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Original Article

Practice of surgical hand antisepsis in a university hospital: an observational prevalence study

Prática da antissepsia cirúrgica das mãos em um hospital universitário: estudo de prevalência observacional

Práctica de la antisepsia quirúrgica de manos en un hospital universitario: estudio observacional de prevalencia

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ABSTRACT

Background and Objectives: surgical hand antisepsis is an essential measure in surgical site infection prevention, with the aim of reducing and eliminating the microbial load on the skin of professionals participating in surgical procedures. However, studies have shown that the surgical team has neglected this practice. In this context, the research aimed to assess the practice of hand surgical antisepsis among members of the surgical team of a teaching hospital. **Methods:** an observational, descriptive, quantitative study, conducted from September 20 to October 20, 2023. The data were transcribed in a spreadsheet, tabulated and analyzed by means of absolute and relative frequency. **Results:** a total of 238 surgical antisepsis were observed in the hands. In 100% of the practices, professionals did not use adornments; rubbing of the hands up to the elbow occurred in 96.22%; keeping the hands above the elbow occurred in 80.25%; rinsing in full running water occurred in 78.57%; and rinsing in a single direction occurred in 83.19%. However, the time used to perform the technique was adequate in 12.74% of observations for the first shift surgery and, in 23.53%, for the second. The overall adequacy of the practice was 9.31% and 17.65% for the first and second antisepsis of the shift, respectively. **Conclusion:** the research revealed deficiencies mainly in the time dedicated to practice, low general adequacy in the practice of surgical antisepsis of the hands, the hospital role as an educational institution in multiprofessional training in health.

Keywords: *Antisepsis. Hand Hygiene. Surgical Wound Infection. Infection Control.*

RESUMO

Justificativa e Objetivos: a antissepsia cirúrgica das mãos é medida essencial na prevenção de infecção de sítio cirúrgico, tendo como finalidade a redução e eliminação da carga microbiana na pele dos profissionais que participam de procedimentos cirúrgicos. Contudo, estudos têm evidenciado que a equipe cirúrgica tem negligenciado esta prática. Neste contexto, o objetivo da pesquisa foi avaliar a prática da antissepsia cirúrgica das mãos entre os membros da equipe cirúrgica de um hospital de ensino. **Métodos:** estudo observacional, descritivo, de abordagem quantitativa, realizado no período de 20 de setembro a 20 de outubro de 2023. Os dados foram transcritos em planilha, tabulados e analisados por meio de frequência absoluta e relativa. **Resultados:** foram observadas 238 antissepsias cirúrgicas das mãos. Em 100% das práticas, os profissionais não utilizaram adornos; a fricção das mãos até o cotovelo ocorreu em 96,22%; a manutenção das mãos acima do cotovelo ocorreu em 80,25%; o enxague em água corrente total ocorreu em 78,57%; e o enxágue em uma única direção ocorreu em 83,19%. Contudo, o tempo utilizado na realização da técnica foi adequado em 12,74% das observações para a primeira cirurgia do turno e, em 23,53%, para a segunda. A adequação geral da prática foi de 9,31% e 17,65% para a primeira e segunda antissepsia do turno, respectivamente. **Conclusão**: a pesquisa revelou deficiências, principalmente no tempo dedicado à realização da prática, adequação geral baixa na prática de antissepsia cirúrgica das mãos, resultado preocupante considerando o papel do hospital como instituição de ensino na formação multiprofissional na área da saúde.

Descritores: *Antissepsia. Higiene das Mãos. Infecção da Ferida Cirúrgica. Controle de Infecção.*

