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Retaining knowledge of external ventricular drain by nursing professionals

Retenção de conhecimento dos enfermeiros sobre derivação ventricular externa

Retención del conocimiento de los enfermeros sobre derivación ventricular externa

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Abstract

Introduction: Hydrocephalus is a common complication among neurological patients whose treatment in acute cases is done through an external ventricular drain catheter which allows monitoring and controlling intracranial hypertension. This study aimed at describing the knowledge retention by nurses after an educational intervention on nursing care for an external ventricular drain. **Materials and Methods:** A quasi-experimental study with nurses at an adult intensive care unit was conducted in which knowledge retention on the topic was evaluated at different three times: before, one week and three months after training. **Results:** After one week, significant retention was observed but not after three months, given that after this period the question success rate was significantly low with respect to the previous phases. Participants' performance was better in those questions related to system management. **Discussion:** Time is a factor that interferes with learning since studies show that knowledge at three months significantly decreases and is almost completely gone after six months and a year. Practical behaviors based on assistance guidelines have better retention among professionals, underlining that it is easier to learn technical skills that are associated with professional experience. **Conclusions:** A significant knowledge retention was observed among professionals in the first week after training but not after three months.
Key words: Knowledge; Inservice Training; Cerebrospinal Fluid; Nursing Care.

Resumo

Introdução: A hidrocefalia é uma complicação frequente entre os pacientes neurológicos e seu tratamento em casos agudos é por meio de um cateter de derivação ventricular externa que possibilita a monitorização e o controle da hipertensão intracraniana. O objetivo desse estudo foi descrever a retenção do conhecimento dos enfermeiros após intervenção educativa sobre cuidados com derivação ventricular externa. **Materiais e Métodos:** Estudo quase experimental com enfermeiros de uma unidade de terapia intensiva adulto, em que foi avaliado a retenção de conhecimento sobre o tema em três momentos: antes, uma semana e três meses após o treinamento. **Resultados:** Houve retenção significativa após uma semana, mas não aos três meses, sendo que aos três meses o índice de acertos nas questões foi expressivamente baixo em relação às fases anteriores. O desempenho dos participantes foi melhor nas questões relacionadas ao manuseio do sistema. **Discussão:** O tempo é um fator que interfere no aprendizado e os estudos mostram que o conhecimento aos 3 meses diminui significativamente, sendo que aos 6 meses e um ano quase que completamente. Condutas práticas baseadas em diretrizes de assistência tem melhor retenção entre os profissionais, ressaltando que há mais facilidade no aprendizado de habilidades técnicas que estão associadas a vivência profissional. **Conclusões:** Houve retenção de conhecimento significativa entre os profissionais na primeira semana após o treinamento, mas não aos três meses após o treinamento.
Palavras chave: Conhecimento; Capacitação em Serviço; Líquido Cefalorraquidiano, Cuidados de Enfermagem.

Resumen

Introducción: La hidrocefalia es una complicación frecuente entre los pacientes neurológicos y su tratamiento en casos agudos se hace a través de un catéter de derivación ventricular externa que permite monitorear y controlar la hipertensión intracraneal. El objetivo de este estudio fue describir la retención del conocimiento de los enfermeros después de la intervención educativa sobre cuidados relativos a la derivación ventricular externa. **Materiales y Métodos:** Estudio cuasi experimental con enfermeros de una unidad de terapia intensiva de adultos, en el que se evaluó la retención del conocimiento sobre el tema en tres momentos: antes, una semana y tres meses después del entrenamiento. **Resultados:** Después de una semana se observó una retención significativa, sin embargo, no a los tres meses, dado que después de tres meses el índice de aciertos en las preguntas fue significativamente bajo con respecto a las fases anteriores. El desempeño de los participantes fue mejor en las preguntas relacionadas con el manejo del sistema. **Discusión:** El tiempo es un factor que interfiere en el aprendizaje y los estudios muestran que el conocimiento a los tres meses disminuye significativamente, y después de seis meses y un año casi por completo. Las conductas prácticas basadas en directrices de asistencia tienen mejor retención entre los profesionales, resaltando que resulta más fácil aprender habilidades técnicas que están asociadas con la vivencia profesional. **Conclusiones:** Se observó una retención de conocimiento significativa entre los profesionales en la primera semana posterior al entrenamiento, pero no a los tres meses después del entrenamiento.
Palabras clave: Conocimiento; Capacitación en Servicio; Líquido Cefalorraquídeo; Atención de Enfermería.

