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Insertion of central vascular catheter: adherence to infection prevention bundle

Inserção de cateter vascular central: adesão a bundle de prevenção de infecção

Inserción de catéter venoso central: adhesión a bundle de prevención de infección

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ABSTRACT

Objective: To evaluate the compliance of the care process involving insertion of central vascular catheter (CVC) in hemodialysis. **Method:** Cross-sectional quantitative approach developed at the hemodialysis service of a reference hospital in Sergipe, Brazil. Sample consisting of 1,342 actions evaluated, corresponding to 122 forms for monitoring and control of CVC insertion. Data collection was held from July to December 2016. **Results:** The adherence rate to the use of the insertion form was 54.9%. The procedure evaluated achieved 93% overall compliance. Of the 11 specific actions observed, seven (64%) presented 100% compliance. The density of the overall incidence of primary bloodstream infections reduced from 10.6 to 3.1 infections per 1,000 patients/day. **Conclusion:** Although the observed actions reached specific desired conformities, the use of the checklist was lower than expected. Strategies for monitoring, coaching and educational and organizational actions can contribute to safe care.

Descriptors: Health Care Quality Assurance; Central Venous Catheters; Catheter-Related Infections; Patient Safety; Patient Care Team.

RESUMO

Objetivo: Avaliar a conformidade do processo assistencial envolvendo a inserção do cateter vascular central (CVC) em hemodiálise. **Método:** Abordagem quantitativa, de corte transversal, desenvolvida no serviço de hemodiálise de um hospital de referência do estado de Sergipe, Brasil. Amostra constituída por 1.342 ações avaliadas, correspondendo a 122 formulários para monitoramento e controle da inserção de CVC. A coleta de dados ocorreu de julho a dezembro de 2016. **Resultados:** A taxa de adesão ao uso do formulário de inserção foi de 54,9%. O procedimento avaliado alcançou 93% de conformidade geral. Das 11 ações específicas observadas, sete (64%) apresentaram 100% de conformidade. Observou-se redução da densidade de incidência global das infecções primárias da corrente sanguínea de 10,6 para 3,1 infecções por 1.000 pacientes/dia. **Conclusão:** Apesar das ações observadas alcançarem conformidades específicas desejadas, a utilização do *checklist* foi aquém do esperado. Estratégias para monitoramento, *coaching* e ações educativas e organizacionais podem contribuir para uma assistência segura.

Descritores: Garantia da Qualidade dos Cuidados de Saúde; Cateteres Venosos Centrais; Infecções Relacionadas a Cateter; Segurança do Paciente; Equipe de Assistência ao Paciente.

RESUMEN

Objetivo: Evaluar la conformidad del proceso asistencial relacionada a inserción del catéter venoso central(CVC) en hemodiálisis. **Método:** Enfoque cuantitativo, corte transversal, realizado en el servicio de hemodiálisis de un hospital de referencia del estado de Sergipe, Brasil. Muestra constituida por 1342 acciones evaluadas, que corresponden a 122 formularios para monitoreo y control de la inserción de CVC. La recolección de datos fue realizada de julio a diciembre del 2016. **Resultados:** La tasa de adhesión al uso del formulario de inserción fue del 54,9%.El procedimiento evaluado obtuvo un 93% de conformidad general. De 11 acciones específicas observadas,7(64%) presentaron 100% de conformidad. Se observó reducción en la incidencia global de infecciones primarias de corriente sanguínea de 10,6 para 3,1 por 1000 pacientes/día. **Conclusión:** Aunque las acciones observadas tuvieron conformidades específicas, el uso de la lista de verificación fue inferior a lo esperado. Estrategias para monitoreo, coaching y acciones educativas podrian contribuir para una asistencia segura.

Descriptores: Garantía de la Calidad de los Cuidados de Salud; Catéteres Venosos Centrales; Infecciones Relacionadas con el Catéter; Seguridad del Paciente; Equipo de Asistencia al Paciente.

INTRODUCTION

Hemodialysis consists of a mechanical procedure of renal replacement therapy that aims to remove toxic substances and excessive fluids that accumulate due to renal failure[1].

According to data from the Brazilian Society of Nephrology, the number of hemodialysis units in Brazil has been increasing over the years, from 510 units in 2000 to 747 in 2016. Thus, the estimated percentage of hemodialysis patients with central venous access catheter (CVC) reached 20.5% of the total number of patients in 2016, with approximately 9.4% of short stay and 11.2% of long stay[2].