RESUMEN

Justificación y Objetivos: la antisepsia quirúrgica de la mano es una medida esencial en la prevención de la infección del sitio quirúrgico, con el objetivo de reducir y eliminar la carga microbiana en la piel de los profesionales que participan en los procedimientos quirúrgicos. Sin embargo, los estudios han demostrado que el equipo quirúrgico ha descuidado esta práctica. En este contexto, el objetivo de la investigación fue evaluar la práctica de la antisepsia quirúrgica de la mano entre miembros del equipo quirúrgico de un hospital docente. **Métodos:** estudio observacional, descriptivo, cuantitativo, realizado en el período del 20 de septiembre al 20 de octubre de 2023. Los datos fueron transcritos en hoja de cálculo, tabulados y analizados por medio de frecuencia absoluta y relativa. **Resultados:** se observaron 238 antisepsias quirúrgicas en las manos. En el 100% de las consultas los profesionales no utilizaron adornos; la fricción de las manos al codo ocurrió en el 96,22%; mantener las manos por encima del codo ocurrió en el 80,25%; el enjuague total con agua corriente ocurrió en el 78,57%; y el enjuague en una sola dirección ocurrió en el 83,19%. Sin embargo, el tiempo empleado para realizar la técnica fue adecuado en el 12,74% de las observaciones para la primera cirugía del turno y, en el 23,53%, para la segunda. La adecuación general de la práctica fue de 9,31% y 17,65% para la primera y segunda antisepsia del turno, respectivamente. **Conclusiones:** la investigación reveló deficiencias, principalmente en el tiempo dedicado a la práctica, baja adecuación general en la práctica de la antisepsia quirúrgica de las manos, el papel del hospital como institución de enseñanza en formación multiprofesional en el área de la salud.

Palabras Clave: *Antisepsia. Higiene de las Manos. Infección de la Herida Quirúrgica. Control de Infecciones.*

INTRODUCTION

Healthcare-associated infections (HAIs) are considered a serious public health problem worldwide and are among the most frequent adverse events occurring in health services.[1]

In Brazil, surgical site infection (SSI) is one of the main HAIs, ranking third among infections present in hospital services. It represents one of the most common complications in patients undergoing surgical procedures, occurring in the postoperative period in approximately 3% to 20% of surgeries performed.[2]

Although there have been advances in practices to control these infections, including improvements in surgical room ventilation, modernization of sterilization methods, improvement of surgical techniques and the availability of antibiotic prophylaxis, SSIs continue to significantly impact patients' health, contributing substantially to their morbidity and mortality, in addition to prolonging hospitalization and increasing the costs of additional treatments and interventions.[3]

The development of SSI depends on several factors, such as those related to the patients' immune system, the presence of a foreign body, the degree of contamination of the surgery, the indiscriminate use of antibiotic prophylaxis and the presence of bacteria inoculated at the site during the surgical procedure.[4]

One of the main ways in which microorganisms are transmitted to patients is through the hands of healthcare professionals during the care provided, as these become a reservoir for various pathogens that can be transmitted to patients.[5]

Hand hygiene (HH) is considered one of the pillars of infection prevention and control, and is one of the most important standard precaution strategies available in health care settings. It is widely recognized as the most effective, easy-to-implement, and cost-effective measure for preventing HAIs and reducing the spread of pathogens in health care settings.[5-6]

Aiming to promote adherence to HH practices, the World Health Organization (WHO) instituted, in 2009, the multimodal strategy, composed of five complementary and interdependent components, namely: system change; professional education and training; assessment and feedback; workplace reminders; and a favorable institutional safety climate. It was suggested with the purpose of increasing immediate compliance and cultivating a long-term cultural change, promoting safer health environments.[7]

HH techniques are categorized according to their intended purpose, including simple sanitation, antiseptic sanitation, antiseptic rubbing, and surgical antisepsis or preoperative preparation. The effectiveness of HH is intrinsically linked to the duration and technique employed during the procedure, highlighting the importance of rigorous practices to ensure maximum protection against the spread of pathogens.[6]

When it comes to preventing SSI, despite the causes being multifactorial, adequate surgical hand antisepsis is a fundamental stage, being one of the preoperative control measures listed by the Brazilian National Health Regulatory Agency (In Portuguese, *Agência Nacional de Vigilância Sanitária* - ANVISA) and strongly suggested by other organizations and societies, such as the WHO, Ministry of Health and Centers for Disease Control and Prevention.[1-3]

Surgical hand antisepsis aims to eliminate transient microbiota, reduce resident microbiota on the hands and forearms, and provide a residual effect on the skin of professionals participating in surgical procedures.[2]

Upon entering the Nursing Residency Program, Specialty in Health Surveillance and Infection Control, working and developing practices in various sectors of the study hospital, during the stay in the Hospital Infection Control Service (HICS), there has been growing concern regarding the practice of HH, including surgical antisepsis, given that this practice plays a crucial role in preventing HAIs, contributing significantly to patient safety and surgical procedures.

Although it is a very important procedure, studies have shown that the surgical team often does not perform it properly, whether in terms of the time spent or the technique used during the procedure.[8-9] Additionally, at the study institution, SSIs accounted for 19% of infections in 2022.

