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## ORIGINAL ARTICLE

### NURSING TEAM ADHERENCE TO MEASURES FOR PREVENTION OF BLOOD CURRENT INFECTIONS

### ADESÃO DA EQUIPE DE ENFERMAGEM ÀS MEDIDAS DE PREVENÇÃO DE INFECÇÕES DE CORRENTE SANGUÍNEA

### ADHERENCIA DEL EQUIPO DE ENFERMERÍA A LAS MEDIDAS DE PREVENCIÓN DE INFECCIONES DE CORRIENTE SANGUÍNEA

Gisele Dias Dantas<sup>1</sup>, Danielle Samara Tavares de Oliveira-Figueirêdo<sup>2</sup>, Amanda Manuella Dantas Nobre<sup>3</sup>, Edlene Régis Silva Pimentel<sup>4</sup>

#### ABSTRACT

**Objective:** to evaluate the knowledge and adherence of the nursing team to measures of prevention of bloodstream infections related to the central venous catheter (ICSR-CVC) in the Intensive Care Unit. **Method:** this study is descriptive, exploratory with a quantitative approach, conducted in an Adult Intensive Care Unit of a school hospital. The sample had 22 professionals from the nursing team. The data collection was held by structured questionnaires occurring in two stages - application of the instrument to the team and systematic observation of their behaviors. Data were analyzed using descriptive statistics. **Results:** 16 (72.7%) professionals did not mention the measures of prevention of ICSR-CVC, there was inconsistency between the discourse and the practice and the nursing team presented weaknesses in adherence to the prevention measures. **Conclusion:** it is concluded that adherence to the measures of prevention of ICSR-CVC should be encouraged through continuing education. **Descriptors:** Intensive Care Units; Cross Infection; Catheter-Related Infections; Catheterization, Central Venous; Patient Safety.

#### RESUMO

**Objetivo:** avaliar o conhecimento e adesão da equipe de enfermagem às medidas de prevenção de infecções de corrente sanguínea relacionadas ao cateter venoso central (ICSR-CVC) em Unidade de Terapia Intensiva. **Método:** estudo descritivo, exploratório, de abordagem quantitativa, realizado em uma Unidade de Terapia Intensiva Adulto de um hospital-escola. Compuseram a amostra 22 profissionais da equipe de enfermagem. A coleta de dados foi auxiliada por questionários estruturados ocorrendo em duas etapas - aplicação do instrumento à equipe e observação sistemática dos comportamentos dos mesmos. Os dados foram analisados mediante estatística descritiva. **Resultados:** 16 (72,7%) profissionais não citaram as medidas de prevenção de ICSR-CVC, houve incoerência entre o discurso e a prática, e a equipe de enfermagem apresentou fragilidades na adesão às medidas de prevenção. **Conclusão:** conclui-se que a adesão às medidas de prevenção de ICSR-CVC deve ser incentivada através de educação continuada. **Descritores:** Unidades de Terapia Intensiva; Infecção Hospitalar; Infecções Relacionadas a Cateter; Cateterismo Venoso Central; Segurança do Paciente.

#### RESUMEN

**Objetivo:** evaluar el conocimiento y adherencia del equipo de enfermería a las medidas de prevención de infecciones de corriente sanguínea relacionadas al catéter venoso central (ICSR-CVC) en Unidad de Terapia Intensiva. **Método:** estudio descriptivo, exploratorio, de enfoque cuantitativo, realizado en una Unidad de Terapia Intensiva Adulto de un hospital escuela. Compusieron la muestra, 22 profesionales del equipo de enfermería. La recolección de datos fue auxiliada por cuestionarios estructurados ocurriendo en dos etapas - aplicación del instrumento al equipo y observación sistemática de sus comportamientos. Los datos fueron analizados mediante estadística descriptiva. **Resultados:** 16 (72,7%) profesionales no citaron las medidas de prevención de ICSR-CVC, hubo incoherencia entre el discurso y la práctica y el equipo de enfermería presentó fragilidades en la adherencia a las medidas de prevención. **Conclusión:** se concluye que adherencia a las medidas de prevención de ICSR-CVC debe ser incentivada a través de educación continuada. **Descriptor:** Unidades de Cuidados Intensivos; Infección Hospitalaria; Infecciones Relacionadas con Catéteres; Cateterismo Venoso Central; Seguridad del Paciente.