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INTRODUCTION

Hydrocephalus is one of the most frequent complications found in patients in neurosurgery units, which may occur due to different clinical s ituations[1]. Its treatment in acute cases is by means of placing an External Ventricular Drain (EVD) catheter that also enables the monitoring and control of the intracranial pressure when necessary[1].

This treatment may increase the risk of developing infections such as meningitis and catheter ventriculitis in patients, which results in increased morbidity and mortality. The incidence of these infections is about 2% to 27% in relation to the time that the catheter remains installed, the underlying disease, the catheter insertion technique, the type of device used to drain fluids and device handling[1,2].

Decreasing the risk of infection for these patients impacts the reduction of costs through shorter hospitalization times and use of resources, besides the contribution to have better outcomes in terms of health care. Another relevant aspect is device handling and its association with adverse events is usually caused by training gaps of healthcare teams[2].

Studies have shown that educational interventions with healthcare teams have resulted in a 40%-50% reduction in invasive device-related infections[3,4]. Therefore, implementing actions of this nature and promoting a culture of harm prevention is fundamental in health care.

The implementation of standardized EVD care based on guidelines and protocols and professionals' instrumentation regarding these issues are recognized strategies in the prevention of infections related to this device, as well as in the development of safety culture[2,4,5].

Health care professionals are exposed to significant demand for information and technological resources, which requires qualification to ensure patients' safety and more assertive decisions. Thus, it is essential that these professionals have the corresponding knowledge and skills to perform assistance. Training is increasingly used to teach and practice new skills[6] as well as to keep continuously searching for knowledge and professional updating and training.

There is a wide variety of learning and educational model theories in the literature to evaluate teaching and learning through a wide variety of teaching strategies that can be used to develop cognitive skills and the necessary clinical skills for health care practices[7]. These strategies are defined according to the learning objectives, available resources, and teachers' experience. As knowledge is enhanced and the adoption of good practices is emphasized, outcomes in health care may be more positive. However, it is critical to understand the needs and learning outcomes so that we can implement more efficient and effective education strategies.

In our work context, we observed a need for nurses' "instrumentalization" regarding EVD care to reinforce safety, quality, and education aspects of patients and families, as well as the need to understand which factors favor nurses' knowledge retention on the subject.

Our objective was to describe the knowledge retention of nurses of an Intensive Care Unit (ICU) after an educational intervention on External Ventricular Drain care and to analyze whether socio-demographic variables have an impact on nurse's knowledge retention.

MATERIALS AND METHODS

Study design

A quasi-experimental study based on a one-month educational intervention on nurses applying EVD care was conducted between November 2015 and March 2016. Nurses were evaluated before training, one week after training, and three months after training through a questionnaire completed in person, which contained 10 questions on the content covered during the training.

Population and sample

38 nurses were included in the study who worked in a general adult ICU in a private hospital in São Paulo, Brazil and participated in the EVD care training. Professionals who were on vacation or sick leave at the time of the study as well as those who did not participate in the training were excluded.

Data Collection Procedure

The study took place in a general ICU with 29 beds distributed in three areas intended for the care of cancer patients as well as postoperative major and neurological surgery patients, for which the total number of nurses is 50.

The educational intervention consisted of one face-to-face expository class supported by a video on the fluid flow measurement technique, bandage, and leveling of the EVD drain device handling. The content approaching the educational strategy involved the pathophysiology of hydrocephalus and intracranial hypertension, complications, and care related to the treatment such as device handling. Researchers designed and implemented a strategy according to the *Guideline of the American Association of Neuroscience Nurses*[5], which sets the highest standards of care for patients with neurological disorders and has been validated by nurses and experienced physicians in neurointensive care and intensive therapy. Researchers performed the intervention lasting 60 minutes during professionals' work shift for one month, who were nurses with proven experience in education and intensive care. We opted out for this strategy due to the experience of the team involved in the educational methodology training and the optimization of time and resources[8, 9], and also because there is no high-quality evidence regarding the type of educational strategy that is more effective for knowledge transfer[10].

Researchers applied a questionnaire containing some questions related to socio-demographic characteristics and ten questions with five possible answers each, among which only one alternative was the correct one. These questions referred to the content undertaken in the educational intervention. Just as the educational intervention, the evaluation questionnaire was also designed and validated by the same professionals, being completed in about 30 minutes. It was ap-

plied during participants' work shift at three stages: phase 1: before the training; phase 2: one week after the training; and phase 3: three months after the training.

Nurses' knowledge on the proposed topic was measured by the number of correct answers, considering that in this case the number of correct answers could range from 0 to 10, i.e. correct answers were from 0% to 100%.

