Cogitare Enfermagem

ORIGINAL ARTICLE

CLINICAL SIMULATION IN NURSING PROFESSIONALS' LATE RETENTION OF KNOWLEDGE AND SELF-CONFIDENCE: A QUASI-EXPERIMENTAL STUDY

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ABSTRACT

Objective: to evaluate the late effect of using combined simulation of a dialog lecture class, as compared to the exclusive use of simulation, on Nursing professionals' self-confidence and knowledge under cardiopulmonary arrest situations. Method: quasi-experimental with pre- and post-test. Convenience sample comprised by 53 Nursing professionals divided into control and experimental groups. A semi-structured questionnaire and the Self-confidence dimension of the Satisfaction and Self-Confidence in Learning Scale were applied. Q tests were used with p-value≤ 0.05. Results: self-confidence increased significantly among the professionals from the experimental group (p=0.007) in relation to the control group (p=0.06). None of the groups showed significant gains in retained knowledge over time. Conclusion: regardless of how the simulation method is employed, it represents a pedagogical strategy that can enable the development and improvement of self-confidence and late knowledge fixation in relation to cardiopulmonary arrest situations.

DESCRIPTORS: Simulation Training; Learning; Knowledge; Confidence; Nursing Professionals.

HOW TO REFERENCE THIS ARTICLE:
Araújo PRS, Santana B de S, Nogueira JW da S, Magro MC da S. Clinical simulation in nursing professionals' late retention of knowledge and self-confidence: a quasi-experimental study. Cogitare Enferm. [Internet]. 2022 [accessed "insert day, monh and year"]; 27. Available from: dx.doi.org/10.5380/ce.v27i0.86981

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INTRODUCTION

Professional training strategies aimed at instigating reflection on the practice and improving Nursing care quality have been study themes by several authors[1-2]. In these studies, learning is revealed as a key element of the clinical practice and interferes both directly and indirectly in the quality of the service provided. However, the mechanisms inherent to memory are not linear and are reflected in the learning curve, with consequent implications for Nursing care and patient safety. The learning curve is a graphical representation of the relationship between learning effort and learning outcome[3]. A number of studies have pointed to simulation as a useful learning strategy for longer knowledge retention in relation to traditional classroom education[4-6].

However, it has been challenging to understand the impact of the simulation strategy on the process to retain theoretical and practical knowledge over time and to verify the need and temporality of repetitions in training and new simulated training sessions[7]. Especially in the field of emergency care, Cardiopulmonary Arrest (CPA) instills the need to combine diverse knowledge, skills and attitudes to ensure greater survival for patients[8].

In this perspective, many professionals have targeted at searching for certified and specific courses, such as those that comply with the American Heart Association (AHA) guidelines, as they support longer retention of learning and competences on Cardiopulmonary Resuscitation (CPR). Guidelines such as the aforementioned adopt simulation training as a qualification strategy for health professionals, aiming at greater guarantee of safety in patient care, skills development, such as recognition of urgent and emergency situations, and qualified and scientific intervention based on teamwork[9].

The ideal temporality for the repetition of trainings session for the acquisition and retention of CPR skills remains unclear in the scientific literature. However, when investigating the training interval associated with performance in good quality CPR, a randomized clinical trial verified that monthly training is more effective than training every three, six and 12 months[10].

Recently, when evaluating learning retention of the participants attending a basic life support course in a Dentistry unit of a university hospital, a Brazilian study identified that learning was not retained after one year and five months, except in the participants who repeated training during this period, which indicates that long-term learning retention may require more training and practice opportunities[11].

When evaluating retention of knowledge and clinical skills in participants attending an advanced life support course in Cardiology at an emergency unit from a trauma center and after two and eight weeks, a study developed with resident female nurses in Emergency Nursing identified that learning decreased over time. The mean pre- and post-test scores dropped from 93.5% to 77.8% (15 days after the course) and from 94.5% to 86.7% (after two months)[12].

In this perspective, despite the advances in learning strategies and methodologies in recent years, there is a need to unveil teaching models that allow for late learning retention in the education of nurses and nursing technicians. This research was motivated, above all, by the possibility of clarifying whether training sessions mediated by clinical simulation, with and without the addition of theoretical contents, can represent educational support for long-term learning.