<sup>1</sup>Nursing Course Graduate of the Federal University of Campina Grande/UFCG - Campus Cuité. Cuité (PB), Brazil. E-mail: [diasgd19@gmail.com](mailto:diasgd19@gmail.com); <sup>2</sup>Nurse, Master's Professor in Nursing, Federal University of Campina Grande/UFCG - Campus Cuité. Cuité (PB), Brazil. E-mail: [daniellesamara@hotmail.com](mailto:daniellesamara@hotmail.com); <sup>3</sup>Nurse, Master's in Public Health, University Hospital Alcides Carneiro/HUAC. Campina Grande (PB), Brazil. E-mail: [amandamanuella@hotmail.com](mailto:amandamanuella@hotmail.com); <sup>4</sup>Nurse, Professor Specialist in Intensive Care, Federal University of Campina Grande/UFCG - Campus Cuité. Cuité (PB), Brazil. E-mail: [edleneregis@hotmail.com](mailto:edleneregis@hotmail.com)

## INTRODUCTION

Health care is a complex process not free from risks and possible adverse events. Among the possible complications resulting from health care, the most relevant are the Health Care-Related Infections (IRAS), which are frequent problems, mainly in the Intensive Care Units (ICUs), presenting high incidence rates and morbimortality.<sup>1</sup>

In the case of the most commonly identified IRAS in the critical care setting, bloodstream infections (ICS) are particularly prominent, rather than invasive devices, such as central venous catheters (CVCs). They could be inserted into a vein or artery, centrally or peripherally, for hemodynamic monitoring, administration of intravenous fluids, nutrition and medication.<sup>3</sup>

Although 46% decrease in central catheter-related bloodstream infections (CVH-ICSR) was observed in the United States of America from 2008 to 2013, it is estimated that they occur in intensive care units and wards of acute care units each year about 30,100 cases of these infections.<sup>4</sup>

Despite the problems of underreporting and difficulties in the surveillance system of these infections, the National Agency of Sanitary Surveillance (ANVISA) in Brazil notified a total of 18,370 Primary Bloodstream Infections (IPCS) from January to December 2010. Of them, more than half - 10,889 (59.3%), occurred in an adult ICU. However, there is underreporting of the incidence of these infections in all regions of the country evidenced by a fragility in the FormSUS system, which is the ANVISA IRAS notification form.<sup>5</sup>

In recent years, there has been an improvement in the standards of surveillance, the development of guidelines and protocols based on scientific evidence for the prevention of CVC-ICSR, but they are still a major problem for patient safety, especially those hospitalized in an ICU environment.<sup>6</sup> In this sense, some studies have demonstrated the possibility of reducing the rates of these infections, through a set of measures considered easy to apply and of low cost: the standardization of norms for insertion of central venous accesses through the insertion of bundle, sterile technique, and post-insertion maintenance care, so the values approach to zero.<sup>6</sup>

A study carried out in ICUs in the USA found that the establishment of ICS prevention protocols is not the only measure that can achieve impact in reducing the incidence and occurrence of complications related to these

infections. It is necessary for the professionals to be aware and have high adherence to the recommended guidelines.<sup>7</sup> To this end, the Centers for Disease Control and Prevention (CDC) guidelines recommend the evaluation of the knowledge and practices of health professionals in the ICU setting and justifies the need for research investigating the knowledge and adherence of health professionals to the prevention measures of ICSR-CVC.<sup>8</sup>

It is pertinent to emphasize that ICSR-CVC prevention also depends on organizational actions that include encouraging the management of health services to the knowledge and compliance of infection control and patient safety care, including good practices in insertion and maintenance of central venous accesses, by the health team. Efforts to prevent these infections should aim at the quality of care and patient safety, minimizing the occurrence of adverse events through the identification and implementation of intervention strategies aimed at zeroing the occurrence of this complication in critically ill patients.

