen supply, SpO2 above 96% in patients on supplemental oxygen therapy probably causes a small but important risk of death without plausible benefit. For patients who have suffered myocardial infarction or stroke whose SpO2 was ≥90%, there is no evidence of benefit from supplemental oxygen, but there is at least a modest risk of damage[15].

A study conducted with the objective of analyzing the knowledge of health professionals, mostly nurses, about oxygen therapy, identified the need for training of these professionals, to improve knowledge on the subject. However, the authors scored on the results that the professionals were able to point out the main indication of oxygen use (hypoxemia). Most of them request the monitoring of pulse oximetry of patients using oxygen and also know the main oxygen supply devices (Venturi mask, nasal catheter and macronebulization)[16].

It is known that the accumulation of secretions in the airways can hinder gas exchange and impact a low concentration of circulating oxygen and, consequently, lead to hypoxia. To prevent this from occurring, it is essential that nurses evaluate the patient's breathing pattern and identify this problem, in order to intervene assertively. Among the interventions, airway aspiration, a procedure that consists of the introduction of a catheter to the pharynx, trachea or artificial airway, followed by vacuum suction of accumulated secretions, is indicated when the patient is unable to eliminate respiratory secretions by cough[11].

Patient evaluation determines the frequency and type of aspiration. Therefore, if the patient is able to cough, but unable to expectorate secretions, it is indicated the aspiration of the upper airways. However, when he is unable to cough, lower airway aspiration should be indicated. Tracheal aspiration is possible through an artificial respiratory tract, such as a OTT or TCT[11]. In addition to knowing the indications of the procedures, it is necessary to master the aspiration technique and evaluate its effectiveness after performing it.

In the workshops of the present study on airway aspiration, it was identified that errors in questions about technical knowledge, in both groups, remained after the educational activity, and these errors were more marked than those

about the particularities of care when aspirating an upper or lower airway. Both methodologies obtained similar results in the construction of knowledge of nurses in this theme.

The effect of the use of simulation in teaching lower airway aspiration skills was evaluated in a randomized clinical trial conducted with nursing students. The authors point out that there was no difference in the mean of correct answers in the theoretical and practical knowledge about the skill taught between the intervention groups (individual workshops of simulation and debriefing) and control (exhibition class and group training). However, the simulation impacted on greater confidence and safety in the development of the technique[17].

PE workshops on the airway aspiration technique are of paramount importance to enable nurses to promote this care correctly, so that the risks of damage to the respiratory mucosa and infection related to health care are minimized, in addition to promoting respiratory comfort to the client.

The artificial airway is used in patients with decreased level of consciousness or airway obstruction, and its presence puts the patient at high risk of infection and respiratory tract injury. TOT is the short-term artificial airway to administer mechanical ventilation, relieve upper airway obstruction, and protect against aspiration or secretions. Tracheostomy is considered for cases in which the patient requires long-term artificial ventilator care[11].

Knowing the general mechanisms of an advanced airway, OTT or TCT, is essential to promote adequate care for patients undergoing these procedures. In the present study, it was noticed that both groups maintained errors in questions of general knowledge about advanced airway after educational activities. Thus, the principles of general care of artificial airways need to be emphasized in PE workshops.

In the present study, it was found that nurses who experienced PE workshops using simulation as a teaching methodology obtained higher averages of correct answers in relation to those who experienced traditional classes, which demonstrates the positive effects of the simulation, in which the nurse could observe another professional demonstrating nursing care in a simulated health environment.

The positive effects of simulation on the performance of nurses and nursing students were also described in other studies[17–21] in which there was also a higher average or percentage of correct answers in the groups in which the simulation was used, in isolation or complementarily, as teaching methodology.

A cohort of students from a surgical medical nursing course, developed with simulations using a high-fidelity human patient simulator, observed that the experimental group performed better in the final exam, performed 13 weeks after the simulation, in relation to the control group. The authors also concluded that the content learned through active participation was not significantly different from the content learned by the observation of other people who participated in the simulation, which demonstrates the advantage of simulation in retaining knowledge over the traditional teaching method and ensures that observing the simulation, and not only performing the simulation, provides the acquisition of knowledge[18]. These results corroborate those of the present study, in which the group that experienced the simulation methodology also obtained a higher average of correct answers in relation to traditional teaching and that the observation of the simulation was satisfactory for the construction of knowledge.