The objective of this study was to evaluate the late effect of using combined simulation in a dialog lecture class as compared to the exclusive use of simulation on Nursing professionals' self-confidence and knowledge in cardiopulmonary arrest situations.

METHOD

A quasi-experimental intervention study, with pre- and post-test and non-equivalent comparison group. The sample consisted of 53 Nursing professionals (17 nurses and 36 nursing technicians) from the Medical Clinic, Intensive Care and Emergency Care units of a public teaching hospital in the Brazilian Midwest region, from September 2017 to February 2018. The hospital units were chosen because they represent the environments with the highest rates of CPA occurrence.

Nursing professionals who had been working for at least two months in the hospital units under study were included. The professionals who attended some training and/or qualification course in CPA during the two months prior to data collection were excluded, as well as those on leave or vacation, or in administrative functions, or who did not provide direct care to patients. Non-random and consecutive allocation was adopted and 26 professionals comprised the Experimental Group (EG), 9 nurses and 17 nursing technicians, and 27 professionals were included in the Control Group (CG), 9 nurses and 18 nursing technicians.

As intervention, high-fidelity simulation was adopted for the scenario of advanced life support in CPA, both for the EG and for the CG. For the EG, pre-simulation session, and a dialog lecture class was given as preparatory to the professionals for the simulated experience. In order to present the content, multimedia was used to project the slides, lasting 30 minutes.

Reproduction of the high-fidelity simulated scenario lasted 25 minutes and took place in a controlled environment, that is, simulation room of the laboratory in the simulation center located in the premises of the hospital itself (outside the professionals' work environment), whose infrastructure has a control room, a partition with one-way mirror, cameras and microphones installed on the ceiling, CAE METIMan® patient simulator and materials such as stretcher, emergency cart and ventilatory assistance equipped for CPA.

The structured and "good judgment" debriefing session was carried out by the main researcher immediately after the scenario, lasting 20 minutes. In this type of debriefing, the facilitator verbalizes the observed activity and enables the students to express themselves actively, consequently valuing their point of view. At this moment, articulation on the errors made takes place jointly, as a learning opportunity; therefore, critical and constructive judgment that favors reflexive thinking is enabled[13-14]. No recorded and/or filmed simulated practice scenes were used.

The simulated scenario was previously tested and validated by three experts in the simulation area selected from the Lattes curriculum.

The dialog lecture class and the simulation addressed the same theme: advanced life support in cardiology and CPA care for adults, according to standards established by the current guidelines, during the study period, of the American Heart Association[15] and the Brazilian Society of Cardiology[16].

A structured questionnaire prepared by the researchers was initially applied to obtain the demographic (gender, age) and professional (time of training, position, allocation sector, previous course on advanced life support in Cardiology) characterization items.

To evaluate theoretical knowledge about CPA, a questionnaire consisting of nine multiple-choice items was applied to each professional based on the national and international Advanced Life Support (ALS) guidelines[15-16]. The questionnaire score varied from zero to 100 points.

The professionals' practical performance was assessed by means of direct observation and filling out of a checklist by a group of judges specialized in CPA care during the simulated

session. The list consisted of the sequence of CPA care steps and the pattern of responses/actions expected from the professionals. The evaluators were trained by the research team in a pre-data collection stage, contemplating a theoretical-practical approach related to the study object in the same simulation laboratory where the intervention for the professionals was conducted.

The Student Satisfaction and Self-Confidence in Learning Scale (ESEAA)[17] was adopted, being adapted to the professional context of care for patients in CPA. Although the original scale includes 13 items, only the 8 items referring to the Self-Confidence dimension were evaluated, preserving the original meaning of the sentences and the 5-point Likert type format with the following answer possibilities: (1) I strongly disagree with the statement; (2) I disagree with the statement; (3) Undecided - I neither disagree nor agree with the statement; (4) I agree with the statement; and (5) I strongly agree with the statement. Internal validity of the scale in Brazil is represented by a Cronbach's Alpha value of 0.77 for the Self-confidence dimension.

