







CONTINUING EDUCATION IN BLADDER CATHETERIZATION FOR THE PREVENTION OF URINARY TRACT INFECTION

EDUCAÇÃO PERMANENTE EM CATETERISMO VESICAL PARA PREVENÇÃO DE INFECÇÃO DO TRATO URINÁRIO

EDUCACIÓN PERMANENTE EN CATETERISMO VESICAL PARA PREVENCIÓN DE INFECCIONES DEL TRACTO URINARIO

 Myria Ribeiro da Silva ¹
 Irene Maurício Cazorla ¹
 João Luís Almeida da Silva ¹
 Talita Hevilyn Ramos da Cruz Almeida ¹
 Patrícia Peres de Oliveira ²
 Dulce Aparecida Barbosa ³

¹ Universidade Estadual de Santa Cruz – UESC, Departamento de Ciências da Saúde. Ilhéus, BA – Brazil.

² Universidade Federal de São João del-Rei – UFSJ, Campus Centro-Oeste – CCO, Curso de Enfermagem. Divinópolis, MG – Brazil.

³ Universidade Federal de São Paulo – UNIFESP, Escola Paulista de Enfermagem. São Paulo, SP – Brazil

Corresponding author: Patrícia Peres de Oliveira
E-mail: pperesoliveira@gmail.com

Author's Contributions:

Data Collection: Myria R. Silva, Irene M. Cazorla, João L. A. Silva, Talita H. R. C. Almeida; **Investigation:** Myria R. Silva, Irene M. Cazorla; **Methodology:** Myria R. Silva, Patrícia P. Oliveira, Aparecida Barbosa; **Project Management:** Myria R. Silva; **Statistical Analysis:** João L. A. Silva; **Supervision:** Myria R. Silva, Irene M. Cazorla, Aparecida Barbosa; **Writing – Original Draft Preparation:** Myria R. Silva, Talita H. R. C. Almeida; **Writing – Review and Editing:** Patrícia P. Oliveira, Aparecida Barbosa.

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ABSTRACT

Objective: to analyze the impact of continuing education on the prevention and the control of urinary tract infection in patients undergoing a delayed bladder catheterization procedure. **Method:** a quasi-experimental study of before and after type with an educational intervention on the care related to insertion, maintenance, and removal of the delayed bladder catheter. We applied a scale of 20 questions with 124 nurses and Nursing technicians to measure their knowledge. We analyzed the change in the behavioral pattern from the pretest to the posttest, by a global scale, and covariance analysis, which adjusted the regression line by professional category. To analyze the knowledge and behaviors of the delayed bladder catheterization procedure, Levene's tests for equality of variance, t-test for independent samples, nonparametric inferential tests, and chi-square tests were used. **Results:** in the overall analysis of the study, starting from the 20 questions considered, it was observed that, on average, Nursing technicians compared to nurses obtained seven points from the pretest to the posttest ($\cong 12,00$ to $\cong 19,00$), while nurses scored 4.0 points ($\cong 16$ to $\cong 20,00$). **Conclusion:** the educational intervention significantly increased the knowledge of health professionals about the delayed bladder catheterization procedure and contributed to reducing the rate of infection of urinary tract infections in the institution, as well as an evolution in the level of knowledge, especially of Nursing technicians after the educational interventions.

Keywords: Urinary Catheterization; Urinary Tract Infections/prevention & control; Education, Continuing; Disease Prevention.