Contrasting the methodology used in the present study, in which only one teaching strategy was applied in each group, another study[19] submitted nursing and medicine students to three complementary educational methodologies: reading of didactic material, dialogued lectures and simulation. The knowledge assessment instruments applied previously and later to each teaching strategy showed an increasing average score among them. The data found corroborate the data of this study, as they also

showed that the traditional teaching method was able to contribute to the performance of the participants in the items evaluated. The use of different teaching methods provided improvements in knowledge assessment and allows us to conclude that simulation is a method that allows improving student knowledge and providing greater satisfaction and self-confidence in learning[19].

In the present study, it was verified that, regardless of the teaching strategy used, nurses acquired knowledge about the theme of Oxygenation NHB after participating in in-service education activities. Similar to this finding, a study that also aimed to compare the simulation and traditional methodology, but with emphasis on the critical thinking capacity and self-confidence of nursing students in relation to the interpretation of the electrocardiogram, divided the students at random. Their results did not find significant differences and indicated that both teaching methods had beneficial effects on the parameters examined[22].

The request of group 2 participants to follow PE traditional teaching methodology demonstrates that this teaching-learning method may be appropriate for a given group and that respecting this choice is fundamental for the construction of a relationship of trust and collectivity. It reinforces the idea that PE goes beyond formal acts, being also a space for self-analysis and collaboration, because it is built with and for participants. Therefore, it is important to know their perception of these educational actions. Other studies have observed that nursing professionals recognize the objectives of PE to promote professional improvement through frequent updating of learning, qualify their actions, guide and facilitate their care practices, promote the theoretical-practical qualification for patient and professional safety, improve the quality in the provision of services, besides favoring learning, the exchange of experiences and knowledge and knowledge of work processes[23-24].

PE is an important strategy for the realization of changes in health practices, as it seeks to improve the quality of services by uniting scientific knowledge and professional practice. The results of the present study, as well as in others described in the literature, prove that both traditional methodology and simulation have promising results in the construction of nurses' competencies[17,19]. Thus, the traditional methodology should not be discarded, but associating it with active methodologies is an alternative to make health education more effective[19].

The limitation of this study was that it was developed with a small sample and in only two institutions, however, it is believed that the research can contribute to support future PE activities with nurses. Although no statistical significance was found in the comparison analyses between the groups, the results of this study can contribute to support the advantages of simulation as a teaching methodology for nurses.

Conclusion

The mean correct answers were higher after participation in the workshops of Permanent Education on Oxygenation BHN, regardless of the methodology used. This study confirms that PE is an effective strategy of in-service education, to increase the capacity of nurses to correctly answer questions related to nursing activities in the care of oxygenation BHN. It should be emphasized that PE should be encouraged by health service professionals and managers for the construction and updating of knowledge, as well as for improving nursing care.

Due to the fact that no statistically significant difference was found between the comparison data of the groups and their respective methodologies, it is not possible to infer which teaching methodology is capable of promoting better knowledge acquisition.

When analyzing the questions of checklists in which errors were continued even after PE, it was found that these were mainly related to technical knowledge. Thus, it reinforces the need for nurses to have contact with health

care devices, materials and equipment, and to update themselves regarding the techniques of the procedures.

The subjects identified in this study with the highest number of errors are issues that may require greater attention when discussed with these professionals in health education activities. It is suggested the reproduction of the study with larger and equivalent samples between the groups.

Collaborations:

1 – conception and planning of the project: Bruna Juvaneri Vieira and Pedro Paulo do Prado Júnior;

2 – analysis and interpretation of data: Bruna Juvaneri Vieira and Pedro Paulo do Prado Júnior;

3 – writing and/or critical review: Bruna Juvaneri Vieira and Pedro Paulo do Prado Júnior;

4 – approval of the final version: Bruna Juvaneri Vieira, Pedro Paulo do Prado Júnior, Mara Rúbia Maciel Cardoso do Prado, Patrícia Oliveira Salgado and Luciene Muniz Braga Daskaleas.

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