Therefore, given the relevance of this procedure in preventing SSI, the guiding question of this research is: how is surgical hand antisepsis performed by professionals working in a surgical environment? In this context, the study had the general objective of assessing the practice of surgical hand antisepsis among members of the surgical team of a teaching hospital. The specific objectives are to assess compliance in the stages of surgical hand antisepsis and to analyze compliance of the time in performing surgical hand antisepsis in the first and second/other surgical procedures.

METHODS

This is an observational, cross-sectional, descriptive study with a quantitative approach, carried out from September 20 to October 20, 2023, at the institution's Operating Room (OR). The study was carried out in a teaching hospital, located in the state of Paraná, which has 330 beds, according to the Brazilian National Registry of Health Establishments. It is currently a reference for emergency care, traumatology, orthopedics, neurosurgery, obstetrics, high-risk neonatology and rehabilitation of craniofacial anomalies, playing a fundamental role in providing

specialized health services to the community in 25 municipalities.

The institution's OR consists of six surgical rooms designed to perform procedures of various sizes and specialties. In order to ensure maximum safety and asepsis, the lavatories have an automated activation system (pedal and sensor), providing a contactless approach and reducing possible sources of contamination. Additionally, the institution has disposable brushes impregnated with antiseptic degerming for performing surgical hand antisepsis.

The study population consisted of surgeons, residents, medical students and surgical technicians who participated directly in the surgical procedure by convenience sampling. It is worth noting that professionals may have been observed on more than one occasion, due to their participation in several surgical procedures performed during the data collection period.

Observations were carried out "*in loco*", with the presence of the observer – a resident whose field of activity included the sector where the practices were monitored. This role, related to hospital infection control, allowed the observer to be regularly present in the environment, which facilitated the study without professionals realizing that they were being observed, specifically for the research. In this way, the observer's familiarity with the sector and their active role within the team created a natural context for data collection, ensuring that the observed practices reflected professionals' everyday and spontaneous actions, minimizing possible changes in behavior related to the awareness of being monitored.

For the first surgical antisepsis of the shift, a time of three to five minutes was considered adequate. For subsequent surgical antisepsis in the shift, a time of two to three minutes was considered adequate, as established by the institution's Standard Operating Protocol (SOP). It is worth noting that, according to ANVISA, for the second surgical antisepsis, a time of two to three minutes is considered adequate, as long as it is performed within one hour of the first antisepsis.[2]

The instrument for data collection and observations were based on the instructions of the Multimodal Strategy, contained in the WHO Manual for Observers, considering that, to date, there is no form with specific guidelines for evaluating surgical hand antisepsis.

According to the manual, the most accurate way to study HH practice is through direct observation of health professionals during their work routine, as it allows us to identify behaviors, assess lessons learned and remaining failures as well as help determine the most appropriate interventions for the promotion, instruction and training of this practice.[10]

The data collection instrument was designed considering the following variables: date; professional category; shift surgery; use of ornaments (ring, bracelet, watch); use of a brush impregnated with antiseptic; degerming agent used (Chlorhexidine 2% or Polyvinylpyrrolidone-iodine (PVP-I). To assess the general adequacy of the surgical hand antisepsis practice, the following were considered: not using adornments, rubbing the hand antisepsis agent up to the elbow, keeping the hands above the elbow, rinsing in running water, rinsing in a single direction and technique duration within the recommended time.

The collected data were transcribed into a Microsoft Office Excel® spreadsheet, tabulated and analyzed using absolute (n) and relative (%) frequencies. The results were organized and presented in the form of tables. This study is part of a larger project, submitted and approved by the Research Ethics Committee on September 6, 2023, under Opinion 6,287,135 and Certificate of Presentation for Ethical Consideration 72943723.5.0000.0107, respecting the ethical principles for research involving human beings recommended by Resolution 466/2012 of the Brazilian National Health Council.

RESULTS

There were 238 opportunities observed for the practice of surgical hand antisepsis performed by the team during the study period, 51 (21.43%) by surgeons, 125 (52.52%) by medical residents, 33 (13.87%) by medical students, and 29 (12.18%) by surgical instrument technicians.

Table 1. Characteristics involving the practice of surgical hand antisepsis according to the observed variable. Cascavel, Paraná, Brazil, September to October 2023.