RESUMO

Objetivo: analisar o impacto da educação permanente na prevenção e no controle da infecção do trato urinário em pacientes submetidos ao procedimento de cateterismo vesical de demora. **Método:** estudo quase experimental do tipo antes e depois, com intervenção educacional sobre os cuidados relacionados a inserção, manutenção e retirada do cateter vesical de demora. Aplicação de escala de 20 questões com 124 enfermeiros e técnicos de Enfermagem para medida do conhecimento. Realizou-se análise da mudança do padrão de comportamento do pré-teste para o pós-teste, por meio de escala global, e análise de covariância, nos quais se ajustou a reta de regressão por categoria profissional. Para analisar o conhecimento e as condutas do procedimento de cateterismo vesical de demora, foram utilizados os testes de Levene para igualdade de variâncias, teste t para amostras independentes, testes inferenciais não paramétricos e teste qui-quadrado. **Resultados:** na análise global do estudo, partindo das 20 questões consideradas, observou-se que, em média, os técnicos de Enfermagem em comparação aos enfermeiros obtiveram ganho de sete pontos do pré-teste para o pós-teste ($\cong 12,00$ para $\cong 19,00$), enquanto os enfermeiros obtiveram 4,0 pontos ($\cong 16$ para $\cong 20,00$). **Conclusão:** a intervenção educacional aumentou significativamente o conhecimento dos profissionais de saúde sobre o procedimento de cateterismo vesical de demora e colaborou para a redução da taxa de infecção das infecções de trato urinário na instituição, bem

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como uma evolução no patamar de conhecimento, principalmente dos técnicos de Enfermagem após as intervenções educativas.

Palavras-chave: Cateterismo Urinário; Infecções Urinárias/prevenção & controle; Enfermagem; Educação Continuada; Prevenção de Doenças.

RESUMEN

Objetivo: analizar el impacto de la educación continua en prevención y control de infecciones del tracto urinario en pacientes sometidos a procedimiento de cateterismo vesical intermitente. **Método:** estudio cuasi-experimental realizadas antes y después del procedimiento, con intervención educativa sobre cuidados con la inserción, mantenimiento y extracción de la sonda vesical intermitente. Se utilizó una escala de 20 preguntas con 124 enfermeros y técnicos de enfermería para medir el conocimiento. Se analizó el análisis del cambio en el patrón de comportamiento de la prueba previa y de la prueba posterior, mediante una escala global, y análisis de covarianza, que ajustó la línea de regresión por categoría profesional. Para analizar el conocimiento y las conductas del procedimiento de cateterismo vesical intermitente, se emplearon las pruebas de Levene para igualdad de varianzas, prueba t para muestras independientes, pruebas inferenciales no paramétricas y chi-cuadrado. **Resultados:** en el análisis general del estudio, basado en las 20 preguntas consideradas, se observó que, en promedio, los técnicos de enfermería en comparación con los enfermeros obtuvieron siete puntos más de la prueba previa a la posterior ($\cong 12,00$ para $\cong 19,00$), mientras que los enfermeros obtuvieron 4,0 puntos ($\cong 16$ para $\cong 20,00$). **Conclusión:** la intervención educativa aumentó significativamente el conocimiento de los profesionales de la salud sobre el procedimiento de cateterismo vesical intermitente y contribuyó a la reducción de la tasa de infección entre las infecciones del tracto urinario en la institución, así como a aumentar el nivel de conocimiento, especialmente de los técnicos de Enfermería después de las intervenciones educativas.

Palabras clave: Cateterismo Urinario; Infecciones Urinarias/prevenición & control; Educación Continua; Prevención de Enfermedades.

INTRODUCTION

Urinary tract infection (UTI) is characterized by pathogens in the urinary tract, whether lower or upper. This condition is predominant in the hospital environment due to the use of invasive devices, microbial resistance, and the care-related infection (CRI).¹⁻⁴ In this CRI, 40% are UTI, and 80% of them are related to the use of delayed bladder catheterization (DBC). During hospitalizations, 16 to 25% of patients will have a catheter at some point. UTI associated with the Center for Disease Control and Prevention (CDC) causes prolonged hospitalizations, high costs, sequels, and high mortality rates.⁵⁻⁷

Foley catheter is one of the most widely used devices in clinical practice and is the one that causes most UTI, especially due to its indiscriminate use, inadequate insertion mechanism, and maintenance. Also, indiscriminate antimicrobial therapies and inappropriate therapeutic regimens enable the acquisition of UTI. Women have a higher prevalence due to some intrinsic factors to the female apparatus when related to the male, such as urethral extension and periurethral colonization.¹⁵⁻⁷

DBC residence time is strongly related to the device colonization and infection. This can occur through the extraluminal and intraluminal routes.^{8,9} The daily risk of developing a UTI when having a DBC grows from 3 to 7%. When using it for one week, the risk of bacteriuria increases by 25%, and when it stays for a month, the risk increases by almost 100%. Among those with bacteriuria, 10% will develop UTI symptoms (fever, dysuria) and up to 3% will develop bacteremia.¹⁰⁻¹²

In this research, the DBC procedure and the care performed by the Nursing team regarding insertion, maintenance, and removal were considered. To this end, we addressed the relevance of in-service education as a fundamental process in training professionals.