Considering the demand for this service, health professionals need to be aware of the safety measures, especially regarding the prevention of infections that may result in a complication in the general state of the patient[3].

The innumerable advantages of implementing the CVC are indisputable. However, there may be problems, such as infectious complications[4], as primary bloodstream infections (PBSI) in CVC, which are associated with unfavorable health outcomes[5]. Although PBSI is one of the most common and preventable infections, a study shows that hospitals in developed countries in the Asia Pacific region have not yet reached rates equal or close to zero – a reality found in most of the intensive care units (ICUs) studied[6].

In Brazil, recognizing the importance of preventing this condition, the Brazilian Health Regulatory Agency (Anvisa) determines the mandatory notification for all cases in hospitals with ICU beds, for the purpose of collecting infection rates and the possibility of comparison with other national and international institutions[5].

In this sense, the quality advocated by the institution must be associated with the compliance of the rules established by regulatory agencies, as well as the constant search for possible failures in the implementation of the practices and their respective corrections, always prioritizing the satisfactory security and quality of the care provided[7].

The implementation of preventive measures to control healthcare-related infections aims to provide a safer care to patients. This theme has been discussed all over the world, showing several strategies that can be adopted to guarantee quality in health care[6,8,9]. For this reason, this study aims to evaluate the compliance of the care process, involving the insertion of CVC for hemodialysis. The assessment of care practices offered to patients with a central catheter allows the identification of frailties and the implementation of practices that favor the improvement of the quality of care offered.

In Brazil, this issue has been treated with priority by programs that highlight the importance of safety in patient care, such as the National Patient Safety Program, established by Ministerial Ordinance No. 529/2013[10]. Similarly, implementing the bundle or the package of measures ensures the introduction of preventive actions for controlling primary bloodstream infections.

The elements of emphasis that make up the bundles are: hand hygiene, use of chlorhexidine alcohol as an antiseptic for skin preparation, use of maximum barrier precaution, nonuse of femoral vein accesses, and daily verification of the need for catheter permanence[11-13].

Associated with this measure, Anvisa recommends health services to monitor and elaborate indicators. These tools are intended to analyze the care processes and the results achieved through the improvement of care practices. This analysis allows identifying vulnerabilities in the care process and their impact on the occurrence of adverse events, in order to ensure the elaboration of strategies for correction and improvement of care[5].

In this context, although protocols and indications for best practices described by the Ministry of Health and Anvisa exist in the literature, there is a lack of studies that evaluate how care practices involving catheter insertion in hemodialysis patients are being performed and whether these instruments are being used effectively in the care practice to guarantee a safe patient care.

Thus, the following question was raised: what is the adherence rate to the measures for safe practices given the CVC insertion in the hemodialysis service in a public hospital in the state of Sergipe?

OBJECTIVE

To evaluate the adherence of the care process involving the CVC insertion for hemodialysis.

METHOD

Ethical aspects

The research followed the precepts in Resolution 466/2012 of the National Health Council and was initiated after approval of the project by the Research Ethics Committee of the Federal University of Sergipe, CAAE no. 46319615.9.0000.5546.

Study design, location and period

Cross-sectional and quantitative study developed at the hemodialysis service of a reference hospital in the state of Sergipe, Brazil. This service provides care to inpatients who require hemodialysis and peritoneal dialysis. About 70 patients are evaluated monthly. They are followed up by a multidisciplinary team with nephrologists, nurses and nursing technicians, contributing to a better care and quality of care. Data collection was held from July to December 2016.

Population or sample: inclusion and exclusion criteria

The *n* for this study was 222 observations of CVC insertions performed in the nephrology service, considering that, on average, 37 insertions were performed monthly. The sample was calculated using the Epiinfo software, Statcalc, with a 5% margin of error and a 90% confidence level. It consisted of 122 observations held with a checklist for monitoring and control of CVC insertion in patients undergoing hemodialysis. It should be noted that all professionals involved in the insertion procedure were previously trained and oriented regarding the use of the prevention checklist by the Hospital Infection Control Committee (CCIH), based on the guidebook of preventive measures for healthcare-related infections[5].

All care practices involving CVC insertion with the use of the checklist for infection prevention that were performed during the collector's stay in the unit were considered as inclusion criterion. Procedures performed by teams with no previous training delivered by the CCIH, procedures held in parallel, and those that, even when performed in the unit and in the collector's presence, could not be observed due to the severity of the patient's condition and/or the context of care, were considered as exclusion criteria for observation of practices.

