Implementation of an intravenous therapy team based on convergent-assistance research

Implantação de time de terapia intravenosa a partir de pesquisa convergente-assistencial

Implementación de un equipo de terapia intravenosa basado en investigación convergente-asistencial

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ABSTRACT: Objective: To implement an intravenous therapy team in a large hospital. **Method:** Qualitative study carried out based on convergence group meetings, using the methodological framework of convergent-assistance research. Semi-structured interviews were carried out, data were collected through content analysis and three categories were formed, which originated the subjects for the training of professionals. **Results:** Nine nurses participated in the research and, after four training meetings, an intravenous therapy team was implemented and a guiding document was developed for carrying out the work. **Conclusion:** The study resulted in the implementation of an intravenous therapy team in a large hospital based on the research developed and the work experience of nurses who work in care practice. The methodological framework allowed nurses to be heard as promoters of action and implementers of innovation.

Keywords: Cross infection. Catheters, indwelling. Catheter-related infections. Patient safety.

RESUMO: Objetivo: Implantar um time de terapia intravenosa em um hospital de grande porte. **Método:** Estudo de abordagem qualitativa realizado a partir de encontros de grupo de convergência, utilizando o referencial metodológico da pesquisa convergente-assistencial. Foram realizadas entrevistas semiestruturadas, a apuração dos dados obtidos por meio da análise de conteúdo e a formação de três categorias, que originaram os assuntos para a capacitação dos profissionais. **Resultados:** Participaram nove enfermeiros e, após a realização de quatro encontros de capacitação, foi implantado um time de terapia intravenosa e desenvolvido documento norteador para a execução do trabalho. **Conclusão:** O estudo resultou na implantação do time de terapia intravenosa em um hospital de grande porte a partir da pesquisa desenvolvida e da experiência de trabalho dos enfermeiros que atuam na prática assistencial. O referencial metodológico possibilitou aos enfermeiros serem ouvidos enquanto promotores da ação e implementadores da inovação.

Palavras-chave: Infecção hospitalar. Cateteres de demora. Infecções relacionadas a cateteres. Segurança do paciente.

RESUMEN: Objetivo: Implementar un equipo de terapia intravenosa en un gran hospital. **Método:** Estudio cualitativo realizado a partir de reuniones de grupos de convergencia, utilizando el marco metodológico de investigación convergente-asistencial. Fueron realizadas entrevistas semiestructuradas, recogida de datos a través del análisis de contenido y la formación de tres categorías, que originaron los temas para la formación de profesionales. **Resultados:** Participaron nueve enfermeros y, después de cuatro reuniones de capacitación, se implementó un equipo de terapia intravenosa y se elaboró un documento guía para la realización del trabajo. **Conclusión:** El estudio resultó en la implementación de un equipo de terapia intravenosa en un hospital de gran porte a partir de la investigación desarrollada y la experiencia laboral de los enfermeros que actúan en la práctica asistencial. El marco metodológico permitió que los enfermeros sean escuchados como promotores de la acción e implementadores de la innovación.

Palabras clave: Infección hospitalaria. Catéteres de permanencia. Infecciones relacionadas con catéteres. Seguridad del paciente.

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INTRODUCTION

The identification and control of healthcare-associated infections (HAIs) are among the concerns of health systems and authorities. It is any infection acquired during the patient's admission to the health service, manifested after 48 hours of admission or before this period, when related to invasive procedures[1]. It may also manifest itself after discharge when associated with surgeries or invasive procedures[1].

Among HAIs, primary bloodstream infections (BSI) acquired in hospitals are responsible for prolonging hospital stays and, mainly, for increasing morbidity and mortality. It is estimated that 60% of bacteremia related to health care are associated with an intravascular device, highlighting the use of central venous catheters (CVC) and intravascular catheters (IVC) as the most frequent risk factor[2].

In 2021, 1,967 Brazilian hospitals reported the occurrence of BSI in the adult Intensive Care Unit (ICU), of which 104 hospitals are in Rio Grande do Sul. It is evident that the frequency of notifications about these infections grows every year both in Brazil and in Rio Grande do Sul[3].