Thus, the discussion about the importance of continuing education (CE) is important. CE started at the III National Health Conference in 1963; however, the Pan American Health Organization (PAHO) in 1978 conceptualized CE as a dynamic, active, and continuous process of teaching and learning for analysis and enhancing the empowerment of people and groups. In this sense, the National Policy of C was instituted in 2004 in Brazil, through Ordinance N 198/GM/M, which defines continuous education as the learning process inserted in the daily life of professionals, becoming individuals in the process of social construction of knowledge and practices.^{13,14} It is a fundamental strategy for the recomposition of attention, management, and social control practices and it configures a transformative praxis.^{15,16}

However, applying CE to the hospital Nursing team in public institutions is still a challenge for the responsible sectors, such as the core of CE and the existing committees in these institutions such as the Hospital Infection Control Commission (CCH), since it suffers political influence, lack of adequate human, technological and financial resources, becoming a challenge for the organizations, management and the professional. Managers and internal organizations need to establish political and pedagogical strategies.¹⁵⁻¹⁸

The relevance of this research is based on analyzing the teaching-learning process about the DBC procedure, its risks, sequels, and the quality of care provided, expanding the knowledge of the prevention and control measures of UTIs.

Thus, this study aimed to analyze the impact of continuing education on the prevention and control of urinary tract infection in patients undergoing delayed bladder catheterization procedures.

METHOD

This is a quasi-experimental study, "before and after" type, which allows data collection and analysis before and after the interventions. It was held in a public hospital in a city of Bahia, from July 2013 to January 2016.

The participating units and study scenarios were: orthopedic/vascular clinic, medical clinic, general surgery, neurological clinic, and intensive care. Outpatient care units and units that do not require inpatient care such as the emergency room, surgical center, and material disinfection and sterilization center were excluded.

The choice of the participants obeyed the following inclusion criteria: being professional Nursing activities in the scenario units of the study during the research period. The exclusion criteria were those who were on vacation, on sick leave, on maternity leave or leave for professional training.

Initially, 134 Nursing professionals who worked in the study's scenario units were selected; however, six of them were on vacation, or sick leave and four of them refused to participate in the research.

Thus, 124 professionals from the Nursing team participated in the research, in which 36 were nurses, and 88 were Nursing technicians who worked directly in care. For data collection, we used a structured questionnaire prepared by the authors based on the recommendations of the Ministry of Health and investigative analysis of the field of study. The questionnaire was applied to Nursing professionals in a private place without affecting patient care.

A pilot test of the questionnaire was conducted with six professionals of the institution to improve the collection instrument. The instrument was divided into two categories: a) socio-demographic variables: gender, age, education level, professional category, relationship with another institution, time of experience and time of experience in the institution; and b) delayed bladder catheterization (DBC) procedures: general considerations on DBC; insertion care; care during installation; maintenance care and removal considerations.

The pre-educational intervention period was between August/2013 and February/2014. At this stage, the existence of pre-established protocols, manuals, and routines was verified. The educational intervention period was from March to August/2014, and the following strategies were used: a) the application of the pretest questionnaire; b) the distribution of posters in the units, yellow tags in the medical records of patients with DBC to guide the importance of Nursing care and registration during the catheter permanence; c) Nursing team training: dialogued exposition about the semiology and semi-technique related to the urinary system; construction of educational process with on-site training, serial album containing procedure information and DBC material set for theory/practice articulation; d) review and adequacy of the procedures, routines, and instruments for surveillance and prevention of UTIs, preparation of DBC procedure roadmap together with the CCIH; e) training in hand hygiene. After these behaviors, we performed the post-intervention stage between September

2015 and January 2016, which consisted of the reapplication of the posttest questionnaire.