Study protocol

The observations were made by only one collector, who was previously trained by the CCIH team. It should be noted that this observer only identified whether or not the work team for CVC insertion adhered or not to the use of the bundle. However, the use and completion of the checklist to verify the follow-up of preventive actions was performed by a member of the hemodialysis service, thus guaranteeing the absence of bias during the collection.

The checklist instrument was constructed based on the guidebook *Preventive measures for healthcare-related infections*[14], which established 11 actions or specific components referring to preventive measures for primary bloodstream infections related to CVC insertion, listed below: verification of patient's identification and CVC indication, patient positioned correctly, complete material kit, hand hygiene in the preparations of insertion by the doctor and by the assistant, site preparation with solution based on chlorhexidine alcohol, use of maximum barrier protection (long sterile fields, sterile glove, cap, mask, sterile long-sleeved overcoat), sterile technique kept when performing the dressing, and signed and dated dressing.

For this instrument, the response options for each of the actions were: compliant action and noncompliant action. On the other hand, the score of each procedure evaluated, according to the bundle, was calculated by the number of actions in compliance or not, for further analysis of the process indicators.

To record infection cases, continuous monitoring was initiated through clinical and laboratory analysis as soon as the catheter was inserted into the patient.

Analysis of results and statistics

The information collected was entered into a database in the Microsoft Excel software. Percentage and absolute frequencies were applied for analysis and descriptive statistics. For the calculation of indicators, specific formulas were used to identify general and specific compliance[15], as follows:

$$\frac{\text{Nº. of observations in which all actions were performed}}{\text{Total nº. of observations}} \times 100 \text{ general}$$

$$\frac{\text{Nº. of observations in which the specific action was performed}}{\text{Total nº. of specific actions observed}} \times 100 \text{ specific}$$

Based on studies[16] that evaluated nursing care practices and practices for control and prevention of hospital infections, the adherence expected for this study was defined as that in which the procedure evaluated reached a percentage greater or equal to 80%.

The density of infection incidence was calculated by the following formula:

$$\frac{\text{Nº. of patients using CVC with infection} \times 1000}{\text{Nº. of patients/day using CVC}}$$

RESULTS

A total of 222 CVC insertions for hemodialysis were observed; the teams used the observation form in 122; with this, the rate of adherence to the use of the checklist during the procedure corresponded to 54.9% for this study. In the 122 insertions with adherence to the checklist, 1,342 preventive measures involving the CVC insertion could be evaluated.

Table 1 shows that the 122 patients involved in the procedures observed were mostly males with diagnosis of chronic renal failure, mean age of 59 years and presented insertion of the catheter into the internal jugular vein.

Figure 1 shows that the care practice evaluated had a general compliance of 93%, i.e. the professional performed all the necessary actions in 113 observed procedures.

Table 1 – Distribution of variables related to the patient using a central vascular catheter Aracaju, Sergipe, Brazil, 2016

Variables	N	%
Sex		
Male	89	73
Female	33	27
Indication for use of catheter		
Acute renal failure	38	31
Chronic renal failure	79	65
No record	5	4
Catheter insertion site		
Right internal jugular vein	63	52
Left internal jugular vein	24	20
Right subclavian vein	3	2
Left subclavian vein	2	2
Right femoral vein	27	22
Left femoral vein	3	2
Total	122	100

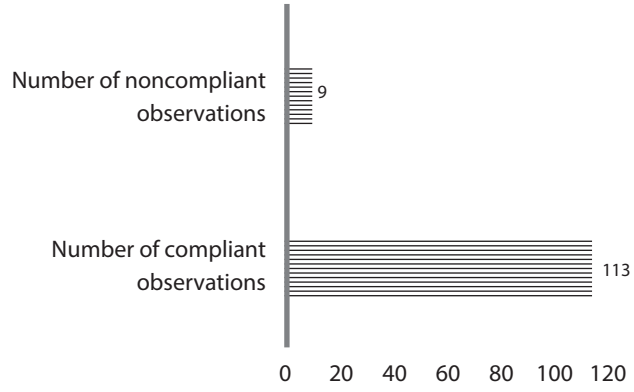

Figure 1 – Distribution of the general adherence to the procedures involving the insertion of the central vascular catheter for hemodialysis, Aracaju, Sergipe, Brazil, 2016

Of the 11 specific components, seven (64%) presented 100% adherence, namely: verification of patient's identification and CVC indication, patient positioned correctly, hand hygiene in the

preparations of insertion by the doctor and by the assistant, use of sterile glove, cap and mask during catheter insertion; sterile technique for performance; and dressing with date record and signature of the person in charge (Table 2).