In this sense, the results of this study contribute to the identification of knowledge gaps and nursing team adherence to the prevention of CVRD-ICSR, and may support continuing education actions in favor of improvements in the quality of nursing care.

## OBJECTIVE

- To evaluate the knowledge and adherence of the nursing team to the measures of prevention of ICSR-CVS in the Adult Intensive Care Unit.

## METHOD

This study is a descriptive, exploratory research with a quantitative approach developed at a School Hospital located in the city of Campina Grande (PB), Brazil, from January to February 2017. The study site was an Adult Intensive Care Unit (ICU). The adult ICU has ten beds and one is for patients in isolation. It is a scenario of theoretical and practical activities for several courses in the health area. The population was composed by 30 professionals of the nursing team. The sampling was of the non-probabilistic and intentional type, being formed by 22 professionals of the nursing team.

The data collection was carried out in two concomitant operational stages: application of a structured questionnaire and systematic observation. The structured questionnaire was applied with the purpose of evaluating the professionals' knowledge about good practices

with the CVC and prevention of ICSR-CVS, as well as checking the difficulties/facilities of the professionals about the execution of measures to prevent these infections.

A systematic observation step was performed to verify the compliance of the ICSR-CVC prevention actions by the nursing team, consisted of the visualization of the maintenance of the CVC during the dressing of the catheter insertion, during the preparation of medications and during the administration Of the medications by the nursing team. In this sense, one of the researchers stayed four hours in the sector for two days a week during the morning, totaling eight weeks of observing practices of maintenance of central venous access and medication administration. Eleven moments of CVC maintenance were verified during the dressing of the CVC insertion, 11 moments focused on the preparation of medications and 11 moments regarding the administration of medications.

At this stage, the data were collected through a systematic observation technique. For this purpose, a check list for systematic observation was used, according to national and international guidelines of ANVISA, Guideline of the Centers for Disease Control and Prevention and Bundle of the Institute for Healthcare Improvement<sup>8-9-10</sup>. Data analysis

was performed using descriptive statistics. The quantitative data were entered into a database and processed using statistical software, the Statistical Package for the Social Sciences (SPSS) version 20.0 for Windows and presented in tables and graphs and discussed based on the relevant literature. This research obeyed the ethical precepts contained in resolution 466/12 and it was approved by the Research Ethics Committee of the Federal University of Campina Grande, Alcides Carneiro University Hospital under protocol number 1,869,315 and CAAE: 57929816.3.0000.5182.

RESULTS

A total of 22 professionals from the nursing team, 7 nurses and 15 nursing technicians participated in the study who had a mean age of 39 years old (SD±7.35), had a mean duration of 17 years old (DP±8.32) and the average time of professional experience was 16 years old (SD±8.58). When evaluated on the working time in the sector where the research was carried out, the average was 10 years (SD±7.92). As for the complementary training, 14 (63.6%) stated that they had specialization. However, an expressive amount, 7 (31.8) did not have complementary training.

Table 1. Knowledge of the nursing team about the measures of prevention of ICSR-CVC. Campina Grande (PB), Brazil, 2017 (n=22).