The impact of this type of infection was identified in a study carried out in Brazil with 33 patients admitted to an adult ICU. Of these, 18 were diagnosed with catheter-related bloodstream infection (CRBSI). As for the clinical outcome, 20% of the patients who presented CRBSI died[4].

Among the risk factors that contribute to the development of bloodstream bacteremia associated with the use of catheters are: location of the venous access; type of infused solution; experience of the professional who performs the procedure; type and manipulation of the catheter[5]. There is also a strong correlation between the length of time the device is in place and the risk of infection, with the risk being negligible when the venous catheter remains in place for less than three days. The longer the period of stay (three to seven days), the higher the risks, increasing between 3 and 5%, and up to 5 to 10% in periods that exceed seven days, cumulatively[6].

CRBSI prevention strategies are being developed. The main measures have been included in clinical practice as a set of interventions called bundle[7]. Among these measures, hand hygiene, the use of the maximum precautionary barrier, skin asepsis with alcoholic chlorhexidine for catheter insertion and dressing change, selection of the CVC insertion site and daily evaluation of the need for catheter permanence, with immediate removal of unnecessary ones[8].

Surveillance of nosocomial infections associated with devices is an important tool in the control of nosocomial infections and ensures quality of care and patient safety. This is because CRBSI is preventable when evidence-based guidelines are followed for CVC insertion and maintenance[6]. In this sense, it is estimated that approximately 30% of HAIs are preventable, and can be prevented with control and hygiene measures, such as hand washing[9].

Since CRBSI may be harmful to patients, establishing strategies to avoid infections and complications, for instance the constitution of teams experienced in the subject, such as intravenous therapy teams, has been relevant to ensure the implementation of guidelines, bundles, and other prevention actions[8]. These initiatives are not mandatory and, therefore, several health institutions end up not adopting them. Thus, the implementation of evidence-based best practices for care with catheters ends up, sometimes, without professional reference in the services or with insufficient professionals.

Therefore, the importance of structuring and implementing a team of professionals trained to manage intravenous therapy was observed, aiming to reduce CRBSI in a large hospital in southern Brazil. Given the above, the guiding question of this study was: how to implement an intravenous therapy team in a large hospital?

OBJECTIVE

To implement an intravenous therapy team in a large hospital in southern Brazil.

METHOD

This is a qualitative research based on the methodological framework of convergent-assistance research (CAR), which aimed to provide opportunities for the convergence of research and care actions that result in improvements for health scenarios. The researcher is immersed in the reality under study and is able, together with the protagonist professionals of the analyzed scenario, to formulate responses that generate real improvements. The attributes of immersibility, simultaneity, expansibility, and dialogicity allow the elaboration of the convergence constructo[10].

This method presupposes moments when the researcher approaches the care practice, as well as moments when he moves away, providing discussion and elaboration of the

identified aspects. During this process of approximation and distancing, overlapping spaces are created, in which the changes and innovations necessary for the practice are unveiled[10]. This research followed the five steps recommended by CAR: conception, instrumentation, scrutiny, analysis, and interpretation[10]. The actions performed in each step are described next.

- Conception: the research topic is chosen based on the need for the service; justification; objective.
- Instrumentation: the field of action, participants, inclusion and exclusion criteria, and techniques for obtaining information are defined.
- Scrutiny: the service is identified and characterized, as well as data collection through a focus group.
- Analysis: proceeds with the investigation of the information collected through content analysis.
- Interpretation: based on the analyzed data, the guiding document and the training of the intravenous therapy team are developed.

The study took place between August and September 2020 in a philanthropic hospital located in Serra Gaúcha. The study hospital is highly complex, with 296 beds, and is a reference in traumatology and trauma-orthopedics for 49 municipalities in the region. It is structured with four ICUs and a Semi-intensive Unit. An average of 1,100 surgical procedures are performed per month. As for CVC insertions, approximately 600 catheters are applied per day, with an infection rate of 4.4/1,000 catheters/day.

