

Assessment of the infrastructure of a COVID-19 unit and health professionals' perception about safety attitudes

Avaliação da infraestrutura de uma unidade COVID-19 e a percepção de profissionais de saúde sobre as atitudes de segurança

Evaluación de la infraestructura de una unidad COVID-19 y la percepción de los profesionales de la salud sobre las actitudes de seguridad

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ABSTRACT

Background and objectives: does the COVID-19 Intensive Care Unit have a favorable structure to sanitize the hands of health professionals? What is the perception of health professionals about the organizational safety of that sector? It aims to assess the structure for hand hygiene in an Intensive Care Unit for patients with COVID-19 and the perception of safety attitude by health professionals. **Methods:** an analytical, cross-sectional study with 62 health professionals from a university hospital in the state of Mato Grosso, Brazil. The unit structure commands for hand alignment and safety attitudes were used. **Results:** flaws were found in the infrastructure that can hinder and prevent hand hygiene by professionals at the point of care. The safety attitude was impaired in all domains. No difference was found between the median scores regarding professional categories. **Conclusion:** investment is urgently needed in improving infrastructure with alcoholic preparation supply at the point of assistance. The study demonstrates the negative impact of the perception of low management involvement in patient safety actions and poor infrastructure for hand hygiene.

Keywords: Hand Hygiene. Patient Safety. Organizational Culture. COVID-19.

RESUMO

Justificativa e objetivos: a Unidade de Terapia Intensiva COVID-19 possui estrutura favorável para a higienização das mãos dos profissionais de saúde? Qual a percepção dos profissionais de saúde acerca da segurança organizacional do referido setor? Tem como objetivo avaliar a estrutura para higiene das mãos de uma Unidade de Terapia

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Intensiva destinada a pacientes com COVID-19 e a percepção da atitude de segurança pelos profissionais de saúde. **Métodos:** estudo analítico, transversal, com 62 profissionais de saúde de um hospital universitário do estado de Mato Grosso, Brasil. Foram utilizados os questionários de estrutura da unidade para higienização das mãos e o de atitudes de segurança. **Resultados:** constataram-se falhas na infraestrutura que podem dificultar e impedir a realização da higiene das mãos pelos profissionais no ponto de assistência. A atitude de segurança esteve prejudicada em todos os domínios. Não foi encontrada diferença entre as medianas dos escores com relação às categorias profissionais. **Conclusão:** se faz urgente o investimento na melhoria da infraestrutura com fornecimento de preparações alcoólicas no ponto de assistência. O estudo demonstra o impacto negativo da percepção do baixo envolvimento da gestão nas ações de segurança do paciente e infraestrutura precária para higiene das mãos.

Descritores: Higiene das Mãos. Segurança do Paciente. Cultura Organizacional. COVID-19.

RESUMEN

Justificación y objetivos: ¿La Unidad de Cuidados Intensivos COVID-19 cuenta con una estructura favorable para la higiene de manos de los profesionales de la salud? ¿Cuál es la percepción de los profesionales de la salud sobre la seguridad organizacional en ese sector? Tiene como objetivo evaluar la estructura para la higiene de manos en una Unidad de Cuidados Intensivos destinada a pacientes con COVID-19 y la percepción de actitudes de seguridad por parte de los profesionales de la salud. **Métodos:** estudio transversal analítico con 62 profesionales de la salud de un hospital universitario en el estado de Mato Grosso, Brasil. Se utilizaron los comandos de la estructura de la unidad para la alineación de las manos y las actitudes de seguridad. **Resultados:** se encontraron fallas en la infraestructura que pueden dificultar e impedir la realización de la higiene de manos por parte de los profesionales en el punto de atención. La actitud de seguridad se vio afectada en todos los dominios. No se encontró diferencia entre las medianas de las puntuaciones con respecto a las categorías profesionales. **Conclusión:** urge invertir en mejorar la infraestructura con el suministro de preparados alcohólicos en el punto de atención. El estudio demuestra el impacto negativo de la percepción de una baja implicación de la dirección en las acciones de seguridad del paciente y una infraestructura deficiente para la higiene de manos.

Palabras clave: Higiene de las Manos. Seguridad del Paciente. Cultura Organizacional. COVID-19.