Data were tabulated and analyzed using Excel for Windows® version 2010 and Statistical Package for Social Sciences® (SPSS) version 21.0. Levene's tests for equality of variance, t-test for independent samples, nonparametric inferential tests, and chi-square tests were used to analyze the knowledge and behavior of the DBC procedure. The significance level used was 5%. A scale of 20 questions was constructed, and its total score consisted of the sum of the points of five subscales. The score in each subscale corresponds to the points obtained in the questions that compose it. Each correct answer got one point value, and the incorrect answers got zero point value.

To globally analyze the change in the behavioral pattern of the pretest to the posttest in both professional categories, using the global scale, we used the covariance analysis, which adjusted the regression line between test and posttest by professional category.

The project was submitted to the Research Ethics Committee of the *Universidade Federal de São Paulo*, CAAE nº 14982613.6.0000.5526, protocol nº 319255/13. All participants signed the Informed Consent Form.

RESULTS

The socio-demographic characteristics of 124 Nursing staff participants showed that most of the Nursing staff (82.3%) were female. Double employment was observed in 54.8% of these participants. Of them, 51.1% were Nursing technicians, and 63.9% were nurses. Regarding the age of the participants, the average observed was 37.7 years old for technicians (± 8.6) and 31.9 for nurses (± 6.0). The reported professional experience ranged from 6.5 years for nurses and 10.2 for Nursing technicians, on average (± 6.7 for both categories). However, regarding the experience in the institution, a total average of 5.5 years was observed for both categories (± 3.0).

In subscale 1 – general considerations – which deals with knowledge of information on institutional protocols of healthcare-related infections, as well as DBC protocol and frequency of consultation with these protocols, there was a significant change from pretest to posttest in both categories (p -value <0.05), without great difference in the comparison of nurses and Nursing technicians, as can be seen in Table 1.

When we analyzed the results of the questionnaire applied to the Nursing team on information about the protocols, posttest got 87.9% of significant association, with $p = 0.000$. Regarding the knowledge of the DBC protocol, in the total analysis also, 19.4% who knew the protocol about DBC in the pretest, increased to 78.2% in the posttest. Regarding the protocol consultation, 15.3% of the Nursing professionals performed pretest, and 88.7% of them had the same significance representation.

Table 1 - Results of McNemar's nonparametric test on the questions, by professional category, pretest, and posttest. Bahia, Brazil, 2015-2016

| Question | Professional category | Stage | | McNemar Test | |
|-----------------------------------|-----------------------|-------------|--------------|--------------|---------|
| | | Pretest (%) | Posttest (%) | Chi square | p-value |
| Q1: Protocol Information | Technician | 50.0 | 97.7 | 40.024 | 0.000 |
| | Nurse | 80.6 | 100.0 | | |
| | Total | 58.9 | 98.4 | | |
| Q2: Knowledge of the DBC protocol | Technician | 48.9 | 100.0 | 43.022 | 0.000 |
| | Nurse | 66.7 | 100.0 | | |
| | Total | 54.0 | 100.0 | | |
| Q3: Consultation Frequency | Technician | 13.6 | 84.1 | 58.141 | 0.000 |
| | Nurse | 19.4 | 100.0 | | |
| | Total | 15.3 | 88.7 | | |
| Q4: Do you feel safe? | Technician | 97.7 | 100.0 | - | 0.500* |
| | Nurse | 100.0 | 100.0 | | |
| | Total | 98.4 | 100.0 | | |
| Q5: Do you know the directions? | Technician | 81.8 | 98.9 | - | 0.000* |
| | Nurse | 97.2 | 100.0 | | |
| | Total | 86.3 | 99.2 | | |

(*) Exact value.

Concerning the safety of the knowledge of the DBC and the knowledge of its indications, there was no significant difference between the categories and the entire Nursing team.

In subscale two about the care in DBC insertion actions, hand hygiene, the use of aseptic technique, and the importance of the closed system showed significant increases from pretest to posttest for both categories (p-value <0.5), but without important differences in the comparison of nurses and Nursing technicians.