| Variables                                                                                     | n  | %    |
|-----------------------------------------------------------------------------------------------|----|------|
| Risks of using central access                                                                 |    |      |
| Pneumothorax                                                                                  | 11 | 35.4 |
| Local infection                                                                               | 6  | 19.3 |
| Bleeding                                                                                      | 4  | 12.9 |
| Sepsis                                                                                        | 3  | 9.6  |
| Hemothorax                                                                                    | 2  | 6.4  |
| Thrombosis                                                                                    | 2  | 6.4  |
| Shock                                                                                         | 1  | 3.2  |
| Subcutaneous emphysema                                                                        | 1  | 3.2  |
| Endocarditis                                                                                  | 1  | 3.2  |
| Existence of training offered to the professional on prevention of ICSR-CVC                   |    |      |
| Yes                                                                                           | 1  | 4.5  |
| No                                                                                            | 20 | 90.9 |
| Missing Answer                                                                                | 1  | 4.5  |
| Adherence to any ICSR-CVC prevention protocol                                                 |    |      |
| Yes                                                                                           | 3  | 13.6 |
| No                                                                                            | 19 | 86.4 |
| CVS contamination route related to ICS                                                        |    |      |
| Via Extraluminal                                                                              | 8  | 36.4 |
| Intraluminal Via                                                                              | 4  | 18.2 |
| Colonization of the catheter tip by hematogenous spread from another infectious site          | 2  | 9.1  |
| Intraluminal, extraluminal and colonization of the catheter tip by hematogenous dissemination | 2  | 9.1  |
| Intraluminal and extraluminal pathways                                                        | 3  | 13.6 |
| Extraluminal and colonization colonization of the catheter tip hematogenous dissemination     | 1  | 4.5  |
| Intraluminal and colonization colonization of the catheter tip hematogenous dissemination     | 2  | 9.1  |

Almost all the participants, 20 (90.9%) stated that they had never had any type of training on preventive measures of ICSR-CVC.

The main route of contamination of the catheter that relates to the occurrence of ICSR-CVC reported by participants was

extraluminal - eight (36.4%) and intraluminal - four (18.2%). Only two (9.1%) participants reported the ways most associated with ICSR-CVC, which would be the intraluminal, extraluminal and colonization of the catheter tip by hematogenous dissemination from another infectious source (Table 1).

Regarding the knowledge of the measures of prevention of ICSR-CVC recommended by CDC and ANVISA, 16 (72.7%) participants did not know how to quote them. Of the six participants, four (66.6%) cited the use of aseptic techniques, three (50%) hand hygiene, three (50%) aseptic dressings, two (33.3%) asepsis hub of the catheter and two others (33.3%) the maximum protection barrier use. Observing the insertion site daily, changing equipment at the right time, disinfecting ampoules and vial ampoules and the use of sterile gloves were mentioned at least once (data not shown).

Three (13.6%) participants did not know what the role of the nurse would be at the moment of insertion of the CVC. Sixteen (84.2%) confirmed the importance of being

certified aseptic, two (10.5%) indicated that this moment would be turned to the physician's help, one (4.5%) cited the checklist at the time of insertion and one (4.5%) believes that observing and providing inputs is the most important. All participants indicated that they felt able to perform the catheter manipulation, as well as performing the daily assessment of their insertion. Regarding the preparation of medications, 13 (59.1%) reported disinfection of ampoules and ampoules and nine (40.9%) said they did not perform it.

At the time of drug administration, 21 (95.5%) indicated that they disinfected the catheter hub and one (4.5%) pointed out that he did not practice disinfection of ampules and vials. Among those who said to disinfect, they consider it mandatory, since it reduces the risk of infection. One participant (4.5%) indicated that it is not mandatory to carry out the disinfection of ampoules and vials and infusion systems, justifying that the administration system is closed and free of contamination.

Table 2. Observation of the behaviors of the nursing team at the time of dressing. Campina Grande (PB), Brazil, 2017 (n=11).

| Variables                           | n  | %    |
|-------------------------------------|----|------|
| Hygiene of hands before dressing    |    |      |
| Did not perform it                  | 11 | 100  |
| Layout of materials                 |    |      |
| Aseptically                         | 8  | 72.7 |
| There was contamination             | 3  | 27.3 |
| Use of gloves                       |    |      |
| Procedure gloves                    | 2  | 18.2 |
| Sterile gloves                      | 9  | 81.8 |
| Cleaning of the insertion site      |    |      |
| With alcoholic chlorhexidine        | 8  | 72.7 |
| With aqueous chlorhexidine          | 1  | 9.1  |
| Did not perform it                  | 2  | 18.2 |
| Cover of the insertion site         |    |      |
| Sterile gauze and tape              | 5  | 45.5 |
| Semi-permeable dressing             | 6  | 54.5 |
| The dressing was dated              |    |      |
| Yes                                 | 1  | 9.1  |
| No                                  | 10 | 90.9 |
| Reason for dressing Exchange        |    |      |
| By saturation                       | 5  | 45.5 |
| The dressing was not dated          | 5  | 45.5 |
| Due time                            | 1  | 9.1  |
| Hygiene of the hands after dressing |    |      |
| Yes                                 | 8  | 72.7 |
| No                                  | 3  | 27.3 |