INTRODUCTION

Healthcare-associated infections (HAIs) constitute a serious public health problem, as they are adverse events associated with healthcare that occur with great frequency, demonstrating high morbidity and mortality. In turn, they have a direct impact on patient safety and health service quality, reflecting economic and social aspects for the population, health systems and the economy of countries.¹

Studies have shown that the highest prevalence of HAIs occurs in Intensive Care Units (ICUs), due to the high number of invasive procedures required by patients with greater complexity, greater severity and greater demand for intensive care.² In this environment, patients are more exposed to the risk of infection, given their clinical condition.²

HAI occurrence is linked to the health care provided, which may be a consequence of the failure of care systems and processes as well as human behavior. Simultaneously with these factors, one can take into account the inadequate infrastructure of health institutions, the lack of professionals and the lack of knowledge or inability to use preventive and control measures for HAIs.³

On January 30, 2020, the World Health Organization (WHO) declared that the outbreak of the new coronavirus constitutes a public health emergency of international concern and, on March 11, 2020, Coronavirus Disease 2019 (COVID-19) was characterized by the WHO as a pandemic.⁴

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), an agent initially known as the new coronavirus, which causes the disease COVID-19, is potentially fatal and represents the main global public health problem of the last 100 years, similar only to the Spanish flu that killed around 25 million people between 1918 and 1920.⁵

Due to the increasing increase in mortality rates related to the aforementioned pandemic, many countries began to introduce measures to prevent the spread of the virus, with hand hygiene (HH) being essential. This is a simple, inexpensive and highly effective measure.⁶ According to recommendations, health institutions must guarantee the availability of inputs and the necessary structure for HH, and they must be accessible to all professionals in all areas of patient care, with alcoholic preparations being considered preferable resources.⁷

Since 2009, the WHO has recommended the multimodal strategy (MS) and, each year, in the global HH campaign, it reinforces this practice⁸. It is composed of five intervention components, complementary and interdependent, which have been proven to help improve adherence to HH, such as system changes, training and education, performance observation and feedback, workplace reminders, and supportive institutional safety climate and patient engagement.⁸

With regard to the perception of institutional safety climate and adherence to HH, a recent study found a positive correlation between the two variables, since

the greater perception of organizational safety climate by professionals was related to their greater adherence to HH.⁹ Experimental studies have demonstrated that the participation of managers in MS is essential to establish a favorable safety climate in the institution in order to achieve satisfactory levels of adherence to safety protocols.^{10,11} Therefore, it is necessary to execute all components of the aforementioned strategy in order to favor the increase and sustainability of HH adherence rates over time.

Considering the above, the following guiding questions were formulated: does the COVID-19 ICU have a favorable structure for HH for health professionals? What is health professionals' perception regarding organizational safety in that sector? Therefore, this study aimed to assess unit structure for HH of an ICU intended for patients with COVID-19 and safety attitude perception by health professionals.

METHODS

This is an analytical and cross-sectional study. To compose the study sample, all health professionals who worked in an ICU designed to care for patients with COVID-19 at a university hospital located in the state of Mato Grosso were chosen. The hospital is medium-sized and offers diagnostic and therapeutic care on an outpatient basis and medical and surgical hospitalization as well as an adult, pediatric and neonatal ICU, and is a reference for patient care in all municipalities in the state.

The unit consisted of eight beds, including one for isolation, represented by 65 health professionals distributed among 29 nursing technicians, 13 nurses, 12 physicians and eight physical therapists. Professionals who performed direct patient care actions during the data collection period and who had completed and delivered the questionnaires were included. Professionals who performed exclusively administrative activities or were undergoing training on biosafety topics at the time of data collection were excluded from the study, in order not to influence the proposed objectives.

Professionals working in that unit were approached by the main researcher during their work activities at times when they were not providing direct assistance to patients and invited to participate in the research, moment in which the study objective was briefly presented and the importance of participation was highlighted. Upon acceptance, they were invited to sign the Informed Consent Form (ICF). The ICF was delivered to the professionals in opaque envelopes, containing the socio-demographic and safety attitudes questionnaires, both self-administered, to be completed and delivered by the end of the shift or the next shift, and the researcher scheduled the best time to collect the envelopes. The mean time to complete both questionnaires was approximately 15 minutes. Up to three attempts were made with each professional. If they agreed to participate in the research and did not submit the completed questionnaire on the chosen date and time or after three unsuccessful

attempts, this professional was excluded from the study. The study sample consisted of 62 professionals, as three of them did not answer the Safety Attitudes Questionnaire (SAQ), which resulted in justification for exclusion from the study.