Variables observed	N (%)
Use of ornaments (ring, bracelet, watch)	
Yes	0
No	238 (100)
Use of sponge impregnated with antiseptic	
Yes	238 (100)
No	0
Degerming agent used	
Chlorhexidine 2%	224 (94,12)
PVP-I	14 (5.88)
Rubbing the hand degerming agent up to the elbow	
Yes	229 (96.22)
No	9 (3.78)
Keeping hands above the elbow	
Yes	191 (80.25)
No	47 (19.75)
Rinse thoroughly in running water	
Yes	187 (78.57)
No	51 (21.43)
Rinse in one direction, towards the nails, hands to elbows	
Yes	198 (83.19)
No	40 (16.81)

Legend: Polyvinylpyrrolidone-iodine (PVP-I).

According to the data in Table 1, it was found that, during the practice of surgical hand antisepsis, none of

the professionals analyzed were using adornments. Rubbing of the hands up to the elbow was performed in 96.22% of antisepsis procedures, while keeping the hands above the elbow was observed in 80.25%. Rinsing in running water occurred in 78.57%, and rinsing in a single direction was adopted in 83.19% of the practices performed.

However, the surgical hand antisepsis time was timed and considered adequate in 12.74% of observations made for surgical antisepsis of the first surgical procedure and in 23.53% for the second surgical antisepsis of the shift (Table 2).

Table 2. Time spent on surgical hand antisepsis by professionals according to shift surgery. Cascavel, Paraná, Brazil, September to October 2023.

Surgical hand antisepsis time	1st shift surgery N (%)	2nd shift surgery N (%)
< 30 seconds	0	2 (5.88)
30 to 59 seconds	29 (14.22)	7 (20.59)
1:00 to 1:29 minutes	54 (26.47)	8 (23.53)
1:30 to 1:59 minutes	48 (23.53)	9 (26.47)
2:00 to 2:29 minutes	31 (15.20)	5 (14.71)
2:30 to 2:59 minutes	16 (7.84)	3 (8.82)
3:00 to 3:59 minutes	20 (9.80)	0
> 4 minutes	6 (2.94)	0
Total	204 (100)	34 (100)

In the first shift surgical antisepsis, the minimum time recorded was 31 seconds, with a maximum time of 06:08 minutes and an average of 02:53 minutes. In the second shift surgical antisepsis, the minimum time recorded was 28 seconds, with a maximum time of 02:55 minutes and an average of 01:31 minutes.

When analyzing all stages of surgical hand antisepsis, the results showed compliance of only 9.31% in the first antisepsis of the shift and 17.65% in the second, which highlights the lack of adherence to the institutionalized SOP and/or lack of updates of this practice that permeates the surgical teams' actions (Table 3).

Table 3. Compliance at all stages assessed according to shift surgery. Cascavel, Paraná, Brazil, September to October 2023.

Compliance at all stages assessed	1st shift surgery N (%)	2nd shift surgery N (%)
Yes	19 (9.31)	6 (17.65)
No	185 (90.69)	28 (82.35)
Total	204 (100)	34 (100)

DISCUSSION

The presence of microorganisms on the hands of the surgical team represents a potential risk of infection if these microorganisms penetrate the surgical site. Therefore, surgical hand antisepsis is routinely performed before invasive procedures, aiming to reduce the microbial load present, minimizing the risk of releasing bacteria into the operating field, even when barrier mechanisms are violated, such as tears or perforations in the gloves, and, consequently, reducing the risk of SSI.[11-12]

A recent study investigated the presence of microorganisms on the hands of surgeons, revealing a high incidence at two important moments: before surgical hand antisepsis (100%) and after this procedure (27.5%). This finding highlights the potential for transmission of microorganisms that can cause infections in hospitalized patients in different care settings. Transmission frequently occurs through the hands of health professionals, especially when hygiene is not performed at the recommended times and in an adequate manner.[12]

The surgical hand antisepsis procedure using a sterile sponge impregnated with antiseptic antigerm is based on wetting the hands, forearms and elbows, pressing the soft spongy part against the skin, spreading the antiseptic all over, cleaning the nails with the bristles of the brush and rubbing the hands (palm, back, interdigital spaces, sides), arm and forearm up to the elbow for at least three to five minutes. It is important to always keep the hands above the elbows to avoid recontamination of the hands through water/soap on the forearms and elbows.[2]

The technique is repeated on the opposite limb, followed by rinsing under running water, in the direction of the nails, hands and elbows, ensuring that all product residue is removed.[2]

As important as the technique itself are some recommendations related to the removal of adornments from the hands and arms (such as rings, bracelets, watches), the prohibition of artificial nails, keeping nails short and clean, and taking precautions against using brushes directly on the skin.[2]