Participation of the professionals was obtained by the sensitization made through the visit of one of the researchers to the leaders' action and articulation sectors for release of the professionals during a work shift period.

The study stages took place at different times. Initially at Time 1 (T1), pre-test, the questionnaires to characterize and evaluate knowledge were applied, as well as the ESEAA scale. The intervention was conducted immediately after T1. The EG participants were directed to the auditorium where they participated in the lecture class and, later in the simulation laboratory, they participated in the high-fidelity simulation session with structured debriefing, a period of reflection on the simulated experience between the participants and the facilitator. In contrast, the CG participants were directly referred to the laboratory to participate in the high-fidelity simulated activity and debriefing. At the end of the intervention, the participants were redirected to the work sectors.

At Time 2 (T2), which occurred three months after the intervention (post-test), the ESEAA scale and the theoretical questionnaire for late knowledge evaluation were reapplied. The three-month period was adopted following the recommendation of previous studies that showed a progressive reduction in knowledge retention in this time interval[18-21].

The data went through double typing and verification in Microsoft Excel® 2016 spreadsheets. They were subsequently exported to the Statistical Package for the Social Sciences (SPSS®), version 23. The categorical variables were described in absolute (n) and relative (%) frequencies. For the numerical variables, summary (mean and median) and dispersion (standard deviation and 25 and 75 percentiles) were used as presentation measures. Asymmetric distribution of the variables was verified by means of the Shapiro-Wilk test and, then, the Mann-Whitney non-parametric and Wilcoxon Signed Ranks tests were applied for intragroup comparison and for paired comparison between groups, respectively. Results with $p \leq 0.05$ were considered significant.

The study was approved by the Research Ethics Committee of the Health Sciences School of the University of Brasília (CEP-FS/UnB), approval reference number 2,200,558.

RESULTS

The study included 17 nurses (32.1%) and 36 nursing technicians (67.9%), predominantly female (84.9%), aged 33.2±6.5 years old, and with academic training mainly in private educational institutions (92.5%), 9±5 years ago, as shown in Table 1.

Lato sensu specialization was reported by 32.1% of the professionals. The performance

locus of most of the sample was in the Emergency Care unit (75.4%), during the day shift (90.6%), for 24 (11 – 36) months, with 24 (24 – 36) months in the study institution itself. ALS in Cardiology had been performed by 30.2% of the professionals in previous training sessions (Table 1).

Table 1 - Sociodemographic and professional characterization of the control and experimental groups (n=53). Brasília, *Distrito Federal*, Brazil, 2018

Characteristics	Unit	EG (n=26)	CG (n=27)	Total (n=53)
Female gender	n (%)	21 (80.8)	24 (88.9)	45 (84.9)
Age (years old)	Mean±SD	33.4 ± 6.4	33.1 ± 6.8	33.2 ± 6.5
Training				
Time of training (years)	Mean±SD Median (25-75)	8 ± 4 8 (5 – 10)	9 ± 6 7 (5 – 11)	9 ± 5 7 (5 – 10)
Private institution	n (%)	26 (100)	23 (85.2)	49 (92.5)
Public institution	n (%)	0 (0)	4 (14.8)	4 (7.5)
Training area				
Generalist	n (%)	17 (65.4)	19 (70.4)	36 (67.9)
Urgency and Emergency	n (%)	0 (0)	2 (7.4)	2 (3.8)
Intensive Care	n (%)	4 (15.4)	3 (11.1)	7 (13.2)
Others	n (%)	5 (19.2)	3 (11.1)	8 (15.1)
Graduate studies				
Lato sensu specialization	n (%)	9 (34.6)	8 (29.6)	17 (32.1)
Function				
Nurse	n (%)	9 (34.6)	8 (29.6)	17 (32.1)
Nursing Technician	n (%)	17 (65.4)	19 (70.4)	36 (67.9)
Work Sector				
Emergency Care	n (%)	17 (65.4)	23 (85.2)	40 (75.4)
Intensive Care Unit	n (%)	7 (26.9)	4 (14.8)	11 (20.8)
Medical Clinic	n (%)	2 (7.7)	0 (0)	2 (3.8)
Shift				
Day	n (%)	25 (96.2)	23 (85.2)	48 (90.6)
Night	n (%)	1 (3.8)	4 (14.8)	5 (9.4)
Working Time (months)	Mean±SD Median (25-75)	22 ± 12 24 (10 – 36)	37 ± 50 24 (12 – 36)	29 ± 37 24 (11 – 36)
Time in the Institution (months)	Mean±SD Median (25-75)	26 ± 10 24 (24 – 36)	39 ± 50 28 (24 – 36)	32 ± 36 24 (24 – 36)
ALS Training	n (%)	8 (30.8)	8 (29.6)	16 (30.2)