Data collection took place from September to December 2021, with the application of three questionnaires, two of which were self-administered (sociodemographic and SAQ) and the unit infrastructure questionnaire, which was to be completed exclusively by the researcher. The sociodemographic and professional questionnaire application aimed to describe the study population through age, sex, education level, length of professional experience, place of professional activity, participation in training on standard precautions offered by the institution employer, year of training and type of training carried out.

The institutional safety climate was verified using the SAQ Short Form 2006, adapted and validated for Brazilian health professionals.¹² This is a self-administered, checklist-type questionnaire, with 41 items that are divided into six domains: teamwork climate; safety climate; job satisfaction; stress recognition; perceptions of management (sector leadership and hospital management); and working conditions. It has an ordinal Likert scale from 0 to 5 points, with 0 being completely disagree and 5 being completely agree. The score varies from 0 to 100 points, and scores ≥ 75 are considered positive values.¹²

To assess sector infrastructure, the questionnaire on unit structure for HH was used, recommended and validated by the WHO, with an average completion time of 20 minutes, with responsibility for completion by the main researcher. This instrument is a checklist, filled out by the researcher himself, and contains 27 items referring to physical resources for HH existing in the units such as: water availability; existence of alcoholic preparation within reach in perfect working order and/or refilled; types of dispensers; availability and stock of procedure gloves; number of beds; number of sinks with water; soap and paper towel availability; presence/location of illustrative posters about HH; number of health professionals in the sector; participation in HH training; and presence of an audit on adherence to HH in the institution.¹³

Regarding statistical analyses, numerical variables were described using descriptive statistics, in which the mean, median and standard deviation were calculated. Nominal categorical variables were described or presented in frequency tables. Analysis of median comparisons was performed using the Kruskal-Wallis test, as there was data non-normality using the Shapiro-Wilk test ($p < 0.05$). For all analyses, a significance level of 0.05 was established.

The project was approved on August 26, 2021 by the Research Ethics Committee (REC) under Opinion 4,934,581. It received the *Certificado de Apresentação para Apreciação Ética* (CAAE - Certificate of Presentation for Ethical Consideration) 75169317.0.0000.5541 so that all ethical requirements of Ministry of Health Resolutions 466/2012, 510/2016 and 580/2018 were met.

RESULTS

Of the 62 professionals who responded to the questionnaires, 29 (46.77%) are nursing technicians, 13 (20.97%) nurses, 12 (19.35%) physicians and eight (12.91%) are physiotherapists. The mean age was 43.44 years, with a minimum age of 24 and a maximum age of 63 years. The highest level of education recorded was specialization, represented by 34 professionals, just after completing higher education, with 21 participants. The others were four participants who had incomplete higher education, and two had master's degree and one had a doctoral degree. The HH infrastructure provided by the institution in the COVID-19 ICU sector for health professionals is represented in Chart 1.

Chart 1. Unit structure for hand hygiene according to variables that make up the instrument on the unit structure for hand hygiene: water, alcoholic preparation and procedure glove availability. Cuiabá/MT, Brazil, 2021.

Variables	COVID-19 ICU
Water availability	Yes
Alcoholic preparation availability	Yes
Types of alcoholic preparation dispensers	Wall-mounted alcohol dispenser
Are dispensers located within easy reach?	Yes
Is there someone responsible for refilling the dispensers?	Yes
Are dispensers refilled with alcoholic preparations?	Sporadically
Do professionals have easy access to pocket flasks with alcoholic preparations?	No
Are procedure gloves available in the units?	Yes
Is stock of gloves stored in the units?	Yes

Chart 2 represents the list of availability of illustrative posters and specific instructions on HH in the COVID-19 ICU.

Chart 2. Unit structure for hand hygiene according to the variables that make up the instrument on unit structure: presence of illustrative posters and training. Cuiabá/MT, Brazil, 2021.

Variables	COVID-19 ICU
Are illustrative posters with hand hygiene techniques with soap and water displayed next to each sink?	Yes
Are posters illustrating the technique of antiseptic hand rubbing with alcoholic preparations displayed at assistance/treatment points?	Yes
Are illustrative posters with instructions for hand hygiene displayed at assistance/treatment points?	No
Are posters promoting hand hygiene displayed in the units?	No
Are written guidelines with recommendations on hand hygiene accessible in the units?	Yes
Have nurses received specific instruction on hand hygiene in the last two years?	Yes
Have physicians received specific instruction on hand hygiene in the last two years?	No

Chart 3 shows the structure of an ICU intended for patients with COVID-19 in terms of number of beds, number of alcoholic preparations present in the environment, number of alcoholic preparations available within reach, number of alcoholic preparations in perfect working order, number of sinks, number of sinks with soap and paper towels available.