The components that had no maximum adherence were: complete material kit, with 95% compliance; preparation of the site with alcoholic solution, 91%; use of sterile overcoat, 98%; and area of the procedure covered with sterile field, 99% (Table 2).

Furthermore, the overall incidence density of primary bloodstream infections was 10.6 infections per 1,000 patients/day during the first month of observation. As for the last month of collection, the incidence density decreased to 3.1 infections per 1,000 patients/day.

Table 2 – Distribution of specific conformities of the observed actions involving the central vascular catheter insertion for hemodialysis, Aracaju, Sergipe, Brazil, 2016

Action observed (n=1,342)	Compliant actions	Adherence rate
1) Patient identification and catheter indication	122	100%
2) Patient positioned correctly	122	100%
3) Complete material kit	116	95%
4) Doctor and assistant hygienized their hands	122	100%
5) Use of alcoholic chlorhexidine	111	91%
6) Use of sterile overcoat	119	98%
7) Use of sterile glove	122	100%
8) Use of cap and mask	122	100%
9) Field kept sterile	120	98%
10) Use of sterile technique for dressing	122	100%
11) Dated and signed dressing	122	100%

DISCUSSION

This study allowed the evaluation of the care processes involving CVC insertion in hemodialysis patients. Considering the total procedures performed, the data analyzed showed low adherence to the use of checklist by the health team. This fact may be related to some barriers in the service that should be evaluated, such as time spent to fill out the checklist, professional's attitude and commitment and organizational environment, among the main ones.

It is known that safe healthcare practices in a health organization are more easily implemented when there is a safety culture, since it can be understood as a result of individual and group values. Thus, the instruments for verifying care processes show better adherence when there is improvement of the work process, awareness of the team in the implementation, accountability for the application of the instrument and continuous assessment of compliance with the checklist[17].

In relation to the characterization of patients in renal therapy submitted to catheter insertion with adhesion to the checklist, a study shows that the majority (57%) were males aged at 65 years or older[2], a similar result regarding sex and a different one regarding the variable age in relation to this study.

Regarding the choice of the CVC insertion site, there was compliance with the guidelines of the Centers for Disease Control and Prevention (CDC) and Anvisa, which recommend, in hemodialysis, the insertion preferentially in the jugular and femoral veins, due to the low risk of stenosis presented in relation to the subclavian vein[18].

On the other hand, among procedures that applied the checklist of verification for CVC insertion, there was a high adherence rate in the follow-up of the 11 recommended components or measures, with overall adherence higher than 80%. However, studies on adherence assessment, related to CVC insertion, show the difficulty in achieving general adherence greater than or equal to 80%[16,18-20]. In this regard, one must remember that the performance of procedures involving aseptic techniques and safe practices contribute to the reduction of adverse events; however, to ensure such safe and risk-free care, the management must focus on strategies that favor better adherence through constant monitoring and continuing education.

Regarding the hand hygiene component, an observational research evidenced the execution of this practice in only 10.7% of the observations made[16], which brings conflicting results with this study, in which this practice was verified in 100% of the cases. It is understood that hand hygiene is one of the most important measures to prevent infections, guaranteeing a safe care for both patients and health professionals, as shown in a study[21], which obtained a reduction in the infection rate from 7.8 to 2.3 episodes/1,000 CVC per day.

The literature[14] indicated that the reduction of healthcare-related infections occurs when there is greater adherence related to the hand hygiene practice and adds that maintaining constant the adherence of the professionals involved is not an easy task.

Concerning the site preparation with alcoholic chlorhexidine, adherence was identified in 92% of the observations. The non-total adherence to this item may be related to the team's lack of knowledge about institutional protocols, which specify the use of chlorhexidine as a first-choice antiseptic, or lack of material at the puncture moment. Despite this, 70% alcohol and iodopovidone are not contraindicated substances and their use confers adequate skin antisepsis for catheter insertion. It is known that 0.5% alcoholic chlorhexidine is recommended worldwide, with a maximum and more effective level of evidence (A1) when compared to other alcoholic antiseptics; however, other antiseptics may be used in the absence of such substance[14,16].

In relation to the measure use of maximum barrier protection (site kept sterile, sterile overcoat, sterile glove, mask and cap), after bundle implantation, the study identified low adherence and compliance (54%) in the observed ICU[12], an outcome different from this research.

