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Original Article

Educational intervention to assess the knowledge of intensive care nurses about pressure injury

Intervenção educativa para avaliação do conhecimento de enfermeiros intensivistas sobre lesão por pressão

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Objective: to compare the knowledge of intensive care nurses about pressure injuries before and after an educational intervention. **Methods:** longitudinal study before and after intervention, conducted with nine intensive care nurses target of an online educational intervention on pressure injuries. Knowledge was investigated through an instrument with items on prevention, staging and evaluation of pressure injuries. **Results:** the average proportion of correct answers was 81.1% and 84.6% in the pre- and post-intervention evaluation, respectively. Regarding prevention, there was an average of correct answers of 25.11 (78.5%) before and 26.22 (81.9%) after the intervention. As for staging, the average of correct answers was 4.33 (86.6%) in the pre-test, and 4.66 (93.2%) in the post-test. As for evaluation of injuries, the results were the same before and after the intervention. **Conclusion:** after the course, the knowledge of nurses about pressure injuries, particularly in items related to staging, increased.
Descriptors: Pressure Ulcer; Education, Distance; Inservice Training; Information Technology; Nursing.

Objetivo: comparar o conhecimento de enfermeiros intensivistas sobre lesões por pressão antes e após intervenção educativa. **Métodos:** estudo longitudinal, antes e depois, realizado com nove enfermeiros intensivistas alvos de intervenção educativa *online* sobre lesão por pressão. O conhecimento foi investigado por meio de instrumento com itens sobre prevenção, estadiamento e avaliação de lesões por pressão. **Resultados:** a média de acertos foi de 81,1% e 84,6%, na avaliação pré e pós-intervenção, respectivamente. Quanto à prevenção, houve média de acertos de 25,11 (78,5%) antes da intervenção e 26,22 (81,9%) após a realização do curso. Sobre o estadiamento, no pré-teste, obteve-se média de acertos de 4,33 questões (86,6%), enquanto no pós-teste a média foi de 4,66 (93,2%). Na avaliação das lesões, os resultados foram iguais no pré e pós-intervenção. **Conclusão:** após realização do curso, verificou-se aumento no conhecimento dos enfermeiros sobre lesão por pressão, destacando-se os itens de estadiamento.
Descritores: Úlcera por Pressão; Educação a Distância; Capacitação em Serviço; Tecnologia da Informação; Enfermagem.

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Introduction

Pressure injuries are seen in the public health scenario as a problem and an indicator of the quality of care provided. Pressure injuries not only cause pain and discomfort, but also increase the length of hospitalization and favor patient morbidity and mortality[1-3].

In this context, it is considered essential that nurses have practical and technical knowledge and skills, as well as positive attitudes towards adverse events[4]. Lack of knowledge and skills in the prevention of pressure injuries contributes substantially to their occurrence or worsening[5].

Thus, poor knowledge and practice of nurses contribute to a higher prevalence of pressure injuries. In the daily clinical practice, lack of knowledge may be related to low adherence to guidelines, especially regarding the importance of repositioning and mobilization of the patient, and choosing the most appropriate preventive measures[2].

Moreover, since pressure injury is a predictable and preventable event and a priority in care management to ensure patient safety, the implementation of educational programs aimed at improving the knowledge of nurses about this topic is necessary and may have an impact on reducing the high incidence and prevalence rates of these injuries[6-7].

An analysis of the epidemiology of pressure injuries and their link with intensive care units points to the relevance of using continuing education programs based on information and communication technologies as an effort to prevent these events[1].

The use of these types of technologies as strategic instruments in Continuing Health Education programs has been well accepted among professionals. However, these tools are reported in studies without presenting an evaluation of short- and long-term results[8].

It is believed that the use of information and communication technologies as a relevant method in the teaching-learning process may be useful for the clinical practice of nurses in the evaluation and prevention of injuries, capable of contributing to empowerment on this theme.

Given the above, the objective of the present study was to compare the knowledge of intensive care nurses about pressure injuries before and after an educational intervention.

Methods

Longitudinal study before and after an educational intervention conducted at a Hospital in Fortaleza, Ceará, Brazil. The intervention was applied to nurses in the clinical intensive care unit because this is the unit with the highest prevalence of pressure injuries in the institution, associated with the severity of the patients' state.