In the general analysis of this subscale, the data revealed that nurses have a previous level of knowledge as a result of their training, which shows a high level of $\cong 4.7$ points to $\cong 5.0$ points pre and post, respectively. In the Nursing technicians, there was an increase in the level from $\cong 3.4$ to 4.9 points, representing a statistically significant gain of 1.5 points (p-value <0.5), as shown in Table 2.

The interference with this general increase is related to the recording of the insertion date and the importance of the closed system to themes that needed more attention in the educational intervention.

Regarding the care in the installation of the DBC (subscale 3), the preparation behaviors and catheter connection did not present significant differences. However, in the question of

antiseptic choice, only 46.8% of Nursing technicians adequately chose the antiseptic in the pretest and reached 92.7% of knowledge in the posttest. In the catheter fixation and positioning, 54.5% of knowledge was observed in the pretest and 96.6% in the posttest. Thus, the statistically significant gain (p-value <0.5) occurred in these questions and the growth of technicians than in nurses who maintained already high levels of knowledge.

In the care for DBC maintenance (subscale 4) – the positioning conditions of the collecting bag; meatus care, perineal region, hygiene and emptying the collection bag, which deserve more attention in the patient's daily care -, the percentages revealed a high pretest level in both professional categories, reaching approximately 100% in the posttest. Regarding the care performed for the collection of urine for the examination of patients with DBC, although statistically significant from pre to posttest, they did not differ between professional categories, but a percentage gain of 56.5% was observed in the pretest to 96.8% in the posttest when analyzing the Nursing staff in general.

In the global analysis of this subscale (Table 3), Nursing technicians compared to nurses, obtained on average, a gain of 1 point from the pretest to the posttest $\cong 3.00$ to 4.00), while nurses got only 0.4 points ($\cong 3.61$ to $\cong 4.00$).

Table 2 - Comparison of the average by professional category in subscale 2, pretest, and posttest. Bahia, Brazil, 2015-2016

| Test | Category | n | Average | Standard Deviation | t | Level of freedom | p-value |
|------|------------|----|---------|--------------------|-------|------------------|---------|
| Pre | Technician | 88 | 3.440 | 1.346 | 7.453 | 120.5 | 0.000 |
| | Nurse | 36 | 4.670 | 0.478 | | | |
| Post | Technician | 88 | 4.890 | 0.413 | 2.579 | 87 | 0.012 |
| | Nurse | 36 | 5.000 | 0.000 | | | |

Table 3 - Comparison of averages by professional category in subscale 4, pretest, and posttest. Bahia, Brazil, 2015-2016

| Test | Category | N | Average | Standard Deviation | t | Level of freedom | p valor |
|------|------------|----|---------|--------------------|-------|------------------|---------|
| Pre | Technician | 88 | 3.100 | 0.935 | 2.984 | 122 | 0.003 |
| | Nurse | 36 | 3.610 | 0.645 | | | |
| Post | Technician | 88 | 3.930 | 0.332 | 1.926 | 87 | 0.057 |
| | Nurse | 36 | 4.000 | 0.000 | | | |

The analysis of subscale 5 – DBC removal considerations – showed the nurses with a higher level of knowledge (72.2%) compared to Nursing technicians (39.8%) about the pretest exchange indications. In the posttest levels, they were elevated for both professional categories. Regarding the registration of catheter removal, both technicians and nurses reached 100%. Therefore, there was a statistically significant gain (p-value <0.5) in the growth of Nursing technicians compared to nurses in this subscale.

In the general analysis of the study, from the 20 questions considered, Nursing technicians compared to nurses obtained, on average seven points gain from the pretest to the posttest ($\cong 12.00$ to $\cong 19.00$), while nurses scored 4.0 points ($\cong 16$ to $\cong 20.00$). The p-value = 0.000 in both categories highlighted that this gain was statistically significant in the Nursing technicians' knowledge growth.

The relationship of the scores on the pretest and posttest scale with regression showed that in the case of the nurse category, the adjusted equation $Y = 0.015X + 19.61$ indicated that regardless of the pretest starting point, virtually every professional has answered all 20 questions correctly. Similarly, in the category of Nursing technicians, the adjusted equation $Y = 0.003X + 18.70$ also indicated the same finding that the educational intervention in this category raised the expected level of correct answers to 19, as shown in Figure 1.