The Research Ethics Committee (REC) of the institution, under code number HSL 2015-81, approved this study.

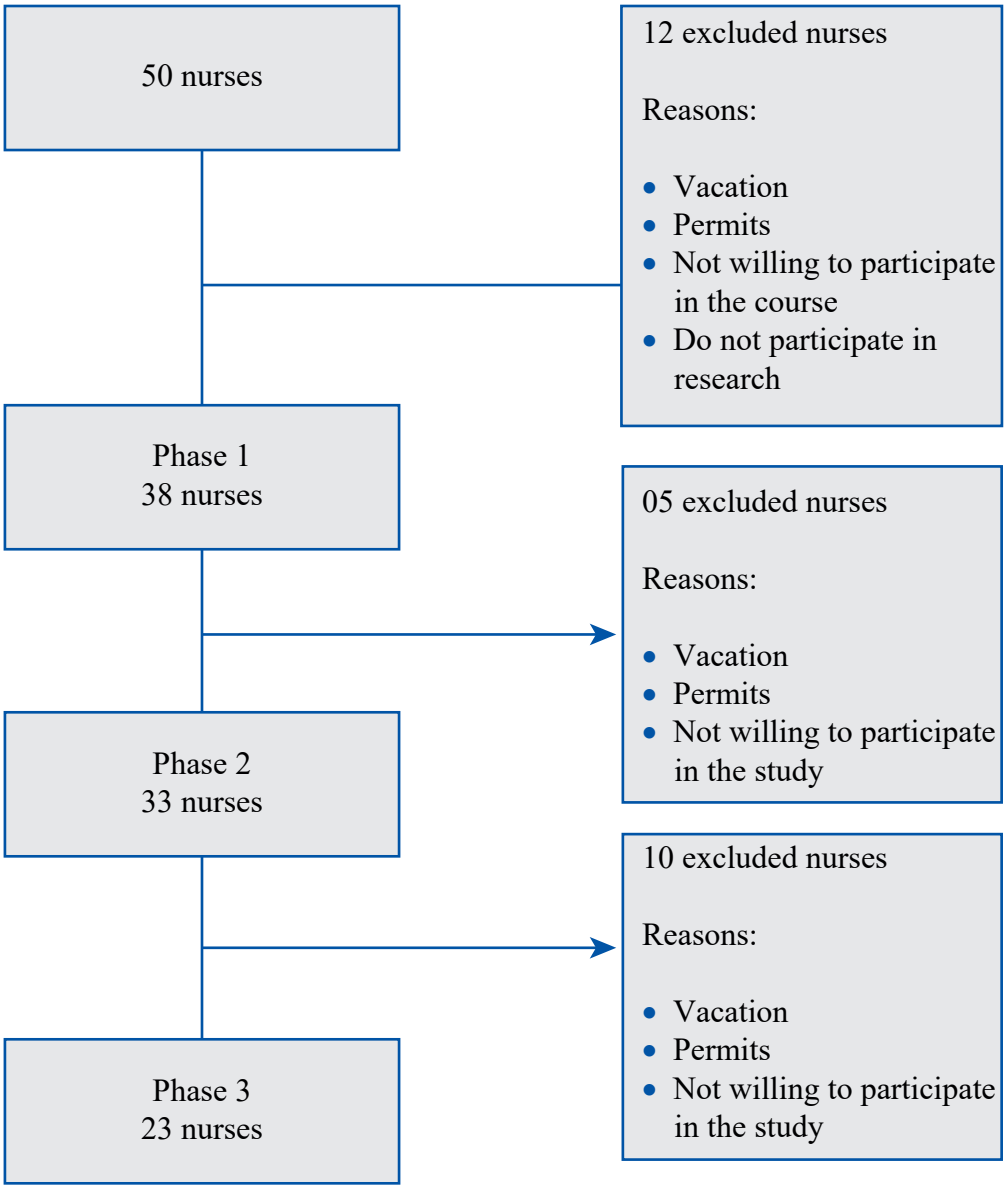

Figure 1. Flowchart of study participant recruitment. São Paulo, 2018.

