



## VALIDATION OF INSTRUMENT FOR MONITORING OF CENTRAL VENOUS CATHETER DRESSING

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### ABSTRACT

**Objective:** to validate an instrument for monitoring the central venous catheter dressing. **Method:** methodological study of content validation. The trial of the professionals took place in a single round, between February and April 2022, with the expert nurses from the intensive care units of a university hospital in Rio de Janeiro as judges. The Likert Scale was used to evaluate the degree of relevance of each item and the Content Validity Index to measure agreement on items scored by expert judges in the instrument. The relevance rate of the items had as minimum acceptable compliance the index of 80%. **Results:** 15 judges participated. After the validation process, an item was deleted and another requested new writing. The tool for monitoring good practices in dressing performance presented all nine items validated. **Conclusion:** the content for monitoring the performance of the dressing was validated, considering the best evidence, the opinion of experts and the specificities of the scenario. The study contributes to the use of a tool that allows the monitoring of actions related to central venous catheter dressing and prevention of bloodstream infections.

**Keywords:** Patient safety. Central venous catheterization. Infections. Critical care. Validation study.

### INTRODUCTION

Healthcare-related infections (HCRI) constitute, globally, a serious health problem, very frequent in hospital units. Considered adverse events, HCRI affect care, increase in the length of hospitalization and increase in hospital costs. Health care, especially in intensive care units (ICU), exposes the patient to risks of acquiring HCRI due to multiple invasive procedures associated with severity<sup>(1,2)</sup>.

Among the most prevalent infections in the ICU, primary bloodstream infection (PBI) is a possible incident to occur in patients who use the central venous catheter (CVC) for a period of more than 48 hours when there is no other suspected focus. To minimize the risk of infections, the CVC must be maintained properly, and occlusive dressing on the catheter is one of the main measures in the care for infection prevention<sup>(3,4)</sup>.

The blood flow infections related to the central venous catheter (PBI) bring costs to the health system, increasing the length of hospitalization in an average of 1.5 to 26 days, and causing an increase in mortality by up to 34%. It is estimated that the cost per episode of infection may vary between USD 24,000 and USD 34,500<sup>(5)</sup>. In Brazil, mortality among patients with PBI reaches 40%, while in the United States this indicator falls to 10% to 25% in patients with higher risk<sup>(6)</sup>.

In order to prevent the infections associated with this device, in addition to good practices related to central venous puncture, nurses involved in the maintenance of CVC need to perform the dressing based on the best available evidence and managers need to organize tools to evaluate and monitor the adherence of these nurses to these measures<sup>(3,4,7,8)</sup>.

An effective means to evaluate the knowledge and adherence to good practices of nursing

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professionals in the management of CVC is the use of educational technologies, as instruments for monitoring practice that enable teams to adhere to evidence-based health care<sup>(9)</sup>. Educational technologies are tools used to expand the knowledge, skills, attitudes and self-knowledge of the professional, characteristics necessary to care for it<sup>(7)</sup>.

The instruments of practice monitoring seek to transfer the knowledge produced in research for application of evidence in a given context and circumstances of the practice, becoming a tool for the transformation of work processes in the search for the best quality of care<sup>(10)</sup>.

The model adopted in this study is evidence-based health care (EBHC), whose guideline is in the collaborative decision-making process, which helps in the translation of knowledge from the valuation of research results and expert opinion, beyond respect for the individuality of the study context and patient preference. The validation of this research instrument was based on this model of care, from the application of its elements related to the search and synthesis of the best evidences for the construction of a monitoring instrument, associated with the validation by the judgment of nurses experts in the area, focusing on the local context of the hospital in question<sup>(11)</sup>.

In this sense, the research aimed to validate an instrument for monitoring central venous catheter dressing.

## METHOD

Methodological study of validation of health instruments for application in adult intensive care units. The judgement of the expert professionals was carried out in a single round, between February and April 2022, and the study was developed according to steps indicated by the referential of choice<sup>(12)</sup>. The study scenario was a university hospital in Rio de Janeiro, which has a total of 550 active beds and 60 adult intensive care beds distributed in five ICUs: General ICU, Cardiac ICU, Cardiac Intensive Unit, Postoperative ICU and Covid ICU.