The removal of adornments is recommended, especially in activities that require sterile technique, considering that their use can alter the microbiota of professionals' hands and make it difficult to effectively remove microorganisms that may remain under the adornments or in their irregularities, when present.[11,13-14]

In the case of long nails, in addition to presenting a greater microbial load in the subungual spaces, there is an increased probability of tearing gloves, in the same way that can occur with the use of rings, compromising the effectiveness of the protective barrier.[13-14] Therefore, it is recommended that nails do not exceed two millimeters in length.[13]

In this study, the results showed strict compliance by the surgical team due to the total absence of adornments in all observations, data that support the findings of another study, which identified complete adherence by the surgical team to the absence of adornments during surgical hand antisepsis, which emphasizes the team's commitment to preventing potential associated risks.[8]

All participants used disposable sponges for hand antisepsis, most of which were impregnated with 2%

Chlorhexidine, according to the institutional SOP. In addition to this antiseptic agent, the hospital where the study was conducted also provided a sponge impregnated with PVP-I, which would be an alternative in the absence of chlorhexidine. These products are indicated for hand antisepsis when there is a need to reduce microbial flora, as is the case in surgeries.[13]

The use of brushes directly on the skin is not recommended, due to the risk of causing damage to the skin layers and exposing bacteria present in deeper regions of the skin. However, if use is unavoidable, it is recommended that such brushes be sterile and for single use and used only to remove dirt from the nails.[2,13]

The recommendation to follow the unidirectional direction during rinsing is an important stage, as failure to do so may lead to the return of microorganisms to the hands, which are the most frequent contact areas in the surgical field. Moreover, inadequate rinsing may leave traces of the antiseptic agent, increasing the risk of adverse skin reactions and skin sensitization.

ANVISA recommends the use of alcohol-based products (ABP) together with antiseptic degerming agents for surgical hand antisepsis.[2] However, at the time of this study, this method has not yet been standardized. A study that evaluated the effectiveness of PBA in microbial reduction during surgical hand antisepsis showed a reduction in bacterial count in most cases, when analyzing the technique in less than and more than 90 seconds, and in techniques performed in more than 180 seconds, all samples showed a reduction in bacterial count.[15]

In another national study that investigated the acceptability of surgical professionals regarding the use of alcoholic solution for surgical hand antisepsis compared to antiseptic degerming agents (PVP-I and Chlorhexidine 2%), more than 70% of participants expressed a preference for the alcoholic solution, attributed to its pleasant texture, color and odor, as well as its less drying effect on the skin. Furthermore, professionals highlighted the more pleasant application of alcoholic solution, resulting in greater overall satisfaction with the product, and it is an alternative to consider in the practice of surgical hand antisepsis.[16]

The issue of time dedicated to surgical hand antisepsis is an important point that deserves further analysis. This finding, revealed by the observation that less than 13% of professionals completed the procedure, in the first shift surgery, within the time recommended by the institutional SOP, reveals a significant gap in compliance with recommended practices. It is important to highlight that the sector does not have well-positioned clocks near the hand antisepsis areas, visible to professionals' 'eyes', only on nearby walls (at a high level). This lack of timers or clocks can contribute to the difficulty in adequately monitoring the time dedicated to the procedure, further compromising compliance with established guidelines.

The time required for surgical hand antisepsis may be directly related to the effectiveness in reducing microorganisms present on the hands of healthcare professionals. Thus, the variation in the times observed not only reflects the effectiveness of the process, but also has implications for patient safety.

In recent research, multivariate statistical analysis revealed that brushing for two minutes increases the risk of contamination by 12 times when compared to longer durations.[11] Furthermore, even after surgical hand antisepsis, different species of microorganisms were identified on surgeons' hands, such as *Staphylococcus warneri*, *Staphylococcus capitis*, *Staphylococcus hominis*, *Staphylococcus hemolyticus*, *Micrococcus luteus* and *Stenotrophomonas maltophilia*, showing that surgeons' hands represent a considerable source of potentially infectious microorganisms.[12]

Other similar studies, focusing on unsatisfactory adherence by the surgical team in relation to the time and technique of surgical hand antisepsis, corroborate the findings of this study. In a previous study, only 16% of surgeons adequately followed the recommended technique and time for surgical hand antisepsis.[8] Another study observed complete adherence to the entire technique in only 18% of observations.[9]

Among the barriers that impede adherence to surgical antisepsis, the above study identified the lack of familiarity with the appropriate technique, the absence of managerial supervision, monitoring and the lack of direct practical training.[9] These results emphasize the need to address these issues to improve surgical antisepsis practice and, consequently, reduce the risks associated with the transmission of microorganisms.