The inclusion criteria were: being a nurse in an intensive care center and having access to the internet to enroll in the course. The exclusion criteria were: specialization course in the area of wounds, being on sick leave/vacation and not having participated in at least 80.0% of the course or evaluation at the end of the educational intervention.

The population was represented by 12 nurses who composed the team working in the schedule who agreed to participate in the study as a response to the invitation made in person and via e-mail. However, only nine nurses composed the sample because they were the ones who did all the activities proposed by the course and completed the course. The nurses provided data on social and professional profile, previous knowledge on the subject, and previous attendance to courses in the distance education modality. Data were collected in three phases from January to June 2015.

In the phase I, the nurses were interviewed to identify their professional profile and knowledge about pressure injuries. To this end, a semi-structured sociodemographic questionnaire and knowledge assessment tool based on the Pressure Ulcer Knowledge Test, validated in Brazil, were adopted[9]. At the end of the course, the nurses evaluated the technology regar-

ding satisfaction and attitudes after intervention.

The instrument was subjected to content evaluation by three specialist wound-care nurses for creation of scores. Thus, each statement received a score ranging from 1.0, 1.5 and 2.0. In the questionnaire, the statements 1, 6, 15, 24, 27, 33, 34, 36, 40-42 received a score of 2.0; the statements 2, 3, 5, 8, 9, 13, 14, 16, 21, 23, 25, 26, 28, 30, 37 and 30, a score of 1.5; and the statements 4, 7, 10, 11, 12, 17, 18, 19, 20, 22, 29, 31, 32, 35 and 39, a score of 1.0. Weights were created for each question, taking into account the degree of difficulty of the answer (1.0, 1.5 and 2.0 points) and the relevance of each item. Thus, the correctness level of the most important questions was identified. Moreover, participants who answered more questions with a lower degree of complexity scored similarly to those who had a lower number of correct answers.

In the phase II, the nurses participated in the educational intervention. They were given 30 days to complete the course. However, this deadline was extended to 60 days because of non-completion due to the high workload and little free time available for the course. Electronic notifications were sent to the enrolled participants 15 days after registration to emphasize the need to conclude the course. The participants registered on the Moodle platform and then received an email with an access code and instructions on how to proceed.

The Online Pressure Injury course is an information and communication technology developed and validated by the School of Nursing of the University of São Paulo in Brazil to train nurses on pressure injury prevention and treatment, available in the Modular Object-Oriented Dynamic Learning Environment (Moodle), which is a Virtual Learning Environment (VLE). The course was divided into modules that covered the following topics: skin anatomy and physiology; pathophysiology of pressure injuries; risk factor analysis; Braden scale and nursing interventions for prevention; among others. This online course requires from the participant around 15 to 20 hours to complete all the stages[10].

In the phase III, after the end of the intervention, the Pressure Ulcer Knowledge Test was applied once again to check the effectiveness of the Online Pressure Injury course in the knowledge of intensive care nurses. Thus, the outcome variable of this study was the knowledge acquired by nurses after the intervention.

Data were stored in the Statistical Analysis System software to calculate percentages, means, medians and standard deviations (SD ±). The McNemar test was used in the post-test analysis, and those with $p \leq 0.05$ were considered significant. The study was approved by the Research Ethics Committee of the Federal University of Ceará, under Opinion nº 1,075,087, in compliance with the norms of Resolution 466/12 on research involving human subjects.

Results

All participants were female. The average age of the nurses was 36.11 years, varying between 23 and 55 years. The average time elapsed since graduation was 12.88 years, with a maximum of 30 and a minimum of two years. None of the participants reported a having attended any distance course related to pressure injury/dressings before.

Items about prevention totaled 32, with correct answers averaging 25.11 (78.5%) and 26.22 (81.9%) in the pre- and post-intervention groups, respectively. Table 1 presents the questions regarding the knowledge about measures to prevent pressure injuries and the percentage of correct answers before and after the educational intervention.

Among the 32 questions about prevention, 14 (43.7%) were correctly answered by all participants before and after the intervention. Three items of the instrument showed a decrease in correct answers after the intervention. Nevertheless, the level of accuracy was maintained above 60.0%, with seven (78.0%) correct answers in the pre-test group and six (67.0%) in the post-test group (Table 1).