All participants indicated hand hygiene as important before handling the cateter. However, when 11 (100%) moments during the dressing of the CVC insertion were observed, the nursing professionals showed that they did not perform the hygienization of the hands immediately before performing the dressing (Table 2).

In 10 (90.9%) moments, the dressing was not dated. CVC insertion dressing was changed in 5 (45.5%) cases by saturation. In the other five (45.5%) moments, the exchange was performed, but the dressing was not dated before. In most cases - eight (72.7%), hand hygiene was performed after the end of the procedure (Table 2).



During the observations of the behaviors of the preparation and administration of medications, it was verified that at all times observed - 11 (100%), hand hygiene was performed before. However, disinfection of ampoules and ampoules vial was not detected in 11 (100%) observations and disinfection of

the catheter hub at the time of administration of medications was also not seen in 11 (100%) of the time. Figures 1 and 2 compare the responses of the professionals regarding their practice and the observations of the behaviors visualized during the assistance of the nursing team.

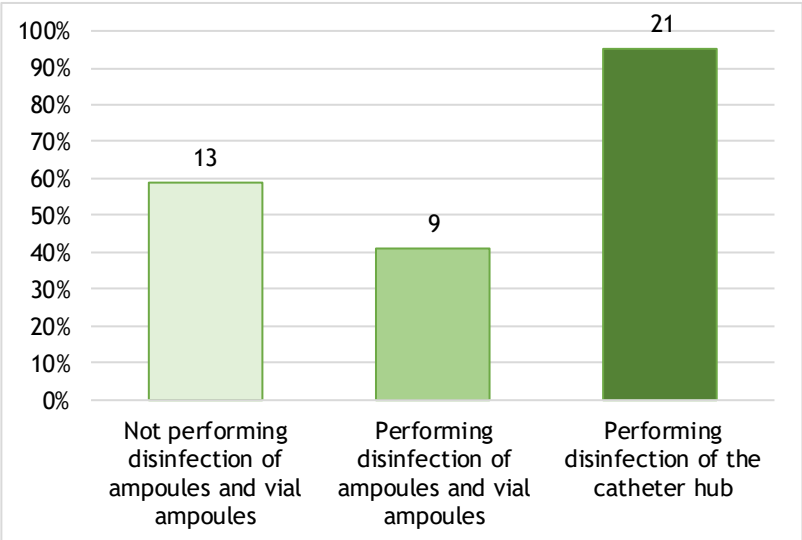


Figure 1. Responses of the professionals regarding the practice performed at the time of drug preparation and administration. Campina Grande (PB), Brazil, 2017 (n=22).

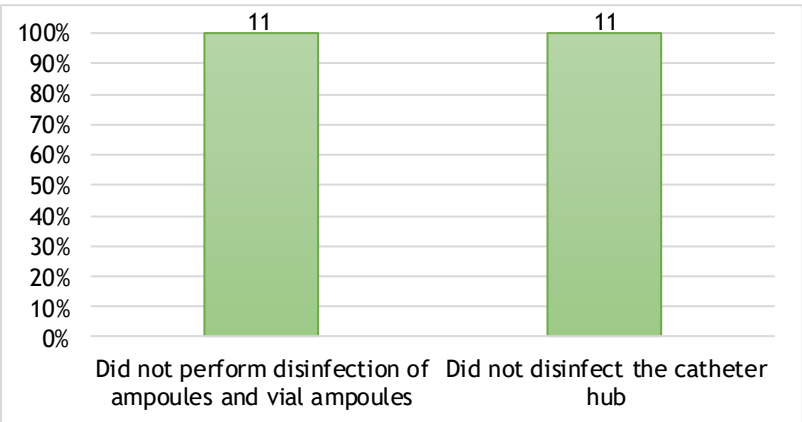


Figure 2. Observation of the behaviors of the professionals during the preparation and administration of medicines. Campina Grande (PB), Brazil, 2017 (n=11).