Unlike the results found in previous studies, a study conducted at a university hospital in Madrid revealed remarkable compliance with surgical hand antisepsis practices during the period analyzed. The overall adequacy of the practice was 80.5%. The authors highlighted the timer as a facilitating element for adherence to the WHO protocol, since 25.8% of professionals assessed used this resource. It is noteworthy that this group showed 96.8% adherence to the recommended time for surgical hand antisepsis.[17]

In another study, researchers sought to achieve 100% adherence to surgical hand antisepsis. Interventions such as video demonstration, personal instruction by a consultant, and individual coaching were implemented to improve adherence. The 100% goal was achieved after six trials. Personal instruction emerged as the most effective intervention, and handwashing technique was the criterion that required the most attempts to correct.[18]

It is worth reflecting that achieving 100% adherence is not only a challenge, but also a journey that requires a holistic, adaptive and people-centered approach. In this

context, the lack of a compliance indicator becomes not only a gap in measuring the effectiveness of the process, but also highlights the urgent need to establish a reliable instrument to monitor and evaluate compliance with the practice of surgical hand antisepsis.

The results of this research highlighted that rubbing the hands up to the elbow, keeping the hands above the elbow, and rinsing in running water in a total and unidirectional manner were, in most cases, performed adequately. However, deficiencies persist in the execution of this procedure, especially with regard to the time dedicated to its completion.

These data reflect a worrying reality, especially considering that the hospital in question plays a crucial role in health professional training as an educational institution as well as a reference hospital in the region for various specialties and complexities. Every professional who enters the institution goes through a period of 'welcoming' at the institution, during which various sectors present their practices and protocols. The HICS addresses several topics related to HH, however surgical hand antisepsis is not specifically addressed in this training. This gap highlights the need for more focused training on surgical antisepsis that could be implemented during the induction period.

Another point to be mentioned is that no easily accessible and visible manuals or posters were identified in the workplaces, especially in the lavatories, regarding surgical hand antisepsis procedures. The absence of informative visual materials in these spaces may compromise correct adherence to protocols and reduce professionals' awareness of recommended practices. Implementing posters in strategic areas would be a simple but effective measure to reinforce institutional guidelines and promote compliance with antisepsis procedures.

Therefore, the implementation of continuous training, monitoring the performance of the technique and maintaining updated protocols in accordance with national guidelines and easily accessible emerge as essential measures to leverage the improvement of the processes carried out, ensuring that professionals are always up to date and prepared to follow the recommended protocols.

It is essential to undertake efforts to identify and implement teaching and ongoing supervision approaches that ensure not only the adoption but also the maintenance of high standards of surgical hand antisepsis by professionals.

Such actions aim not only to ensure patient safety, reducing the risks of HAIs, but also to contribute to training professionals who are more aware and adherent to good practices, essential in all patient care environments, consolidating ethical and moral commitment and co-responsibility in the context of evidence-based practices focused on human beings.

There is a possibility of the Hawthorne effect as a limitation of this study, in which health professionals may modify their behavior when they know they are being observed. This may distort actual surgical hand antisepsis practices, potentially influencing the outcome of the study.[19] Furthermore, it is relevant to mention the scarcity of studies on the subject, highlighting the need for additional research to strengthen the knowledge base in this field of study.

Adopting monitoring of this practice can provide insights into the consistency of practice over time and identify necessary interventions. This approach is essential to improve internal policies, training and protocols, resulting in tangible benefits for patient safety and the adequacy of practices carried out, aiming at HAI prevention and control.

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Beatriz Talluly Bespalhok contributed to bibliographic research, abstract writing, introduction, methodology, discussion, interpretation and description of results, preparation of tables, conclusions, review and statistics. **Débora Cristina Ignácio Alves** contributed to bibliographic research, abstract writing, introduction, methodology, discussion, interpretation and description of results, preparation of tables, conclusions, review and statistics. **Fabiana Gonçalves de Oliveira Azevedo Matos** contributed to abstract review and writing, introduction, methodology, discussion, results and conclusions. **Lara Adrianne Garcia Paiano da Silva** contributed to abstract review and writing, introduction, methodology, discussion, results and conclusions.

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