It should be noted that the main researcher is a nurse and works in the institution's hospital infection control service. That is, it was through his work reality that the problems regarding CRBSI were observed, awakening the need to carry out the research.

The study sample consisted of nurses, a professional category selected for providing direct and continuous patient care, as well as CVC care and assessment.

The nursing management indicated the nurses who work in the care units and the invitation to participate in the study was made in person by the main researcher. Inclusion criteria were: working in one of the hospital's care units for at least six months and being available to participate in the study. The exclusion criterion was absence due to vacations or due to some type of leave during the study period.

The initial sample had 12 nurses who met the inclusion criteria. However, three professionals were excluded: one participant for dropping out of the research and two who, due to the discovery that they were pregnant, were absent from activities at the hospital, totaling nine participants.

Data were obtained through semi-structured interviews, using the technique of convergence groups, which consists of bringing together participants who bring information that contribute to the convergence process between research and care practice[10]. The nine nurses made up this group.

The investigation process until obtaining the results is shown in Figure 1.

Initially, three meetings were held with the convergence group. This step aimed to understand the perception of clinical nurses regarding care with intravenous therapy. In each meeting, two questions were asked to the participants: what problems do you identify in relation to CVC? What care is needed to keep venous therapy safe? In the second meeting: what are the behaviors and strategies to avoid the occurrence of bloodstream infections related to the use of devices? What are the nurses' main doubts regarding bloodstream infection related to the use of devices? At the third meeting: what are the criteria for CVC indication? What are the criteria for CVC removal?

The meetings took place in the hospital's auditorium, were recorded in audio and, later, the recordings were transcribed by the researchers and validated by the study participants. The statements were identified with the letter P (participant) followed by a number, for example: P1, P2, P3, and so on.

The data obtained from the meetings were interpreted and calculated according to the content analysis proposed by

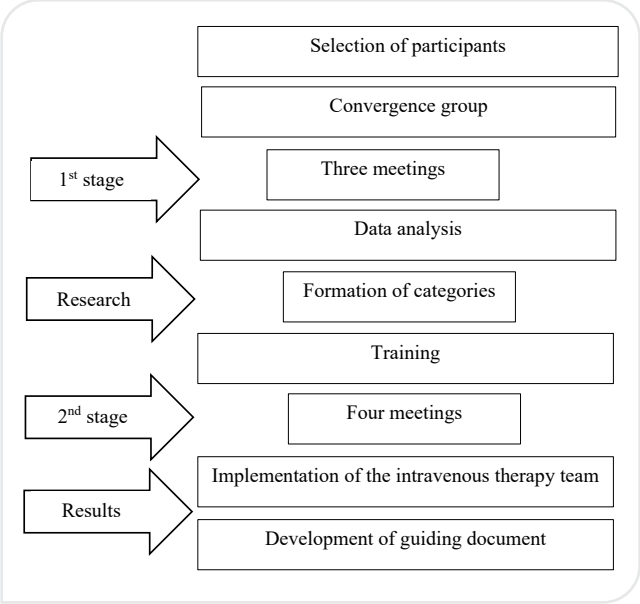

Figure 1. Stages of research development.

Laurence Bardin[11], according to the following flow: pre-analysis and skimming, aiming at familiarizing with the content and selecting what would be analyzed; exploration of the material, with data coding based on the recording units; and data classification, allowing the formation of analysis categories[11]. Three categories were formed at this stage, which are related to the concept of expandability, in which new knowledge could be incorporated into reality, expanding the initial purpose of the research.

From the formulation of the categories, the second stage of the study began, which consisted of carrying out training for the participants on the subjects identified in their speeches, providing opportunities for the strengthening of concepts and the suppression of weaknesses in knowledge about venous catheters, meeting the concept of dialogicity, that is, the relationship between research and care practice. The training meetings were dynamic, constituting spaces for discussion.