Figure 1 demonstrates the professionals' answers regarding the practice performed at the time of medication preparation and administration. Most of the professionals, 13 (59%) reported disinfecting ampoules and vial ampoules at the time of preparation of the medication and 21 (95.4%) reported performing disinfection of the catheter hub judging that this practice was mandatory before administering the medications (Figure 1). However, data on the observation of CVC maintenance during drug preparation and administration showed that in 11 (100%) times the professionals neglected to disinfect ampoules and vial vials and the catheter hub, as demonstrated in Figure 2.

The lack of knowledge of the protocols developed by the CDC and ANVISA is also a problem and was the main difficulty noted by

some professionals - nine (40.9%). However, another nine (40.9%) participants stated that they had no difficulties of any order.

DISCUSSION

It was found that most nursing team did not receive training for insertion and maintenance of CVC with a focus on the prevention of ICSR-CVC. Such a phenomenon can be explained by the lack of a continuing education commission in health institutions. A study that evaluated the impact of continuing education on the knowledge of professionals in the care of patients using CVC found that after implementing educational measures, the participants evolved from 60% to 99% in answers to knowledge about good practices with CVC before and after implementation of the educational intervention, respectively.<sup>11</sup>

Most of the the nursing team, 14 (63.6%) reported having specialization. However, an expressive amount, 7 (31.8%), did not have complementary training. It is known that the professional qualification allows a safer assistance to the patient. A study showed that patient safety is not very much addressed in the training of health professionals, either in undergraduate or in medical/multi-professional residency programs, and when approached in a timely manner without in-depth critical reflections.<sup>12</sup> Therefore, there is a need for improvements in the training process regarding aspects related to the ICSR-CVC at undergraduate and postgraduate levels in nursing.

When citing the risk of local infection due to the use of CVC, participants are probably not able to differentiate local infection and ICSR-CVC. The local infection corresponds to any localized infection located at catheter insertion without systemic repercussions, while the ICSR-CVC is the infections with severe systemic consequences, bacteremia or sepsis, with no identifiable primary focus with CVC as a likely related factor.<sup>13</sup>

The majority of the nursing team indicated the extraluminal and intraluminal ways as those responsible for catheter contamination. Only two (9.1%) of the participants cited the three ways of contamination through which microorganisms can enter the bloodstream. There are three recognized ways for catheter contamination: the extraluminal way that occurs by migrating the skin microorganisms at the insertion site into the catheter and along the catheter surface with colonization of the catheter tip - the most common route of short-term infection; the intraluminal way that occurs from the direct contamination of the catheter by contact with contaminated hands or fluids or devices; colonization of the catheter tip by less common haematogenic spread occurs when catheters can become hematogenously seeded through another source of infection.<sup>8</sup>

It was verified in this study that the most participants - 16 (72.7%), did not know to describe the main measures of maintenance instituted by the CDC: the hygiene of the hands before the manipulation of the CVC; the use of sterile gloves to handle the catheter at the time of dressing; the use of 0.5% alcoholic chlorhexidine for cleaning during the dressing; assessment of catheter insertion daily to monitor signs of infection; disinfection of the CVC hub before drug administration.<sup>8</sup> From this perspective, it should be noted that lack of knowledge is the factor that most contributes to the

occurrence of adverse events. This phenomenon may have repercussions on damages to patients, as well as on injuries to professionals due to related ethical and legal aspects.<sup>14</sup>

This study also verified that it was indicated to ascertain the aseptic technique - 16 (84.2%) as the main role of the nurse at the time of insertion of the catheter. At this point, the professionals pointed out correctly, since this practice can be subsidized through a protocol-based checklist. Applying the checklist at the time of insertion allows the nurse to make sure that aseptic techniques will not be broken, decreasing the risk of infection. A study conducted in China compared the incidence of infection related to the use of the central catheter after the adoption of a care checklist with the device and found that the incidence decreased from 3.1/1,000 to 0/1000 catheters/day, with statistically significant difference.<sup>15</sup>