A change after the intervention was observed

in the knowledge about the use of creams and dressings to protect against the effects of friction. This indicated a lack of knowledge about coverage of pressure injuries and the need for discussing the purposes of different types of dressings in the care practice.

The item with the largest difference in the number of correct answers was "The person should be at an angle of 30° with the bed when the patient is side lying" (from 44.0% to 89.0%). The item on time schedule for positioning change, as well as the time for repositioning patients in wheelchairs, was correctly answered by three (33.3%) participants before and after the educational intervention (Table 1).

Regarding staging, the pre-test group had an average number of correct answers of 4.33 (86.6%) against 4.66 (93.2%) of the post-test group. The item that presented the greatest difference in the percentage of correct answers before and after the course was the one related to the characterization of the stage III, with six (67.0%) and eight (89.0%) correct answers, in the pre- and post-test group. The second greatest difference was found in the item about difficulty in differentiating pressure injuries in stage I, with seven (78.0%) and 8 (89.0%) correct answers. However, 100.0% of the nurses agreed on the description of stages III and IV before and after the educational intervention (Table 2).

Table 1 – Distribution of results regarding knowledge about prevention of pressure injuries

Prevention of pressure injuries	Pre-test	Post-test	Odds Ratio	p*
	n (%)	n (%)		
1. Maize starch, transparent creams and dressings (Tegaderm® or Opsite® type) and hydrocolloid dressings do not protect against the effects of skin friction (F) †	2 (22.0)	1 (11.0)	4.00	0.113
5. Water wheels or ring-shaped cushions help prevent pressure ulcer (F)	6 (67.0)	6 (67.0)	0.5	0.505
8. All individuals at risk of pressure ulcer should have a systematic skin inspection at least once a week (F)	8 (89.0)	7 (78.0)	7.00	0.077
9. The head of the bed should be kept at a low elevation (preferably no more than 30°) consistent with medical conditions (V) ‡	7 (78.0)	6 (67.0)	3.00	0.288
10. The person should be at an angle of 30° with the bed when the patient is side lying (V)	4 (44.0)	8 (89.0)	1.6	0.579
19. All individuals should be evaluated at hospital admission for the risk of developing pressure ulcer (V)	9 (100.0)	9 (100.0)	1.00	1.000
20. Adequate dietary intake of protein and calories should be maintained during illness (V)	9 (100.0)	9 (100.0)	1.00	1.000
21. A heel protector such as water-filled gloves relieves pressure on the heels (F)	9 (100.0)	9 (100.0)	1.00	1.000
22. Skin should remain clean and dry (V)	9 (100.0)	9 (100.0)	1.00	1.000
23. Preventive measures need not be used to prevent further ulcers when the patient already has a pressure ulcer (F)	9 (100.0)	9 (100.0)	1.00	1.000
24. Mobilization and transfer of totally dependent patients must be done by two or more people (V)	9 (100.0)	9 (100.0)	1.00	1.000
25. All patients admitted to the Intensive Care Unit must undergo a risk assessment for pressure ulcer development (V)	9 (100.0)	9 (100.0)	1.00	1.000
26. A good way to decrease pressure on the heels is to elevate them off the bed (V)	9 (100.0)	9 (100.0)	1.00	1.000
27. Not all the care provided to prevent or treat pressure ulcers need to be documented (F)	9 (100.0)	9 (100.0)	1.00	1.000
28. Shear is the force that occurs when the skin sticks to a surface and the body slides (V)	9 (100.0)	9 (100.0)	1.00	1.000
29. Friction may occur when moving a person up in bed (V)	9 (100.0)	9 (100.0)	1.00	1.000
30. For persons who have incontinence, skin cleaning should occur at the time of soiling and routine intervals (V)	9 (100.0)	9 (100.0)	1.00	1.000
31. Educational programs may reduce the incidence of pressure ulcers (V)	9 (100.0)	9 (100.0)	1.00	1.000
32. Hospitalized patients need to be assessed for risk for pressure ulcer only once (F)	9 (100.0)	9 (100.0)	1.00	1.000

*McNemar test; †(F) false statement; ‡(V) true statement

The knowledge about stage II, i.e. that injuries in this stage can be extremely painful due to the position of nerve endings was increased, and this change in knowledge had statistical significance, as observed.