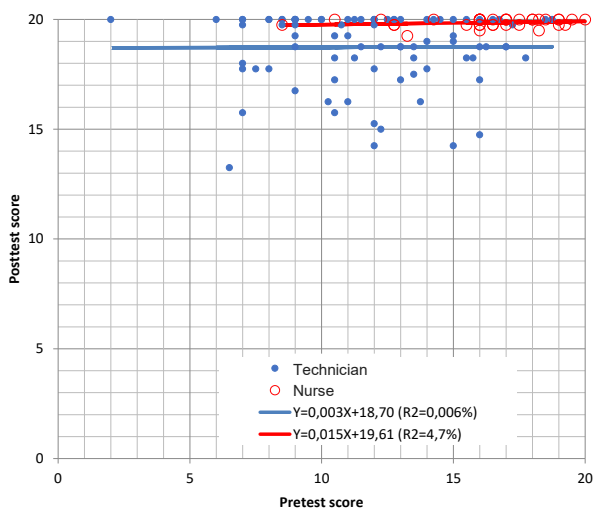


Figure 1 - Relationship between pretest and posttest scale scores of nurses and Nursing technicians. Bahia, Brazil, 2015-2016.

DISCUSSION

The Nursing profile in Brazil is predominantly female. According to the *Conselho Federal de Enfermagem* (COFEN), the percentage is 87.24% women compared to 12.76% men. This study found that 82.3% of the members of the Nursing team are female, similar to the national profile outlined in the literature. The age group has a young picture in the country, between 26 and 45 years old, representing 63.23%, at the peak in its productive and reproductive strength. This corroborates data analyzed in this study.^{19,20}

Analyzing the professional bond, 54.8% of the Nursing staff had a double employment bond. This sad reality is described due to low pay exposing professionals to long working hours, generating physical and mental overload and reflecting on the care provided to patients.¹⁹

The length of professional experience studied was around nine years for the categories analyzed. This experience in the service is fundamental for the professional to recognize and exercise their autonomy, their duties, ethical-legal visibility and safety in their practice.^{20,21}

At the time of the pre-intervention, the study scenario units did not have any protocols or other information the professional category could be guided. The questions made with the nurses about the existence of manuals/protocols enabled them to identify that they were restricted to the sectors of the CCIH and/or Nursing coordination and available for consultation when the team was in doubt. Sinks, soap and alcohol gel dispensers were identified only in Nursing units. The Nursing team was dissatisfied and unmotivated at the time of the intervention, as it is an important subject, but without execution conditions due to the difficulties mentioned above.

In the researched institution, the continuing education Nursing sector did not have a professional nurse; therefore, there were no educational actions to promote alternatives to solve the problems faced by the worker, as well as in the CCIH, where the nurse was newly admitted to the sector. Inputs, materials, and equipment were also insufficient.

A study conducted at the CCIH of a public hospital located in southern Brazil emphasized that 100% of delayed bladder catheters had a closed drainage system. Regarding the medical records evaluated, 100% had nonconformities for the indication

and permanence. Also, only 16.7% of Nursing records had the established criteria.²² These data corroborate this study since the identified Nursing records have nonconformities regarding indication, insertion, permanence, characteristics, aspects, and color of drained urine and signs of infection or obstruction.

In this study, the educational actions were planned with the target audience of professionals already inserted in the service, helping them to improve and update their knowledge in facing problems and the possibility of changes in care practices and the process of job.

There were significant gains observed in adherence to protocols for both categories after educational interventions. These interventions enabled to change the behavior of the team to handle the material provided at different moments of the intervention. In safety regarding the knowledge of the insertion technique and the maintenance of the DBC device, there was an increase of almost 20% of scientific knowledge regarding the appropriate techniques after the interventions.

The institution installed sinks, soap dispensers, alcoholic gel, and posters on hand hygiene in the corridors of the inpatient units, as well as other inputs, materials, and equipment sufficient to perform the DBC procedure, enabling the prevention measures and control of infections.

Regarding the knowledge about the indications for the DBC, the Nursing technicians hardly knew the indications for the device. Even considering that they are professionals not legally and technically qualified to perform this procedure, these data made us discuss not only the knowledge of the person performing it but mainly about the risk/harm to the patient's health.