Although all the participants of the nursing team were able to handle CVCs, it was detected that changes in the behavior of these professionals are necessary, especially in the attempt to encourage adherence to CVS-ICSR prevention measures. These changes are possible from massive investment in continuing education. Continuing education programs, as long as scientifically based, allied theory and practice can change realities in health care.<sup>16</sup>

At the time of the observations, there was inconsistency between the professionals' discourse and the practice. In this research, it was verified that the nursing team does not perform hand hygiene immediately before performing the CVC dressing, even though they are aware of the importance of performing it. A study evaluated the adherence to hygiene of the hands of a multiprofessional team and verified that the nursing technicians (29.8%) were the ones that adhered the least and the physiotherapists (53.5%) those who more adhered to the hygiene of the hands.<sup>17</sup>

In this study, the nursing team demonstrated not to adhere to the disinfection of ampoules and vial ampoules and the disinfection of the catheter hub, because at the time of the observations this practice was not verified. These behaviors may lead to the development of adverse events in patient care. Therefore, it is imperative that management stimulus occurs, through the support of the institutions so errors and adverse events can be notified, analyzed and corrected, preventing their

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repetition, supporting professionals in their practice.<sup>18</sup>

In most of the observations, the nursing team showed that they did not date the dressings. ANVISA recommends the correct dressing change. For this, it is important the dressing be dated. The use of gauze, transparent or semipermeable sterile film to cover the catheter insertion is emphasized. It is important to perform cleaning of the insertion site with 0.5% and/or 2% alcoholic chlorhexidine and exchange coverage with sterile gauze every 48 hours, or before, if it is dirty, loose or moist and for semipermeable clear coverage every 7 days, or before, if it gets dirty, loose or wet.<sup>9</sup>

However, the lack of knowledge about the measures of prevention of ICS recorded by CDC and ANVISA was the most prevalent factor in this study. This finding may be related to the low offer of training of the ICU team regarding the issue. Therefore, a union between the continuing education service, the Hospital Infection Control Commission and care professionals is necessary so changes can be implemented and protocols are adhered by health professionals as an indispensable practice in their routine.<sup>16</sup> Notoriously, the continuing education of nursing professionals in relation to ICSR-CVC prevention measures are needed.

## CONCLUSION

The results of this study allowed to evaluate that the nursing team has weaknesses in the knowledge of the measures of prevention of CVS-ICSR advocated by ANVISA and by international agencies such as CDC. Also, most of the professionals indicated that they did not have training focused on ICSR-CVC prevention measures.

Most of nursing professionals reported carrying out CVC maintenance measures, such as: disinfection of ampules, vial ampoules and disinfection of the catheter hub for administration of medications. However, the execution of these measures were not visualized at the time of care observation provided by the team. These findings allow us to assume that the team knows the importance of such practices, but does not routinely stick to their praxis. Thus, it is concluded that the nursing team participating in this study also has weaknesses in adherence to the measures of prevention of CVRD-ICSR.

The main limitations of this study are the short period of observations and the reduced sample. Educational intervention studies are suggested to evaluate the impact on adherence and knowledge of professionals

regarding IRAS with a focus on CVRD-ICSR. Finally, no structural difficulties were observed for the practice of caring for patients using CVC, but rather with a theoretical approach. The professionals showed they had doubts about CVC management and lack of knowledge about prevention measures, confirming the need for managers to implement continuous education measures for these professionals, covering this issue. It is suggested that protocols, norms and routines be instituted and implemented, aiming at the safety of the patient, in particular, the control and prevention of ICSR-CVC in critical care settings.

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**Corresponding Address**

Gisele Dias Dantas  
Rua Antônio Faustino Gomes, 46  
Bairro Centro  
CEP: 58195-000 – Frei Martinho (PB), Brazil