In the last group of questions related to pressure injury are five items related to the evaluation. The nurses had the same results in these items when comparing the pre- and post-intervention phase, with an average of 3.77 (75.4%) correct answers. The item about indication of hydrogel in cavity ulcers presenting granulation tissue is an incorrect statement, but less than half of the nurses gave correct answers. Only the item regarding the greater chance of developing pressure injuries in scars of previous ulcers in relation to intact skin presented 100.0% of correct answers in both evaluations (Table 3).

The percentage of correct answers in the first evaluation was above 69.0%, reaching up to 88.0%. In the second evaluation, after the educational intervention, the nurses presented more than 73.0% of correct answers, and one of them nurse reached more than 95.0%.

The percentage of correct answers among the nine participants averaged 81.1% and 84.6% in the pre- and post-intervention evaluation, respectively. The items about prevention presented 80.9% and 84.8% of correct answers, while the items about staging obtained 86.8% and 93.4% of correct answers in the pre- and post-intervention groups, respectively. The items related to the evaluation of pressure injuries did not change after the intervention, with a mean score of 75.6%.

Table 2 – Distribution of results regarding knowledge about pressure injury staging

Staging of pressure injuries	Pre-test	Post-test	Odds Ratio	p*
	n (%)	n (%)		
33. Stage I pressure ulcer is defined as a non-blanchable erythema (V) †	7 (78.0)	8 (89.0)	4.00	0.113
34. A stage III pressure ulcer is a partial loss of skin involving the epidermis (V)	6 (67.0)	8 (89.0)	2.66	0.227
35. Stage IV pressure ulcers present full thickness skin and tissue loss with intense destruction and necrosis of tissue or damage to muscles, bones or supporting structures (V)	9 (100.0)	9 (100.0)	1.00	1.000
36. A heel blister should not be cause for concern (F) ‡	9 (100.0)	9 (100.0)	1.00	1.000
37. Stage II pressure ulcers can be extremely painful due to the position of nerve endings (V)	8 (89.0)	8 (89.0)	8.00	0.045

*McNemar test; †(V) true statement; ‡(F) false statement

Table 3 – Distribution of results regarding the assessment of pressure injuries

Assessment of pressure injuries	Pre-test	Post-test	Odds Ratio	p*
	n (%)	n (%)		
38. Pressure ulcers are sterile wounds (F) †	7 (78.0)	7 (78.0)	3.50	0.182
39. A pressure ulcer scar may be damaged more quickly than intact skin (V) ‡	9 (100.0)	9 (100.0)	1.00	1.000
40. Pressure ulcers may occur in patients after 24 hours of admission (V)	6 (67.0)	6 (67.0)	2.00	0.505
41. The sacral and calcaneal regions are the most affected by pressure ulcers (F)	8 (89.0)	8 (89.0)	8.00	0.045
42. Hydrogel can only be indicated for use in cavity pressure ulcers and when granulation tissue is present (F)	4 (44.0)	4 (44.0)	0.80	1.000

*McNemar test; †(F) false statement; ‡(V) true statement

There was a significant association between the educational intervention and the knowledge about identification of the areas most affected by pressure ulcers, although the number of nurses who responded correctly was the same, i.e. eight nurses (89.0%).

The average score increased by more than 5 points from the first to the second evaluation. The average number of incorrect answers in the first evaluation (MD = 5.88; SD ± 2.57) was higher than in the second (MD = 5.0; SD ± 2.54). The average number of questions marked "I do not know" was 2.44 (SD ± 1.81) and 1.22 (SD ± 2.16) in the first and second evaluation, respectively.

Discussion

The limitations of the study include the number of nurses who composed the final sample and the punctual cut-off in the evaluation of variables, which may represent an obstacle for the generalization of the results in other contexts.

It is inferred that the strategy of training and continuing education about pressure injuries through information and communication technology represents a promising model because it increases the means of empowerment of nurses and, consequently, ensures greater quality and effectiveness.