Due to complications, the urinary catheter should be avoided as much as possible, considering the use of alternatives that minimize the risk of infection and trauma. DBC should be removed as early as possible.^{21,23} In postoperative cases, the recommendation is not to exceed 48 hours, except in specific cases.²⁴

The healthy urinary tract has no microbiota attached to its epithelium. Urine excreted in the urine is considered to be sterile. However, at the end of the path, when passing near the urethral opening, it may be contaminated by the cutaneous microbiota.⁸⁻¹⁰ Thus, some precautions are essential to avoid contamination and colonization of pathogens in these pathways, such as hand hygiene before treatment and after manipulation of catheters and urine collection systems. A study conducted in public hospitals in Belo Horizonte, Minas Gerais, Brazil revealed that hand hygiene before and after the procedures, both pre and posttest was adequate for nurses and Nursing technicians.²⁵ The use of antiseptic soap and alcohol gel dispensers are recommended in the high-risk sectors.⁹

The insertion and permanence of the urinary catheter can cause epithelial lesions in both the urethra and bladder. Catheter

diameter should be analyzed to minimize urethral trauma.^{23,24} Regarding the choice of diameter of the caliber, the research identified that nurses knew the catheter caliber appropriately for the procedure. In this sense, the educational interventions were emphasized for the Nursing technicians category, which in the pretest even mentioned that the choice of larger caliber prevented leaks and, as it was an assignment of this professional in the preparation of the material, needing more involvement of the educational process with these professionals.

In the drainage collector, the recommendation is to use the closed and sterile system with an anti-reflux valve, as it promotes the reduction of microorganism migration to the bladder. The emptying and the maintenance of the device is most often performed by Nursing technicians,^{8,20,24} as evidenced in this research.

The use of sterile water-soluble lubricating gel for single-use during bladder catheter insertion technique is essential. Doubts were clarified about the type, amount and first use, as recommended in the literature for the DBC procedure. However, the reports of professionals were based on the constant absence of this product in the institution, and the use of Vaseline was often considered, as well as saline. The institution started to acquire the product at the beginning of the interventions. There are cases of fatty embolism reported in the literature, with the use of sterile petroleum jelly due to the absorption of oily substances, and the use of water-soluble substances is recommended, such as 2% lidocaine jelly.^{23,24}

The educational intervention also underlined the relevance of retention balloon insufflation, highlighting the type of solution used and the importance of preserving catheter integrity. The use of 5-10 mL distilled water is recommended as saline solutions carry the risk of crystallization after long periods of use. It is not recommended to inflate the balloon with air alone, in which spontaneous venting may occur.²⁵ For the procedure to be performed aseptically, the institution must equip with basic inputs and materials. The Nursing team widely reported the lack of these materials (vats, fields, tweezers, antiseptic solutions), but they were purchased after the beginning of this research.

The use of antiseptic is essential to reduce infections, as it inhibits or eliminates microorganisms, as well as having persistent chemical residual activity on the skin.²⁶ This topic was especially evident in Nursing technicians because they do not know the purpose of the various types of antiseptics and their indications. There were interventions focused on the specificity of each product formulation and what type of procedure was intended. The result of this action was the elaboration of illustrative material on the types of antiseptics, which allowed the acquisition of knowledge on the topic. This debate influenced the study setting institution to acquire

chlorhexidine-based antiseptic formulations, as the iodine toxicity described in the literature was widely addressed.^{26,27}

Regarding the installation and connection of the catheter to the closed drainage system, half of the Nursing technicians dominated the topic with an increase obtained after training, while all nurses remained at a significant level. The authors highlighted the relevance of performing a DBC procedure in a standardized manner that complies with all recommended standards and highlighted good maintenance and installation practices as preventive measures for UTI.^{25,27} The system should not be disconnected, except in cases of bladder irrigation. Whenever the system is breached, the entire assembly must be replaced. This may reduce infection rates.^{20,25,27}