**Step 1.** Establishment of the conceptual structure and definition of the objectives of the instrument and the population involved

An integrative review of the literature was carried out in order to find scientific evidence that guides the handling of CVC in the performance of the dressing. The PICo strategy was used, being: P (population), adult patients; I (intervention), central venous access dressing; and Co (context), intensive care unit. Thus, the review's research question was: what are the best practices of venous central access dressing performed in adult patients admitted to an intensive care unit?

The searches were carried out through the portal of the Virtual Health Library (VHL), accessing the following databases of the online system: Medical Literature Analysis and Retrieval System Online (MEDLINE); Latin American and Caribbean Health Sciences Literature (LILACS) and Nursing Database (BDENF), using the terms combined with the Boolean operator "OR": "validation study", "instruments", "central venous catheterization", "infection", "nursing" and "evidence-based clinical practice", in the Portuguese and English languages, within a period of five years.

The inclusion criteria for selection of articles were related to good practices in central venous catheter handling published between 2018 and 2022, in either Portuguese or English. Dissertations and theses, expert opinions and previous notes were excluded. We found 265 articles, and after applying the exclusion criteria and reading the titles and abstracts, we arrived at a total of 13 scientific productions for complete reading, which were used in the study.

### Step 2. Construction of items and response scales

The Clinical Evidence Application Practice System (JBIPACES) platform was consulted, which is an online tool for health professionals to quickly access the best available clinical evidence with offering abstracts of evidence, JBI recommended practices<sup>(13)</sup>. In addition, the recommendations of the National Health Surveillance Agency (ANVISA)<sup>(14)</sup>, Guideline for the Prevention of Intravascular Catheter-Related Infections<sup>(4)</sup>, and the study institution's Protocol<sup>(15)</sup> were also consulted, as well as the evidences found in the literature review articles<sup>(1,2,7,16-25)</sup>.

After the construction of the items, the instrument was initially evaluated by three different nurses from the set of judges and authors

of the study. The defined criteria were: to have a degree of specialization and/or doctorate in adult intensive care, with practical experience of at least five years in critical care. For the assessment of the criteria of the instrument, there was a conversation established in the collective and consensus came to recommendations. Editorial adjustments were suggested and made in the text, which determined the ten recommendations of the instrument.

### **Step 3.** Selection and organization of items and structuring of the instrument

The initial structure of the instrument was organized in ten good practices conducted organized into three categories: nurse's conduct before the central venous catheter dressing; procedures to be performed during the central venous catheter dressing; and procedures to be performed after the central venous catheter dressing.

Ten established procedures were listed as the best practices for performing the CVC dressing, taking into account the reality of the institution and recent evidences regarding the procedure.

### **Step 4.** The content validation procedure

To validate the content of the instrument, expert nurse judges were selected by non-probabilistic sampling for convenience, contact by email and instant messaging application. To meet the inclusion criterion, the nurse should have graduated at least ten before and work in the ICU of the study hospital for at least one year, understanding that these professionals had expertise in the area and knowledge of the reality of the institution. Resident nurses were excluded, because they are in the process of learning and of their movement in different scenarios of the hospital, and nurses who were on vacation or leave, as well as professionals who did not respond to the invitation in the pre-established time.

The expert judges were 15 nurses crowded in the five ICUs of the study scenario. The approach to these professionals was by invitation, via e-mail, and the data collection was carried out between February and April 2022, through collaborative software Google Forms, composed of: inclusion criteria; Informed Consent Form (ICF) to be signed in case of agreement; and the instrument for

validation.

For the validation of the content of the instrument, the Likert scale was used to evaluate the degree of relevance of each item through the following response alternatives: 4 - very relevant; 3 - relevant; 2 - little relevant; and 1 - irrelevant.

The Content Validity Index (CVI) was used to measure the proportion or percentage of agreement on the items scored by the expert judges in the instrument, regarding the monitoring of the adherence of the nursing team to the correct handling of the CVC at the time of performing the dressing<sup>(26)</sup>.