ALS training time (months)	Mean±SD Median (25-75)	16 ± 15 6 (6 – 24)	26 ± 23 24 (6 – 51)	21 ± 20 15 (6 – 24)

Note: ALS = Advanced Life Support in Cardiology; EG = Experimental Group; CG: Control Group
Source: The authors, 2018

Initially, in the pre-test, self-confidence of the EG professionals was significantly lower than that of the CG professionals (p=0.03). However, in the final evaluation (post-test), it was observed that there was leveling of self-confidence in the learning of both groups, as a significant evolution of self-confidence in the EG professionals was identified (p=0.007) while the CG (p=0.06) maintained a stability pattern over time (Table 2).

Table 2 - Comparison of self-confidence in learning between the control and experimental groups at different study times (n=51). Brasília, *Distrito Federal*, Brazil, 2018

		Study Times		
Group	**Unit**	**T1 (Pre-test)**	**T2 (Post-test)**	**p-value[W]**
EG (n=24)	Median (25 – 75)	3.4 (2.8 – 3.8)	3.8 (3.5 – 4.1)	0.007
CG (n=27)	Median (25 – 75)	3.8 (3.4 – 4.0)	3.9 (3.5 – 4.3)	0.06
p-value[M]		0.03	0.3	

Note: EG = Experimental Group; CG = Control Group; W = Wilcoxon Signed Ranks Test; M = Mann Whitney Test
Source: The authors, 2018

Late knowledge acquisition (three months after the intervention) by the Nursing professionals was identified in both groups, although without significant difference (Table 3).

Table 3 - Comparison of the knowledge of the professionals from the control and experimental groups at the different study times (n=51). Brasília, *Distrito Federal*, Brazil, 2018

		Study Times		
Group	**Unit**	**T1 (Pre-test)**	**T2 (Post-test)**	**p-value[W]**
EG (n=24)	Median (25 – 75)	44.4 (33.3 – 55.7)	50.0 (33.3 – 77.8)	0.1
CG (n=27)	Median (25 – 75)	44.4 (33.3 – 66.7)	55.6 (33.3 – 77.8)	0.06
p-value[M]		0.8	0.8	

Note: EG = Experimental Group; CG = Control Group; W = Wilcoxon Signed Ranks Test; M = Mann Whitney Test
Source: The authors, 2018

When analyzing the nurses, in general, a late gain in knowledge is verified (p = 0.05); however, when observing the groups alone, the CG showed a significant evolution of knowledge (p = 0.03) in relation to the EG (p = 0.5), as seen in Table 4.

Table 4 - Comparison of the knowledge of the nurses from the control and experimental groups at the different study times (n=51). Brasília, *Distrito Federal*, Brazil, 2018

		Study Times		
Group	**Unit**	**T1 (Pre-test)**	**T2 (Post-test)**	**p-value[W]**
Nurses (n=17)	Median (25 – 75)	55.6 (44.4 – 66.7)	77.8 (44.5 – 77.8)	0.05
EG Nurses (n=9)	Median (25 – 75)	66.7 (44.4 – 72.3)	77.8 (33.3 – 83.4)	0.5
CG Nurses (n=8)	Median (25 – 75)	50.0 (36.1 – 63.9)	66.7 (55.6 – 77.8)	0.03

Note: EG = Experimental Group; CG = Control Group; W = Wilcoxon Signed Ranks Test; M = Mann Whitney Test
Source: The authors, 2018

In reference to the attitudes, the results show that the EG presented better teamwork (66.7%) in relation to the CG (57.1%). Leadership was a pattern of behavior little identified in both groups, especially in the EG, even in emergencies experienced in the ALS (EG = 16.7%; CG = 42.9%).