Catheter fixation is essential for maintaining unidirectional flow, as well as for not pulling it and causing damage to the urinary system. In the male patient, it should be fixed in the hypogastrium to avoid scarification of the urethra. For females, the fixation to be performed on the anterior face of the thigh root.^{20,23,25}

Good urinary catheter maintenance practices have been indispensable to prevent urinary infections. These practices included hand hygiene and perineal antisepsis, maintenance of the collection bag below the bladder level with adequate volume (should be emptied when it reaches two-thirds of its capacity), and always a closed system. Also, the use of irrigations should be performed only in specific cases, such as urological surgeries, and the rules of aseptic technique must be obeyed. Regarding DBC maintenance care, the study revealed that both categories already had a high pretest level regarding collection bag positioning conditions, urinary meatus care and collection bag emptying.²⁵⁻²⁷

A systematic review study with meta-analysis reported that the best available evidence on the use of antiseptic and antimicrobial solutions for urinary meatus disinfection does not reduce the risk of a UTI. Cleaning the meatus with water is sufficient to keep the area clean. Water, saline or antiseptics are equally effective in cleaning or disinfecting the meatus.¹¹

For laboratory tests, 70% of alcohol should be disinfected in the appropriate collection device and collection tube, and urine collected through a fine needle, sterile syringe, and immediately sent to the laboratory.²⁵ This study evaluated the collection technique of urine for exams. There was an evolution after training with both categories with percentage gain in which almost half were unaware of this care and achieved almost all after educational interventions.

The literature does not have defined criteria with the device permanence time but recommends that prolonged use of DBC is associated with infections and complications.^{8,11,27} Before, the device was changed every seven days to avoid UTI. Currently, catheter replacement recommendation should be made after individual evaluation.^{4,11,25-27} The removal of the

catheter in individuals who use it for an extended period should be planned by a qualified professional. About 50% of patients on long-term DBC have fouling obstructions, which are most often formed by ammonium phosphate, magnesium, and calcium phosphate crystals. Some studies indicated the use of silicone catheters because they cause little damage to epithelial exchanges.^{25,27}

Proper registration and the legal responsibility of the professional are fundamental. The study showed the need for educational actions, especially for Nursing technicians who had little knowledge of the topic. All actions involving the procedure from insertion and care during maintenance should always be documented in medical records, to monitor length of stay and possible complications, including the insertion request and its justification. Also, to inspect urine color, volume and appearance and to prevent reflux and folds in the extensor duct are important, periodically identifying and monitoring the signs of UTI.^{11,24}

By making a general analysis of the level of knowledge of the professionals studied regarding the institutional protocols, safety, and indications for conducting the DBC, it was found that the higher response pattern of nurses reflected the interference of university education in the level of knowledge. However, the gain of approximately two points occurred for both categories, regardless of the pretest starting point.

Educational processes are building opportunities that ensure quality health care.¹⁶ Educational actions were planned with professionals already in the service to help them improve and update their knowledge in facing problems and the possibility of change in care practices, as well as the on-site work process. However, to change health practices, not only educational actions based on the lived context are needed, but institutions need to provide means and conditions in their work process for the professional to put them into practice.^{13,16}

One of the limitations in this study was the lack of specialization of professionals working in the Hospital Infection Control Commission and the continuing education sector of the institution, causing the lack of supervision of the monitoring of education strategies used during the research period. Maintaining this practice with professionals was an obstacle to overcome. Prospective studies in the study scenarios will be conducted to verify if the interventions were timely or absorbed to promote long-term changes.

However, this research highlighted the importance of continuing health education based on the daily life experienced by professionals, change in care practice, management, and contributing to the reduction of care-related infections, such as urinary tract infection associated with delay bladder catheterization.

CONCLUSION

The Nursing team needs periodic training that permeates the problem experienced to perform their work. This research proved the effectiveness of these interventions for professional growth and improvement of the quality of health care, reducing the urinary tract infection rate associated with delayed bladder catheterization.

The professionals participating in this study recognized that the educational actions allowed new learning to stimulate the critical-reflexive analysis for the rescue of autonomy, the relationship of theory with practice, the understanding of the hierarchy level and its professional attributions in their work environment, despite the limitations faced, such as the lack of material resources to perform the procedures.

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