In addition, pre- and post-tests were applied on the first and last day of training. The application of the pre-test aimed to identify the knowledge of the participants before the training and the post-test sought to verify the impact of the activity on the knowledge of the participating nurses about intravenous therapy. The same questions were used in the pre- and post-test, which addressed topics such as: HAI; CVC-associated infections; BSI; characteristics of vascular catheters for patient safety; laboratory tests; risk factors for infections; safe techniques for handling the venous catheter; care to prevent complications.

Training was carried out through a presentation with slides and discussion of a clinical case and experiences brought by the participants. There were four meetings held with the group of nurses participating in the study. After these meetings, an intravenous therapy team was implemented at the hospital, composed of these nurses. A guiding document for care with intravenous therapy was also formulated.

The research followed the norms established by Resolution No. 466/2012, of the National Health Council, and was approved by the Research Ethics Committee (*Comitê de Ética em Pesquisa* – CEP) of the educational institution under Certificate of Presentation and Ethical Appreciation (*Certificado de Apresentação e Apreciação Ética* – CAAE) No. 34321320.5.0000.5344 and Opinion No. 4.158.942, as well as the hospital's CEP, under CAAE No. 3432132.5.3001.5331 and Opinion No. 4.233.175. It is noteworthy that the consolidated criteria for reporting qualitative research were observed through the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist.

All participants were informed of the objectives of the study and signed the Informed Consent, in which the ethical precepts of anonymity, right to information, and participation in the research are guaranteed.

The data from this study are part of the master's thesis of the first author, entitled Implementation of an intravenous therapy team in a large hospital in Serra Gaúcha (*Implantação de um time de terapia intravenosa em um hospital de grande porte da Serra Gaúcha*), presented to the Graduate Program in Nursing (Professional Master's Degree) of Universidade do Vale do Rio dos Sinos (Unisinos).

RESULTS

The study consisted of nine nurses, a group mostly composed of women, with a mean age of 32.8 (±4.9) years; mean academic training time of 6.2 (±4.6) years; and mean working time at the institution of 5.9 (±4) years. Regarding the sector of work, the distribution was heterogeneous, with one nurse from Hospital Infection Control (HIC), one from nephrology, one from the surgical block, one from Urgency and Emergency, two from the ICU, and three from the wards.

After interpreting and analyzing the data obtained in the first stage, three categories emerged: criteria for indication and care in maintaining the CVC; complications related to the use of the CVC device; and safety in venous therapy.

Indication criteria and care in maintaining the central venous catheter

The participants' speeches portray the importance of evaluating the criteria that justify the insertion of the CVC, as well as the characteristics that need to be evaluated for the proper maintenance of the device. It is observed that situations such as hemodynamic instability, need for administration of vasopressor drugs or prolonged use of antibiotic therapy, and difficult venous network are criteria that justify the use of CVC. The participants highlight the need for continuous reassessment of the need for the CVC to remain, and it should be removed when there is no longer any justification for keeping it.

> *"Among the criteria for CVC insertion, we find hemodynamic instability, [the] administration of vasopressor*

medications, and [the] difficult venous network. However, most of the time, the patient arrives at the sector with central access without the need […].” (P9)

“Hemodynamic instability, indication of vasopressor use, major surgeries and difficult venous network, [and] prolonged use of antibiotic therapy are criteria used by the physician. For the team, if the doctor thinks it is necessary to keep the catheter, we agree […].” (P5)

“The main thing is the prolonged use of antibiotic therapy, but when the treatment is over, the doctor does not assess the need to keep the device and it ends up staying until the HIC orders it to be removed […].” (P3)

“Observing phlogistic signs when inserting this catheter; daily assessing the need for this device, observing risks and benefits to the patient; observing the patient’s venous network, dilution and application of medications, as well as drug interactions. If everyone takes these precautions, we can avoid future complications.” (P3)

Complications related to the use of the central venous catheter device

The participants point out their experiences regarding the identification of complications, such as bloodstream infection, phlogistic signs at the catheter puncture site, and phlebitis. The actions performed by the participants as a strategy for preventing complications include: respecting the necessary time for the CVC to remain in place; maintaining the device with proper technique; washing one’s hands before handling the catheter; keeping the device protectors and changing them with each manipulation; systematically assessing signs of inflammation and infection. The statements described below exemplify the findings:

“Bloodstream infection, with the presence of Staphylococcus growth in blood culture, and hyperemia and redness at the puncture site, with the presence of secretion, make the patient remain hospitalized longer because, generally, he needs antibiotics […].” (P5)

“Hyperemia and secretion at the catheter site, prolonged use of the device without need, incorrect cleaning of the cannulas with dirty fixation and dressings, edema with the onset of phlebitis and growth of microorganisms in the bloodstream are some of the most common signs […].” (P2)

“[…] dirty dressings, equipment and extenders with the presence of blood, and unprotected cannulas are often found in patients with devices. We need to change this culture […].” (P1)

“Respect the permanence time of the device, [the] safe handling with the proper technique; maintain the protectors and change them every time the device is manipulated; watch for signs of infection or inflammation; perform the central venipuncture technique according to the protocol […].” (P7)

“Monitor the infusion of solutions, maintain care with the insertion of the device, wash your hands whenever you handle the catheter, maintain the validity of the connectors according to the institutional protocol and prepare medications and observe the osmolarity […].” (P4)

Safety in venous therapy

The reports are related to the general care performed in venous therapy in order to promote safety, that is, in order to prevent the occurrence of risks that could cause harm to patients undergoing venous therapy. Next, the statement of a participant illustrates this category.

“Maintaining care in the handling and preparation of medications, as well as in changing dressings, and changing materials as they expire keep the patient safe […].” (P1)

DISCUSSION

Indication criteria and care in maintaining the central venous catheter

It is important to understand that central venous accesses are vascular accesses used for the infusion of drugs and blood products, as well as for parenteral nutrition, hemodynamic monitoring, and hemodialysis. Although the CVC provides

safe vascular access, failure to follow safe practices for its handling, such as hand hygiene before and after manipulating the device, device asepsis before infusing solutions, keeping device protectors sealed, and replacing of these at each manipulation, may entail risks and several complications, including CRBSI[12].

Regarding the safety of drug administration in relation to the indication of the type of catheter, the CVC is more indicated than the peripheral one when the solution to be infused has a pH <5.0 or >9.0, osmolarity >500 mOsm/L or vesicant characteristic[13].

Complications related to the use of the central venous catheter device

Early detection of complications related to the catheter is important, which can be performed through periodic observation of the insertion ostium, in order to identify the presence of redness, secretion, and signs of dislodgement. The presence of hyperthermia and the appearance of phlebitis and cellulitis, as well as fracture and obstruction of the device also deserve attention[14].

It is noteworthy that local and bloodstream infections are one of the complications related to the use of CVC[2]. Bloodstream infections occur in two stages: in the first, called extraluminal colonization, the bacteria present in the patient's dermis end up grouping together and reaching the bloodstream after forming a biofilm on the external face of the device; subsequently, especially in long-term catheters, intraluminal colonization occurs. The number of manipulations, the lack of asepsis of the connectors and the infusion of contaminated solutions due to the adoption of inadequate preparation practices are the source of infection occurrence[2,8].

The risks of infection related to venous access may also be associated with a sequence of failures in the device insertion technique, infused solutions, prevention barrier methods, catheter handling, device permanence time, and types of catheters used[2,8].

There are also other types of complications related to the insertion and use of the CVC. As for insertion procedures, the following can be mentioned: pneumothorax, hemothorax; chylothorax; arterial puncture; thromboembolism; among others. The use of ultrasound in the insertion of the CVC proved to be a great ally to significantly reduce these complications[15].

It is important to emphasize that complications related to the use of catheters significantly affect the costs of health care and, mainly, the quality of life of patients, impacting morbidity and mortality[16,17].

The education of health professionals (and, in particular, nurses) regarding the management of vascular accesses, as well as the monitoring of care, are integral parts of programs for the continuous improvement of care and the prevention and control of BSI[2,18].

Safety in venous therapy

The control of risks associated with the use of assistive technologies converges with the fulfillment of the ethical commitment of professionals with the guarantee of the quality of the services provided and patient safety[19].