The CVI was calculated from the sum of indicators three or four of each judge, dividing this sum by the total number of responses. The acceptable concordance rate for the validation of the item individually had as minimum acceptable compliance tolerance the index of 80%<sup>(26)</sup>. Suggestions and/or comments to improve the items were made in the spaces left specifically for this purpose.

In addition to the evaluation/judgment of items regarding their relevance in the instrument, there was also the committee's rate of agreement with the instrument as a whole, that is, whether or not the experts agreed with the instrument. This rate was obtained by calculating the percentage, determined by the sum of participants who agreed divided by the total number of participants, being interpreted taking into account that a result greater than or equal to 90% would mean the validation of the instrument, and when less than 90% the instrument would be changed according to the recommendations of the evaluators left in specific space for this.

The study is part of a broad scope project and was approved by the Research Ethics Committee, in accordance with Opinion n. 4.747.146, complying with Resolution n. 466/2012 of the National Health Council and Circular Letter n 1/2021 of the National Commission for Research Ethics, which brings the guidelines for procedures in studies with any stage in virtual environment.

## **RESULTS**

After the first and only round of expert judgment, the final instrument remained structured in the three categories initially proposed, however, with the number of adjusted conducts going from

ten to nine items. The agreement rate of the instrument committee as a whole was 93%. The instrument was organized in: category 1 - procedures before the central venous catheter dressing, composed of two ducts; category 2 - procedures during the central venous catheter dressing, which contained five ducts; and category 3 - procedures after dressing the central venous catheter, with two ducts. In total, its composition was of nine conducts understood as the best practices for carrying out the dressing of the CVC, taking into account the reality of the institution, the evidences for conducting the procedure and the evaluation of the judges.

The participants were 15 expert judges, nurses aged between 20 and 49 years, most of them six (40%), in the age group from 32 to 37 years old during data collection. Regarding the gender, female predominated, constituting 13 (86.7%) specialists. Regarding the training time of professionals, six (40%) had between 11 and 15 years, an average of 12.66 years, and average time in ICU of 9.66 years of experience. Regarding the qualification of professionals, nine (60%) were specialist nurses; three (20%) were MSc and three (20%) had no postgraduate degree.

Regarding the time spent in the ICU, five (33.3%) had between one and five years; five

(33.3%) from six to ten years; two (13.3%) from 11 to 15 years; two (13.3%) from 16 to 25 years; and one (6.7%) with time spent above 26 years. The specialties mentioned by the judges were: cardiology; intensive care; obstetrics; oncology; labor nursing; cardiology and hemodynamics; cardiovascular surgery; emergency; urgency and emergency; public health; and stomatherapy.

As presented in Table 1, after the evaluation of expert judges, one of the items of the instrument obtained CVI < 80%, that is, below the minimum established as a criterion to be validated, which determined the exclusion of conduct "performs the cleaning of the ostium (with secretion), using gauze with saline 0.9% with circular movements from the inside out, three times, using a gauze for each movement".

For better understanding of the direction of conduct, the item "use sterile gloves after removal of the cover and before manipulation of the puncture site" was changed to: "after removal of the cover with gloves procedures, uses sterile gloves for manipulation of the catheter ostium".

As there was no need for a new evaluation, the validation of the instrument content was completed leaving nine items in the validated instrument, considering that criterion four was excluded.

**Table 1** – Result of the evaluation of the items of the CVC dressing instrument. Rio de Janeiro/RJ, 2022

Instrument items	Mean CVI
1 - Performs hand hygiene before handling the catheter with soap and water for 40 to 60 seconds or with alcoholic preparation for 20 to 30 seconds	1
2 - Uses the PPE indicated for catheter handling (surgical mask, cap, goggles, cloak/apron and gloves)	0.93
3 - Uses sterile gloves after withdrawal of the coverage and before manipulation of the puncture site	0.93
4 - Clean the ostium (if secretion), using GAZE with 0.9% SF with circular movements from the inside out three times, using one gauze for each movement	0.73
5 - Applies 0.5% alcoholic chlorhexidine solution or 70% alcohol at the catheter insertion site with circular movements from the inside out three times, using one gauze for each movement	1
6 - Applies 0.5% alcoholic chlorhexidine solution or 70% alcohol towards the ostium to the tip of the catheter	1
7 - If there is drainage in the catheter ostium, it uses sterile gauze compresses and micropore tape or adhesive plaster	1
8 - If there is no drainage in the catheter ostium, uses the sterile transparent film as coverage	1
9 - Properly perform catheter roof change routine: transparent sterile cover every 7 days or immediately if the dressing is dirty, moist or loose; Coverage with sterile gauze every 24 hours, or immediately if the dressing is dirty, damp or loose	1
10 - Identifies the dressing with the name and date of the professional who exchanged the dressing	0.93

Chart 1 shows the validated instrument.