Data analysis

Statistical analysis was performed using *SPSS Statistics for Windows*, version 23.0 and sample distribution was calculated using the Kolmogorov – Smirnov test. For categorical variables, data were expressed as absolute and relative frequency and quantitative variables were expressed as measures of central tendency, dispersion, and interquartile (25% and 75%). In order to compare the correct answers provided by nurses in the three stages, Student's t was used for paring and Friedman test was used for analyzing questionnaire-related content variables. Kruskal-Wallis test was used for comparison between groups of knowledge retention with the nonparametric sociodemographic variables with Bonferroni post-hoc and Mann Whitney tests for categories. Cochran's Q test was used for comparing the percentage of correct answers throughout the three phases. The significance level determined was $p < 0.05$.

RESULTS

The sample comprised 38 nurses with an average age of 33.7 (± 4.8). Nurses aged between 20 and 29 years of age accounted for 21.1% and nurses aged 30 to 39 years of age accounted for 65.8% of the sample; females prevailed with 33 participants (86.8%). There was a loss of 15 participants throughout the study due to employee rotation, sick leave and poor adherence to study participation.

In average, nurses had graduated 9.5 (± 5) years before, with a training time of 50% in the sample, over 10 years and with two postgraduate courses in 29.7% of cases.
The socio-demographic variables between groups showed no significant difference in the general knowledge on the subject (Table 1).

Table 1. Socio-demographic variables regarding knowledge among groups. Sao Paulo, 2018

Variables	p
Age	
20-29 vs 30-39	0.212 *
20-29 vs 40-49	0.448 *
30-39 vs 40-49	0.818 *
Gender	
Female vs Male	0.756 **
Neurological ICU experience	
Yes vs No	0.177 **
Training Time	
<10 years vs >= 10 years	0.697 **
Number of Postgraduate Course	
One vs Two or more	0.117 **

* Kruskal-Wallis test with Bonferroni post-hoc test, ** Mann-Whitney.

Knowledge retention was significant between the first and second phases (p-0.004), showing no significant difference between the first and third phases (p- 0.20). The score of correct answers averaged 4 (± 1.3) and 5 (± 1.4) (Table 2).

Table 2. Number of correct answers provided by nurses according to the study phase. Sao Paulo, 2018

	Phase 1	Phase 2	Phase 3
Mean	4	5	5
Deviation pattern	1,3	1,3	1,4
Minimal - Maximal	2 - 6	2 - 8	1 - 7
p-value		0,004	0,20

Student's *t*-test

Questions related to pathophysiology had a lower median in relation to the other contents in all phases, with p-values of 0.059 between phases 1 and 2. The content on device handling showed a better performance among participants, especially between phases 1 and 2 with p-values of 0.001, obtaining an overall performance of p-0.014 between these two phases (Table 3).

Nurses aged between 20 and 29 years of age showed better performance (p-0.040) with a median of 20 correct answers (0-40) on issues related to device handling when compared to the group between 30 and 39 years of age.

Table 3. Knowledge retention by nurses based on each phase of the study. Sao Paulo, 2018

Time	Phase 1 (n=38)				Phase 2 (n=33)				Phase 3 (n=23)				Friedman test with Muller -Dunn's post test		
Question Content	n	Median	25 %	75 %	n	Median	25 %	75 %	n	Median	25 %	75 %	1 vs 2	1 vs 3	2 vs 3
Specificities (%)	38	50,0	50,0	100,0	33	100,0	50,0	100,0	23	100,0	50,0	100,0	0,532	0,527	0,480
Pathophysiology (%)	38	33,3	33,3	41,7	33	33,3	33,3	66,7	23	33,3	33,3	33,3	1,000	0,059	0,096
Handling (%)	38	40,0	20,0	40,0	33	40,0	40,0	60,0	23	40,0	40,0	60,0	0,001	0,196	0,723
Total (%)	38	40,0	30,0	50,0	33	50,0	50,0	60,0	23	50,0	40,0	50,0	0,014	0,388	0,337

Questions related to device handling and maintenance showed better performance in participants when compared to others, but only question 10 obtained a tendency in the percentage of correct answers in phase 1 when compared to other phases (p = 0.066). For the remaining questions, it was not possible to evidence statistically significant change over time (Table 4).