In relation to the above, the National Health Surveillance Agency (*Agência Nacional de Vigilância Sanitária* – Anvisa) annually publishes data obtained by its notification system, enabling the monitoring of incidents related to assistance that occurred in the national territory. The last publication portrays the period from 2014 to 2022 and reflects a scenario that still needs improvement, as failures involving venous catheters appear in third place in the number of incidents reported in the period between June 2019 and December 2022[20].

Implementing protocols and care flows that contribute to patient safety and quality of care should be a premise to be followed by all health institutions. The great labor demand, multidisciplinary work, the criticality of patients in intensive care, among others, are realities that require institutions to be organized and have care protocols, following the guidelines defined by national and international guidelines with a focus on quality of care and in patient safety. It is noteworthy that the results of this study are important because they provide opportunities and subsidize reflections on the importance of teamwork in the prevention of infections related to health care in intravenous therapy.

After completing the interpretation of the data obtained and the discussion based on the scientific literature, four training meetings were held with the nurses. In these meetings, issues arising from the categories theorized in the first stage were addressed: concept of CVC-related infection; pathophysiology of infections and risk factors; prevention of infections related to the use of invasive devices; and guidance and care regarding the insertion and maintenance of the CVC.

In order to identify the impact of training on nurses' knowledge, pre- and post-tests were applied in the first and last meeting, considering 15 objective questions about

intravenous therapy. All participants responded to both tests. Correct answers ranged from 73.3 to 100% in the pre-test; at this stage, it was observed that the knowledge of the participants was fragile when answering questions related to HAIs, the criteria for defining infection associated with CVC, and the characteristics of vascular catheters for patient safety. In the post-test, the correct answers ranged from 93.3 to 100%, showing that the training contributed to expanding the knowledge of the professionals participating in the study. It is noteworthy that the nurses answered correctly, in the pre- and post-test, all questions related to risk factors for infections, safe techniques for handling the venous catheter, and care to prevent complications.

In addition to training the professionals who participated in the study, the work also involved the elaboration and implementation of a guiding document about intravenous therapy, and the implementation of an intravenous therapy team.

Regarding the flow of access to the intravenous therapy team, it starts when the nurse identifies a problem with the device, such as obstruction, presence of phlogistic signs where the catheter is installed, phlebitis or any incidents or adverse events related to the venous catheter. The professional then opens a call to the intravenous therapy team, via the computerized system, to assess the patient's unique situation. Upon receiving the call, one of the team members goes to the unit and assesses the situation, analyzes the patient's device and the region where it is inserted, then suggesting intervention to the clinical nurse. Every intervention suggested by the member of the intravenous therapy team is recorded as an evolution in the patient's electronic medical record. This flow of action will initially only serve the inpatient and adult and pediatric intensive care units. With the consolidation of the team and the workflow, it may be expanded to other wards in the future.

When the evaluation of the member of the intravenous therapy team involves changing the CVC, the need for insertion of a new device is evaluated together with the medical team. If so decided, the unit nurse must include the patient in the surgical schedule, so that the procedure can be performed in an appropriate place, that is, in the operating room.

Regarding the intravenous therapy guiding document, it was made available on the hospital's Intranet for members of the intravenous therapy team and for all health professionals at the institution. The document contemplates the composition of the team, the objectives and guiding principles of the intravenous therapy team, the responsibilities, the means to request evaluation of the team, the information of which are the standardized venous catheters in the institution (types, calibers, and recommendations), the indications for CVC insertion, contraindications and restrictions for the indication of CVC implantation, possible complications related to the CVC, and precautions to prevent device-related bloodstream infection.

It is noteworthy that the team was recognized and validated by the hospital management. In addition, a consulting space was created by the Intravenous Therapy Committee, via a computerized system and records used in the hospital.

As a limitation of the study, the non-participation of nurses who work on the night shift is pointed out, due to their unavailability to participate in the research stages. For future studies, it is understood the importance of adding professionals from all work shifts and from other health areas who are involved in intravenous therapy, such as physicians, nutritionists, and nursing technicians, further strengthening the quality and safety of care.