During CPA care action itself, saturation and blood pressure (BP) monitoring performed correctly by all study participants (EG = 100%; GC=100%) stood out. However, heart rate monitoring was performed predominantly by the EG in relation to the CG (100% vs. 85%), as shown in Figure 1.

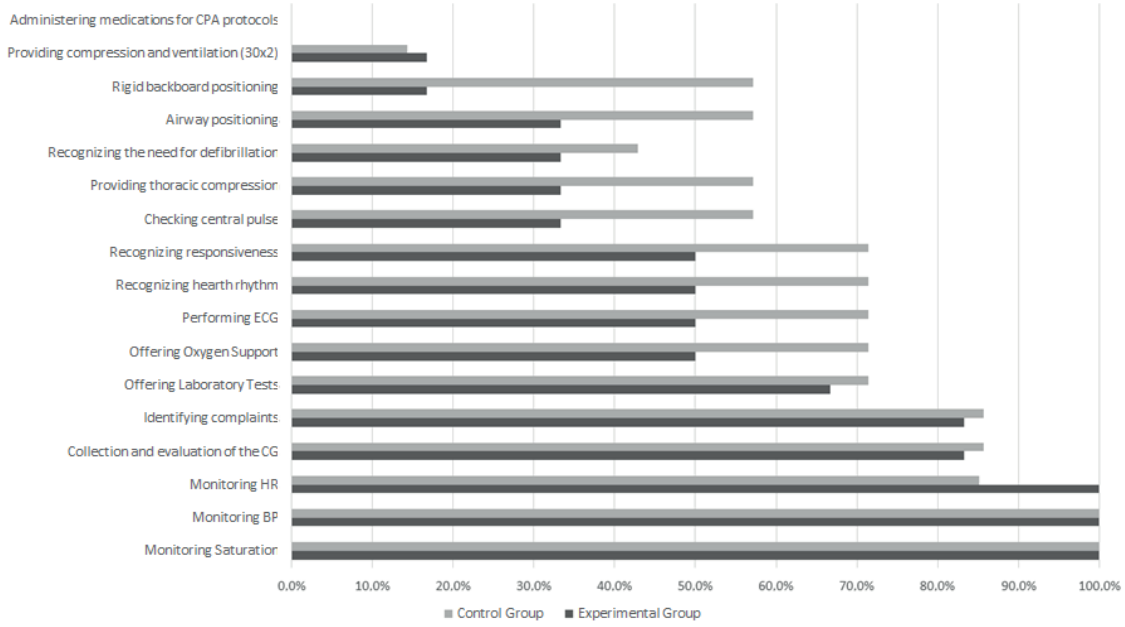

Figure 1 - Ranking of the actions performed correctly by the Nursing professionals during simulated cardiopulmonary arrest care. Brasília, Distrito Federal, Brazil, 2018

Note: CPA = Cardiopulmonary Arrest; ECG = Electrocardiogram; CG = Capillary Glycaemia; HR = Heart Rate; BP = Blood Pressure
Source: The authors, 2018

DISCUSSION

When evaluating knowledge and self-confidence in CPA care by Nursing professionals, the findings showed a significant gains in self-confidence in the EG (p=0.007) in relation to the CG (p=0.06), when compared to the baseline conditions. However, with regard to the knowledge retained over time, none of the groups presented significant improvements. However, when evaluating only the nurses, a significant gain in knowledge (p=0.03) was observed in the CG in relation to CPR maneuvers when compared to the EG (p=0.5).

The results of this study corroborate a national quasi-experiment which obtained similar results, as the Nursing professionals who experienced the simulation strategy combined with the dialog lecture class showed significant self-confidence acquisition and retention in relation to the group that only participated in the simulation[22].

Although the exclusive use of simulation for the CG professionals does not show any relationship with maintenance of professional self-confidence over time, it is still necessary to consider the tendency to increase confidence among the professionals, which may be related to the specific contributions of simulation in behavioral change and development of specific skills, favoring patient safety and professional satisfaction[22].