Table 4. Distribution of nurses' performance according to questions and evaluation phase. Sao Paulo, 2018

Domain	Question	Phase 1	Phase 2	Phase 3	p[a]
Pathophysiology	Question 1 - Initial treatment of intracranial hypertension	2,6%	12,1%	-	0,135
	Question 2 - Indications for External Ventricular Drain (EVD)	100,0%	97,0%	87,0%	0,135
	Question 3 - Risk factors for infections in patients with EVD	23,7%	15,2%	13,0%	0,607
	Question 6 - Complications of ICP monitoring	68,4%	66,7%	69,6%	0,905
Handling	Question 4 - Good practices for intracranial pressure (ICP) monitoring and cerebrospinal fluid drainage	63,2%	84,8%	87,0%	0,156
	Question7- Best EVD catheter dressing practices	23,7%	36,4%	34,8%	0,641
	Question 9 - Best practices in EVD catheter insertion	68,4%	75,8%	78,3%	0,882
	Question 10- Best practices in EVD catheter removal	5,3%	36,4%	13,0%	0,066
Specificities	Question 5 - Anatomical location of intracranial pressure monitoring catheters	76,3%	84,8%	87,0%	0,368
	Question 8 - Professionals' Competences regarding EVD device handling	2,6%	12,1%	4,3%	>0,999

Cochran's Q test

DISCUSSION

The effectiveness of educational strategies has been the object of several studies due to their importance and impact on adherence of health care professionals to the guidelines and consequently showing better performance in health care outcomes[11]. Identifying the best way to achieve these goals is essential for health care quality as well as for medical education[12].
Our study evaluated knowledge retention in ICU nurses on external ventricular drain after the training based on an educational intervention. Results showed that there was significant retention of professionals' knowledge after one week but not after three months. Time is considered a factor that interferes with learning. This has been described in previous studies, in which knowledge retention is almost null after three months, six months and one year of the training in form of education intervention[7].

Knowledge and skills become obsolete if these are not put into practice, stressing that practice-based knowledge is more meaningful, which is observed in our results with the content related to good practices of device handling. Nursing students before and after the learning experience of three different teaching strategies had a significant reduction in knowledge retention[13] after one month of intervention. This aspect strengthens the need for frequent updating and training for professionals[14], particularly in more complex contents such as those related to neurointensivism. In our study, knowledge retention in the third phase was very low, but adherence was compromised due to the loss of 15 participants, which may have influenced the results.

Despite non-satisfactory results, studies including educational interventions among nurses show good results regarding the professionals' performance improvement in relation to knowledge, underlining that these strategies are essential for a good professional performance and positive results in assistance[15, 16, 17]. With regard to the subject of this study, this assumption was also confirmed by lower infection rates in other studies[2,4].

Sociodemographic variables did not influence knowledge retention, except for the 20-29 age group, as for the content related to good practices in device handling. Studies show that there is no correlation between individual characteristics and knowledge, but there is an association between these variables and attitudes related to health care[17]. In their research on assessment of knowledge, attitudes, and practices in palliative care, Kassa et al. identified that age, gender, level of education and professional experience were only linked to attitudes on the subject[17]. This result contrasts with our study, in terms of knowledge, where younger professionals performed better than others, but it is validated by a new perspective, where younger nurses develop critical thinking skills and achieve desired skills faster through training and skills in the context of practice, facilitating their professional progress[18].

A relevant finding is that the questions about pathophysiology did not obtain good results during the study phases, drawing attention as pathophysiology knowledge is fundamental in clinical decision making, considering that nurses need to know how to integrate scientific evidence with patients' needs, the clinical con-

text, and available resources[19]. A knowledge gap of this nature directly impacts care outcomes, for which better nurses' performance in this regard is essential to promote changes in the health care system[19].

At a time of global health transition with scientific and technological advances, it is identified that the work of nurses in diverse settings needs to be associated with a commitment of these professionals to lifelong learning in biological sciences because of their relevance to health care as these are a must for effective nursing care[20]. Corroborating this, nurses have an important role to play in designing and providing effective and efficient health care services to the world's population[21].

The device content related showed best results in knowledge retention. These are practical behaviors based on handling guidelines emphasizing that professionals perform better when having technical skills associated with their professional experience. In a study conducted with Portuguese nurses, it was evidenced that younger nurses with 0 to 5 years of professional experience had lower average scores of professional competencies, while all other age groups showed higher values[22].

The study contributes to nursing practice as it was observed that healthcare-related education contents need to be approached continuously and systemically through the use of strategies that enables the application of knowledge along with technical skills, which develops people's clinical reasoning and competence.

Study limitations

Our study faced some limitations in relation to significant loss of participants throughout the phases and training provided during their work shift that may have influenced the results.

CONCLUSIONS

This study showed that the proposed educational intervention based on a lecture and video strategy was effective in retaining knowledge among nurses, but time may have been a factor that contributed to decrease retention in the third phase. This result implies a call to implement and evaluate innovative training strategies, or even mix them to achieve better results over time. It is essential to expand research on this topic with other populations.

Conflict of interests: The authors declare that there is no conflict of interest.

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