CONCLUSION

The study resulted in the implementation of an intravenous therapy team in a large hospital based on the work experience of nurses who work in care practice and the research developed by the researcher. The methodological framework used allowed nurses to be heard as promoters of action and implementers of innovation.

The study provided opportunities for improvements in the context of the health institution, which intends to reduce the damage caused to patients due to CRBSI. We highlight the importance of the guiding document developed as a guide tool for care and the possibility of this study serving as a reference for the creation and implementation of intravenous therapy teams in other institutions, with an impact on the quality of care and providing better therapeutic results for patients.

It is essential that future studies be carried out to measure the impact of this intervention, as well as to identify new challenges in this area, emphasizing the relevance of convergent-assistance studies.

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None.

CONFLICT OF INTERESTS

The authors declare no conflict of interests.

AUTHORS' CONTRIBUTION

SAT: Project management, Formal analysis, Conceptualization, Data curation, Investigation, Methodology, Resources, Writing – original draft, Writing – review & editing, Supervision, Validation, Visualization. SMCL: Formal analysis, Writing – review & editing, Validation, Visualization. RSDM: Formal analysis, Writing – review & editing, Validation, Visualization. GAFJ: Formal analysis, Writing – review & editing, Validation, Visualization. RMC: Formal analysis, Writing – review & editing, Validation, Visualization. SMSP: Writing – review & editing, Visualization. PT: Project management, Formal analysis, Conceptualization, Methodology, Writing – review & editing, Supervision, Validation, Visualization

REFERENCES

1. Brasil. Ministério da Saúde. Gabinete do Ministro. Portaria nº 2616, de 12 de maio de 1998 [Internet]. Brasília: Ministério da Saúde; 1998 [accessed on Apr. 10, 2023]. Available at: https://bvsms.saude.gov.br/bvs/saudelegis/gm/1998/prt2616_12_05_1998.html

2. Brasil. Ministério da Saúde. Agência Nacional de Vigilância Sanitária. Critérios diagnósticos de infecções relacionadas à assistência à saúde [Internet]. Brasília: Ministério da Saúde; Anvisa; 2017 [accessed on Feb. 28, 2023]. Available at: https://is.gd/33MmT1

3. Brasil. Ministério da Saúde. Agência Nacional de Vigilância Sanitária. Boletim Segurança do Paciente e Qualidade em Serviços de Saúde nº 28: avaliação nacional dos indicadores de Infecções Relacionadas à Assistência à Saúde (IRAS) e Resistência Microbiana (RM) [Internet]. Brasília: Anvisa; 2021 [accessed on Feb. 28, 2023]. Available at: https://app.powerbi.com/view?r=eyJrIjoiZDIwZjYyMzUtMmYxZS00MTRjLTk0NWMtZWE2ZDUzOGRjOTVjIiwidCI6ImI2N2FmMjNmLWMzZjMtNGQzNS04MGM3LWI3MDg1ZjVlZGQ4MSJ9

4. Perin DC, Erdman AL, Higashi GDC, Dal Sasso GTM. Evidence-based measures to prevent central line-associated bloodstream infections: a systematic review. Rev Latino-Am Enfermagem. 2016;24:e2787. https://doi.org/10.1590/1518-8345.1233.2787

5. Santos AMS, Campelo SMA, Santos WN, Alencar DC, Ribeiro IAP. Central catheter insertion protocol: accession of the multidisciplinary team. Rev Enferm UFPI. 2020;9(1):e8638. https://doi.org/10.26694/2238-7234.9152-58

6. Guimarães ROS. Erros de prescrição de antimicrobianos em pacientes com infecção de corrente sanguínea e avaliação do seu impacto na mortalidade em uma UTI adulto [dissertação]. Uberlândia: Faculdade de Medicina, Universidade Federal de Uberlândia; 2016 [accessed on Feb. 28, 2023]. Available at: http://repositorio.ufu.br/handle/123456789/18052