Conducting training aimed at increasing knowledge through continuing education is certainly one of the safest ways to benefit a company's employees and generate greater productivity and/or quality of care. A study conducted in Jordan to assess the effectiveness of e-learning as a teaching method for improving nurses' skills in pressure injury classification found that, in the post-test, the experimental group had a higher average score compared to the control[7].

In a randomized controlled trial conducted in Spain to evaluate the effectiveness of an e-learning program about pressure injuries compared to the traditional method, the results showed that the e-learning group of nursing students had better post-test averages when compared to students in the traditional education group[11].

The present study showed that nurses had a good knowledge about the prevention of pressure injuries, both before and after the educational intervention. Preventing these injuries is one of the main duties of the nursing staff. An evidence-based decision has to be based on valid and relevant research, patient preferences, available resources, and the nurse's judgment and experience[3].

To prevent pressure injuries, nurses must have knowledge about risk factors, as a prerequisite for high quality care, because lack of knowledge may lead to mistakes in the provision of care[7]. In this context, adequate knowledge about prevention is fundamental and will guide nurses to identify patients who are or not at risk and which preventive measures should be applied[5].

The analysis of the questions in the questionnaire showed that nurses play an important role in the prevention and treatment of pressure injuries because they are directly involved in the implementation of care measures such as risk assessment and patient repositioning[12]. The use of support surfaces on beds and chairs to facilitate pressure redistribution and repositioning are important preventive measures, especially among patients with low mobility. In fact, these methods should be used together[13].

During theoretical and practical classes, the classification of pressure injuries should be emphasized to improve accuracy in care practice and during research on the theme[4]. Decision-making on appropriate interventions for each patient may be hampered by lack of confidence of the professional as to the correct classification of the injury and, consequently, on the preventive measures or treatment to be adopted[9]. The statements about the evaluation of pressure injuries did not show any change in the knowledge of the nurses, presenting a low score on the indication of products for treatment and on the time of occurrence of pressure injuries after hospitalization.

When nurses lack clear knowledge about the causes of pressure injuries and the risk factors, pa-

tients cannot expect to receive evidence-based preventive care. The correct identification of risk factors in patients and the implementation of appropriate nursing interventions have an impact on the incidence of these injuries in Intensive Care Units, directly influencing the quality of care and patient safety[3,6].

Thus, when the patient presents risk factors for the development of pressure injuries, the primary goal of the health team is to develop a patient care plan to prevent them. The choice of care measures should be based on the needs of each patient and on risk assessment, in which the use of standardized and validated instruments is recommended[12].

The evaluation of the questionnaire used here indicated that the participants had a good knowledge on the subject both in the pre- and post-test. In Saudi Arabia, a study that investigated the knowledge and attitude of 105 health professionals about pressure injury prevention in an acute rehabilitation hospital with the same instrument used here had an average score of correct answers of 34.1 (71.5%). Comparing the average of each professional category, physicians had an average of 79.3% of correct answers, nurses had 75.0%, occupational therapists had 71.7%, and physiotherapists had 58.5%, demonstrating that nurses had adequate knowledge about the prevention of such injuries[5].

A similar study was carried out in Iran, which analyzed the knowledge of 159 trauma nurses about pressure injury prevention, classification and management, in an emergency hospital and obtained a mean percentage of correct answers of 64.6%, which was lower than the one found in the present study. Nurses had greater knowledge about the characteristics (evaluation) and poor knowledge about the causes and risk factors for appearance of the wounds[14].

The low level of knowledge of nurses about pressure injury prevention and treatment is associated with education during undergraduate training. This lack of knowledge puts at risk patients who are assisted by these professionals, since skin care is directly related to actions of the nursing team. The assessment of specific competences for prevention of pressure injuries, particularly during undergraduate training, is part of the guarantee of quality nursing education[1,15].

Conclusion

After the online course on pressure injuries, there was an increase in the nurses' knowledge and the score that presented the highest significance was the one related to staging.

Collaborations

Araújo TM and Araújo MFM contributed to the conception of the project. Oliveira FJG and Silva LA collaborated in the writing and critical revision of the intellectual content. Barros LM and Caetano JA assisted in the critical review of the intellectual content and final approval of the version to be published.

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