In this regard, it should be noted that in some cases the Material and Sterilization Center may fail to provide a complete kit, a situation that could justify the non-compliance and, therefore, the low adherence to the maximum protection barrier. In addition, it is understood that the greater the use of barriers by the professionals involved in care processes, the lower the rate of colonization and, consequently, infection.

Regarding the dated and signed dressing, a research performed at a hemodialysis service identified that this practice was not adopted in any of the cases observed, i.e. it obtained null adherence[22]; in contrast to such result, this study had 100% compliance.

The date registration should be performed on all CVC dressings because this practice is related to the periodicity for change, guaranteeing greater safety to the user, which, consequently, decreases the risks of infection. It is worth highlighting that the period for change may vary according to the type of dressing used. When sterile gauze

and medical tape are used, the change should be performed every 48 hours, and when transparent film is used, every seven days[14].

Regarding the overall incidence density of the PBSI, a study that evaluated the implementation of bundles to control CVC-related infections showed a reduction in the incidence of bloodstream infections from 2.4% to 0.9% in the pre- and post-intervention periods, respectively[21], corroborating with the results of this research.

Implementing prevention bundles is an effective measure in reducing bloodstream infection rates, yielding significant results for the improvement in the quality of care and patient safety. However, a multicenter study[23] conducted in the United States showed that the bundle method would be associated with lower infection rates in institutions with a monitoring policy related to the implementation of the measures regarding the use of the checklist. Therefore, implementing the application of the verification checklist to the preventive measures has an important role in reducing the incidence of PBSI rates.

In this study, the implementation of the bundle and the verification checklist for CVC insertion into the hemodialysis unit, as well as adherence to the safe practices evaluated, may have contributed to the reduction of the incidence density of the primary bloodstream infections. Therefore, this study suggests that the team responsible for catheter insertion should be monitored and the continuing education process should be strengthened, aiming to achieve the quality of care and patient safety.

Study limitations

One of the major limitations of this study is the evaluation in a strict unit, such as the one for hemodialysis. Thus, the results of this study cannot be generalized to other units of the same institution or different institutions, be they hospital or outpatient. It should also be pointed out that this study covered only the insertion process. Therefore, studies that allow the analysis of patient safety regarding other variables involved in CVC management should be conducted. Due to the limitations presented, future comparative studies that cover a greater number of units and/or institutions should be conducted since they will contribute to the deepening of the question under analysis.

Contributions to the Nursing, Health or Public Policy areas

The findings in this study can contribute to the control and decision-making process and favor these aspects, especially by part of teams for control of hospital infection in the unit studied. Using the bundle is recommended as it is an essential measure to reduce associated infections, alerting for the low adherence in this study. The role of the nurse as a collaborator is highlighted in the incentive for better care practices since he/she accompanies and monitors the use of the prevention checklist. Also, through monitoring, it provides support to the professional responsible for insertion, focusing on essential points of the procedure and contributing to the achievement of adherence and, consequently, to the reduction of infections related to this device. On the other hand, it is pointed out that, during the evaluation process of care, the registration of actions and interventions held is an important tool because, based on these data and information, one can elaborate intervention proposals for the implementation of strategies aimed at improving the care practice and, consequently, patient safety.

CONCLUSION

The results showed low adherence to using the CVC checklist; however, there was a high adherence rate to the use of the prevention bundle among the teams that attended patients on hemodialysis treatment. In addition, of the insertions accompanied with the checklist, all actions evaluated showed the expected compliance. Even with these results, every practice to ensure patient safety must be permeated by full adherence with regulations.

Among the actions with higher specific adherence, there are: verification of patient's identification and CVC indication; patient positioned correctly; hand hygiene in the preparations of insertion by the doctor and by the assistant; use of sterile glove, cap, mask; sterile technique for performance of dressing; and dated and signed dressing. On the other hand, those with lower specific adhesion were: complete material kit; use of alcoholic chlorhexidine; use of sterile overcoat; and field kept sterile. After bundle implementation, the CVC infection rate reduced. The overall incidence density for PBSI showed a considerable decrease in the last month of collection.

In view of the results, one can perceive the effectiveness of bundles as preventive measure for reducing PBSI and, consequently, for patient safety. However, there are risks when the continuous monitoring is not performed to ensure compliance with preventive actions. Thus, one can understand the need for working out strategies that allow greater engagement of health professionals involved in performing this procedure, with consequent use of bundles. On the other hand, the challenge of health organizations is raised as reflection in the sense of favoring, through their policies, changes that allow the consolidation of an organizational environment that favors the strengthening and implementation of a safety culture, focused on the process indicators and results.

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