Therefore, the findings of this study suggest that the use of simulation combined with theoretical contents seems superior to using simulation alone for persistence of professional self-confidence during a prolonged period of time. However, the merit of adopting simulation exclusively for the achievement of certain learning objectives is not excluded, according to the professionals' particularities and to each work environment.

Regarding knowledge, the results of the late post-test showed that both groups (Experimental and Control) had gains reflected by an increase in the cognitive assessment scores over time. However, there was no statistically significant difference when comparing them. A study shows that duration of the learning curve to achieve a given outcome depends on the objectives being investigated, with complexity of the expected actions being one of the factors that influence long-term knowledge retention[23]. CPA situations require different and complex specific skills; therefore knowledge retention requires longer training that allows for the repetition of actions and, consequently, for the fixation of contents[24].

It is known that CPA has a golden time of care and that delays in the application of resuscitation, defibrillation and adrenaline administration maneuvers can reduce survival of the patients[25], and it is crucial that the team is adequately prepared due to its occurrence. Although there the strengthening of continuing education and permanent education within health facilities provide advances and improvements[26], performing simulated training in short intervals still does not constitute a universal reality.

Although the difference between groups was not significant, it is necessary to consider the mechanisms of memory, which predict a trend to forgetfulness and consequent loss of knowledge in time evolution[11]. In line, scientific evidence from a randomized controlled experimental study investigated the efficacy of CPR training, showing that learning retention remained up to one month after training, although there was an increasing and proportional loss of what was learned three and six months after training[27].

In the educational context, including health care, retrieving diverse information stored in memory is important for late knowledge retention and transfer of content to new situations[21]. The findings of this research show that, although 30.2% of the professionals mentioned previous participation in advanced life support training before data collection, they did not present better theoretical responses or greater retention of the knowledge acquired after three months of the simulated experience. This result explains the need for health professionals to perform periodic and not isolated training sessions.

From this perspective, nurses periodically subjected to simulated training are more

likely to maintain the knowledge and skills acquired proportionally to the update interval, that is, the shorter the time between training sessions, the shorter the forgetting curve and the greater the retention[10]. However, the intervals between training and/or qualification sessions involving simulated activities should also take into account the characteristics of the participants, such as the time of professional experience and the theoretical and practical knowledge on the theme studied[21].

One of the study limitations is the reduced sample size, which may have exerted an impact on establishment of significant causal relationships, both intra and among the groups. In addition, the fact that the research was conducted in a single hospital institution, even in different sectors, imposes difficulties for generalization of the findings to populations with different characteristics. Therefore, future studies of the prospective trial type are necessary to evaluate the relationship between the simulation strategy and long-term knowledge retention.

CONCLUSION

Using simulation combined with theoretical contents seems to be superior to the isolated use of simulation for persistence of Nursing professionals' self-confidence during a prolonged period of time. Regarding the knowledge retained over time, none of the groups (Control and Experimental) showed significant gains. However, when evaluating only the nurses, there is a significant gain in knowledge related to the care of patients in CPA by the CG in relation to the EG.

This study contributed to Nursing teaching, research and care by showing that, regardless of how the simulation method is employed (integrated with theory or isolated from it), it represents a pedagogical strategy that can enable development and improvement of self-confidence and late fixation of knowledge in relation to CPA situations.

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*Article extracted from the master's/PhD thesis "Efeito da estratégia da simulação em saúde sobre a aquisição de conhecimento e de autoconfiança para profissionais de enfermagem no cenário de assistência ao indivíduo em parada cardiopulmonar: estudo quase experimental", Universidade de Brasília, Brasília, DF, Brasil, 2018.

Received: 18/06/2021
Approved: 24/02/2022

Associate editor: Gilberto Tadeu Reis da Silva

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Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - Araújo PRS, Santana B de S, Nogueira JW da S, Magro MC da S.; Drafting the work or revising it critically for important intellectual content - Araújo PRS, Santana B de S, Nogueira JW da S, Magro MC da S.; Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - Araújo PRS, Santana B de S, Nogueira JW da S, Magro MC da S.; All authors approved the final version of the text.

ISSN 2176-9133