7. Severo TO, Macedo ABT, Hansel LA, Chaves EHB, Oliveira GS, Rech NLM. Construção de um bundle para prevenção de infecção de corrente sanguínea associada ao cateter venoso central. Rev Enferm Atual In Derme. 2021;95(33):e21025. https://doi.org/10.31011/reaid-2021-v.95-n.33-art.737

8. Brasil. Ministério da Saúde. Agência Nacional de Vigilância Sanitária. Programa nacional de prevenção e controle de infecções relacionadas à assistência à saúde (PNPCIRAS) 2021 a 2025 [Internet]. Brasília: Anvisa; 2021 [accessed on Feb. 28, 2023]. Available at: https://www.gov.br/anvisa/pt-br/centraisdeconteudo/publicacoes/servicosdesaude/publicacoes/pnpciras_2021_2025.pdf

9. European Centre for Disease Prevention and Control. An agency of the European Union. Infectious disease topics [Internet]. 2016 [accessed on Apr. 10, 2023]. Available at: https://www.ecdc.europa.eu/en/all-topics

10. Trentini M, Paim L, Silva DMGV. The convergent care research method and its application in nursing practice. Texto Contexto Enferm. 2017;26(4):e1450017. http://dx.doi.org/10.1590/0104-07072017001450017

11. Bardin L. Análise de conteúdo. São Paulo: Edições 70; 2011.

12. Sousa FC, Pereira JC, Rezende DA, Laura C. Avaliação dos cuidados de enfermagem com o cateter venoso central emu ma unidade de terapia intensive adulto e pediátrica. Rev Adm Saúde. 2018;18(70):1-15. http://dx.doi.org/10.23973/ras.70.92

13. Zerati AE, Wolosker N, Luccia N, Puech-Leão P. Cateteres venosos totalmente implantáveis: histórico, técnica de implante e complicações. J Vasc Bras. 2017;16(2):128-39. https://doi.org/10.1590/1677-5449.008216

14. Borghesan NBA, Demitto MO, Fonseca LMM, Fernandes CAM, Costenaro RGS, Higarashi IH. Peripherally inserted central catheter: practics of nursing team in the neonatal intensive care. Rev Enferm UERJ. 2017;25:e28143. http://dx.doi.org/10.12957/reuerj.2017.28143

15. Bertolin DC, Ferreira VP, Ferreira DV. Cateterismo venoso central: revisão atualizada das técnicas no procedimento. Revista Corpus Hippocraticum. 2020;1(1).

16. Ansel B, Boyce M, Embree JL. Extending short peripheral catheter dwell time: a best practice discussion. J Infus Nurs. 2017;40(3):143-6. https://doi.org/10.1097/NAN.0000000000000137

17. Mendes SILA, Mendes JH, Mendes SA. Escolas de saúde e inovação tecnológica: desenho de novo dispositivo para acesso venoso. REAS. 2021;13(2):1-8. https://doi.org/10.25248/REAS.e5831.2021

18. Silva JI, Leal SMC, Bittencourt B, Viegas K. Análise das etapas do processo de cuidado ao paciente com cateter central. Cienc Cuid Saude. 2019;18(1):e42170. https://doi.org/10.4025/ciencuidsaude.v18i1.42170

19. Oliveira FA, Paes GO. Patient safety in the use of infusion pumps in intensive care: an integrative review. Saúde Coletiva (Barueri). 2020;10(52):2201-09. https://doi.org/10.36489/saudecoletiva.2020v10i52p2192-2209

20. Brasil. Ministério da Saúde. Agência Nacional de Vigilância Sanitária. Boletim Segurança do Paciente e Qualidade em Serviços de Saúde nº 29: incidentes relacionados à assistência à saúde – 2014 a 2022 [Internet]. Brasília: Anvisa; 2022[accessed on Feb. 20, 2023]. Available at: https://www.gov.br/anvisa/pt-br/centraisdeconteudo/publicacoes/servicosdesaude/boletins-e-relatorios-das-notificacoes-de-iras-e-outros-eventos-adversos-1/BR_2014__2022.pdf