**Chart 1.** Validated instrument for monitoring the Central venous catheter dressing, Rio de Janeiro/RJ, 2022

Monitoring of Good Practices in the CVC Dressing		
Domains	Items	Criterion evaluation method
<b>Domain 1.</b> Procedures before performing the central venous catheter dressing	1 - Performs the hygiene of the hands before handling the catheter with soap and water for 40 to 60 seconds or with alcoholic preparation for 20 to 30 seconds;	"YES" is considered if hand hygiene is performed with soap and water for 40 to 60 seconds or with alcoholic preparation for 20 to 30 seconds meeting the recommended steps for hand sanitization.
	2 - Uses the PPE indicated for catheter handling;	YES is considered (cap/cap, goggles, surgical mask, cloak/apron and gloves) are used.
<b>Domain 2.</b> Procedures during the central venous catheter dressing	3 - After withdrawal of the coverage with procedures gloves, it uses sterile gloves to manipulate the catheter ostium;	"YES" is considered if the sterile gloves are used after the roof removed and before the manipulation of the puncture site.
	4 - Applies 0.5% alcoholic chlorhexidine solution or 70% alcohol at the catheter insertion site;	YES is considered if alcoholic chlorhexidine is applied to 0.5% in the insertion of the catheter with circular movements from the inside out, three times, using a gauze for each movement.
	5 - Applies 0.5% alcoholic chlorhexidine solution or 70% alcohol towards the ostium to the tip of the catheter;	"YES" is considered if alcoholic chlorhexidine is applied to 0.5% towards the ostium to the tip of the catheter.
	6 - If there is drainage in the catheter ostium, it uses as sterile gauze compresses and micropore tape or gap;	"YES" is considered sterile gauze and micropore tape (or non-sterile transparent film) are chosen in the presence of drainage in the ostium.
<b>Domain 3.</b> Procedures after central venous catheter dressing	7 - If there is no drainage in the catheter ostium, it uses as a sterile transparent film;	"YES" is considered if a sterile transparent film is chosen without gauze as coverage of the CVC, in the absence of drainage in the catheter.
	8 - Identifies the dressing with the name of the professional and date of the conduct of the dressing;	"YES" is considered if at the end of the dressing is identified with: Name of the professional who made the dressing, date of realization and date of the next exchange, without impairing the view of the Insertion of the CVC.
	9 - Perform properly perform fixation exchange routine to catheters: transparent sterile cover every 7 days or immediately if the dressing is dirty, moist or loose; Coverage with sterile gauze every 24 hours, or immediately if the dressing is dirty, damp or loose.	It is considered "YES" if the exchange of the CVC dressing is: 7 days when in the use of transparent film; 2 days for gauze and micropore roofs and whenever it is dirty, loose and/or moist.

\* PPE – Personal Protective Equipment.

## DISCUSSION

Evidence-based health care is an approach that promotes the improvement of clinical effectiveness

and the support to the health professional in its conduct, using three elements: scientific evidence, clinical experience and patient preferences.

The validation of the instrument for CVC

dressings was conducted by specialists in intensive care, which ensures the adequacy of the proposed tool, reconciling the practice of the institution with relevant scientific evidence. The follow-up of evidence-based health care guidelines offers patient safety and contributes to the quality of work, impacting on the reduction of HCRI rates<sup>(16)</sup>.

It is a consensus that hand hygiene (HH) is one of the pillars of infection prevention, being one of the most important standard precautionary strategies. This practice should be present in any multifaceted outbreak control strategy or prevention of microorganism spread<sup>(17,26,27)</sup>. Patients admitted to the ICU, who have CVC, are susceptible to blood stream infection due to frequent manipulation of the catheter. Thus, HH is indicated and can be performed with water and liquid soap for 40 to 60 seconds or with alcoholic preparation for 20 to 30 seconds, depending on whether they are visually dirty or do not meet the recommended steps for hand hygiene<sup>(17,26)</sup>.

The proposal of the World Health Organization (WHO) of "5 moments for hand hygiene" recommends that it be performed before touching the patient; before performing clean/ aseptic procedure; after risk of exposure to body fluids; after touching the patient; and after touching surfaces close to the patient. This is associated with the "Multimodal Strategy for Improving Hand Hygiene", which includes: system change; training/education/training of health professionals; evaluation and feedback; reminders in the workplace; and institutional safety climate. Both are guidelines that assist leaders in the implementation of tactics to monitor and expand the adherence of teams to HH. Despite the commitment of international organizations and investments in the area, this practice still remains a challenge for health institutions<sup>(27)</sup>.

A study shows that in CVC dressings performed by ICU nurses, all observed professionals wore gloves and performed skin antisepsis during the change of dressings. However, 5.88% did not sanitize their hands before changing the dressings and 35.29% did not do so after changing the dressings<sup>(26)</sup>.

The second and third items of the instrument deal with the use of personal protective equipment (PPE), which corresponds to one of the main measures to improve the overall safety of health care. Regarding this fact, a scope review showed

that its use, among other measures, is an important practice for infection prevention and control. PPE should be placed immediately before the procedure and removed as soon as the activity is completed<sup>(19,27)</sup>.

The use of PPE in the performance of CVC dressings is justified considering that in the exercise of nursing there is a risk of exposure of the professional to biological material. The use of respiratory protection mask, glasses, sterile and procedural gloves, apron/hood and cap are biosecurity measures routinely applied for the safety of the professional and patient in the case of CVC dressings<sup>(15,20)</sup>.

As for the antiseptic to perform this type of dressing, studies indicate 0.5% alcohol chlorhexidine as a first choice antiseptic and maximum evidence when compared with other alcoholic antiseptics. Despite this, alcohol at 70% is not contraindicated and its use in the absence of chlorhexidine confers adequate antisepsis in the procedure<sup>(6,28)</sup>. In order to ensure good practices, antisepsis with sterile gauze and 0.5% alcohol chlorhexidine as first choice, or 70% alcohol should be performed at the site of insertion of the catheter and periosteum, with circular movements from the inside out without returning with the gauze. That is, a gauze for each movement, in the entire length of the catheter<sup>(14,15,28)</sup>.

A comparative study of 0.5% alcohol chlorhexidine with other antiseptics demonstrated that it is the most effective and safe antiseptic in preventing and controlling infections, due to its residual characteristic. However, the other antiseptics, such as 70% alcohol, can be used in the absence of this substance, despite providing short-lived action due to the lack of residual effect<sup>(21,28)</sup>.

Among the nursing care in the handling of CVC is fixation. The stabilization of the catheter reduces the risk of phlebitis, migration and displacement of the device and may also be advantageous in preventing catheter-related infections. In cases of sweating, bleeding or exudate, the use of sterile gauze is the most indicated option and should be changed whenever it is wet, returning to the recommendation of transparent dressing as soon as possible<sup>(3,28)</sup>.

Studies point to the use of transparent sterile film and change it up to seven days or immediately if the dressing is without adhesion, dirty, loose, wet or damaged. However, in the absence of the first

indication material, the professional should use sterile gauze every 24 hours or change it immediately if the dressing is dirty, damp or loose<sup>(13-15)</sup>.

The priority choice of transparent sterile dressing is justified by its technology, which allows a longer exchange period and daily visualization of the catheter ostium, reducing its manipulation and the risk of infection, which does not occur with sterile dressing, whose exchange is indicated daily<sup>(22,24)</sup>.

Regarding the identification of the CVC dressing in the critical patient, it is recommended to perform it with the name of the professional and date of performance immediately after the procedure, being a record necessary to control the exchange period of fixation, according to the type of dressing used, ensuring replacement at the correct time, avoiding material waste, as well as greater patient safety and reduction of risks of infection related to the catheter<sup>(25,28)</sup>.

A limitation of this study concerns the restriction of external validity of the tool, since the participation of the judges was restricted exclusively to nurses from the chosen hospital, despite the choice of the best evidences being

researched in the world context.

## CONCLUSION

The level of evidence of validity reached in the research was based on the choice of the best available evidence in the research, associated with the judgment of the health professional and the context of the institution, taking into account what is recommended in the concept of evidence-based health care.

The research contributes to the use of a tool that allows the monitoring of actions related to central venous catheter dressing and prevention of bloodstream infections.

Thus, the study achieved the intended objective by validating the content for monitoring good practices in the performance of the dressing, proving to be valid, reliable and meeting the best evidence and specificities of the anchor scenario.

The tool validated in this research will contribute to the quality and safety of nursing care for hospitalized patients, since monitoring generates information for that allows drawing strategies and goals of service improvements based on the reality of the context.

## VALIDAÇÃO DE INSTRUMENTO PARA MONITORAMENTO DA REALIZAÇÃO DE CURATIVO DE CATETER VENOSO CENTRAL

### RESUMO

**Objetivo:** validar um instrumento para monitoramento da realização de curativo de cateter venoso central. **Método:** estudo metodológico de validação de conteúdo. O julgamento dos profissionais ocorreu em uma única rodada, entre fevereiro e abril de 2022, tendo como juízes os enfermeiros especialistas das unidades de terapia intensiva de um hospital universitário do Rio de Janeiro. Foi utilizada a Escala tipo Likert para avaliar o grau de relevância de cada item e o Índice de Validade de Conteúdo para medir a concordância sobre os itens pontuados pelos juízes especialistas no instrumento. A taxa de relevância dos itens teve como conformidade mínima aceitável o índice de 80%. **Resultados:** participaram 15 juízes. Após o processo de validação, um item foi excluído e outro solicitado nova redação. A ferramenta para monitoramento às boas práticas na realização do curativo apresentou todos os nove itens validados. **Conclusão:** o conteúdo para monitoramento da realização do curativo foi validado, considerando a fundamentação nas melhores evidências, a opinião dos especialistas e as especificidades do cenário. O estudo contribui para a utilização de uma ferramenta que permite o monitoramento das ações relacionadas ao curativo de cateter venoso central e à prevenção de infecções de corrente sanguínea.

**Palavras-chave:** Segurança do paciente. Cateterismo venoso central. Infecções. Cuidados críticos. Estudo de validação.

## VALIDACIÓN DE INSTRUMENTO PARA EL MONITOREO DE LA REALIZACIÓN DE APÓSITO DEL CATÉTER VENOSO CENTRAL

### RESUMEN

**Objetivo:** validar un instrumento para el monitoreo de la realización de apósito del catéter central. **Método:** estudio metodológico de validación de contenidos. El juicio de los profesionales ocurrió en una sola ronda, entre febrero y abril de 2022, teniendo como jueces a los enfermeros expertos de las unidades de cuidados intensivos de un hospital universitario de Rio de Janeiro/Brasil. Se utilizó la escala de tipo Likert para evaluar el grado de relevancia de cada ítem y el Índice de Validez del Contenido para medir la concordancia sobre los elementos señalados por los jueces expertos en el instrumento. La tasa de relevancia de los ítems tuvo como cumplimiento

mínimo aceptable el índice del 80%. **Resultados:** participaron 15 jueces. Después del proceso de validación, un ítem fue excluido y otro solicitado para una nueva redacción. La herramienta para el monitoreo de las buenas prácticas en la realización del apósito presentó todos los nueve ítems validados. **Conclusión:** el contenido para monitoreo de la realización del apósito fue validado, considerando el fundamento en las mejores evidencias, la opinión de los expertos y las especificidades del escenario. El estudio contribuye a la utilización de una herramienta que permite el monitoreo de las acciones relacionadas con el apósito de catéter venoso central y la prevención de infecciones del torrente sanguíneo.

**Palabras clave:** Seguridad del paciente. Cateterismo venoso central. Infecciones. Cuidados críticos. Estudio de validación.

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