Chart 3. COVID-19 ICU structure for hand hygiene. Cuiabá/MT, Brazil, 2021.

COVID-19 ICU	Total
Number of beds	9
Beds with alcoholic preparations available within reach	6
Alcoholic preparation dispensers available in the sector	8
Alcoholic preparation dispensers in perfect working order/restocked	0
Number of sinks in this area	6
Number of sinks with clean water, soap and paper towels	6
Number of professionals found with pocket-sized bottles of alcoholic preparations	0

Regarding unit infrastructure, it had eight common beds and one isolation bed. Consisting of six sinks with manual taps, operated by hands and without sensors, one of which was at the entrance to the isolation bed, four between the beds and one in the common area, close to the medication preparation space. As for the bins for disposing of paper towels after drying their hands, professionals had to operate them manually, lifting the lid, as pedal operation was impaired.

Regarding alcoholic preparation dispensers, all devices belonging to the unit were activated with fingertips in an upward lever movement, using moderate force applied by professionals. It is important to highlight that some dispensers had difficult access due to inappropriate location, such as poorly positioned behind patients' bed, behind devices such as infusion pump, mechanical respirator, IV pole, chairs, emergency cart, among others. Regarding alcohol and antiseptic soap dispenser replacement and refilling, there was a designated person who was responsible for the task, but dispensers were not always filled.

Table 1 describes the organizational safety attitude perception obtained by health professionals in the sector.

According to table 1, it is noted that there is no statistical difference between the medians of the domains and professional categories. Stress recognition, working conditions and perceptions of unit management domains presented the lowest scores considering all professional categories.

It is noteworthy that, although the teamwork climate domain did not register significant differences between professional categories, nurses obtained a higher median in the job satisfaction domain compared to other professional categories. Stress recognition and job satisfaction domains had the lowest scores in the professional categories of physical therapists and physicians, respectively. Regarding the total score obtained, safety attitude perception was compromised according to all professionals investigated.

Table 1. Distribution of the Safety Attitudes Questionnaire (SAQ) domains by professional categories. Cuiabá/MT, Brazil, 2021 (n=62).

SAQ domains	Physicians Median (SD)	Nurses Median (SD)	Physical therapists Median (SD)	Nursing technicians Median (SD)	p-value*
Teamwork climate	75.0 (14.30)	75.0 (15.00)	75.0 (10.62)	75.0 (13.57)	0.715
Safety climate	64.3 (17.05)	67.9 (16.18)	69.6 (8.10)	67.9 (67.9)	0.621
Job satisfaction	77.5 (12.52)	90.0 (15.49)	85.0 (85.0)	85.0 (16.82)	0.690
Stress recognition	75.0 (17.17)	75.0 (23.04)	56.3 (24.19)	62.5 (27.49)	0.315
Perceptions of unit management	52.5 (18.64)	60.0 (18.99)	60.0 (13.87)	60.0 (18.18)	0.496
Perceptions of hospital management	52.5 (19.55)	60.0 (18.07)	57.5 (11.78)	56.3 (20.52)	0.669
Working conditions	75.0 (15.93)	75.0 (17.51)	60.0 (17.04)	70.0 (18.00)	0.404
Total SAQ	64.6 (12.90)	72.0 (11.42)	67.7 (7.43)	66.5 (11.71)	0.735

* p-value obtained by the Kruskal-Wallis statistical test. SD: standard deviation.

DISCUSSION

The results of this study highlighted weaknesses in sector infrastructure, which is directly related to low adherence to HH, according to current studies.¹⁰ In this context, it is important to highlight the dysfunctionality of alcoholic preparation dispensers, as they were activated with the fingertips in up and down movements, using moderate force, which, in addition to making their use difficult, could cause contamination. Furthermore, professionals did not have individual bottles of alcohol gel, dispensers were not always refilled, taps were manually operated, and sink location was difficult to access between beds.

During the COVID-19 pandemic, special attention and notable emphasis was given to HH, as it is a primordial and simple strategy for preventing the disease, which can be carried out independently among individuals.⁶ Thus, among the variables that may be implicated in low adherence to HH, unit infrastructure becomes a fundamental element in health care services.^{3,9} HH must be performed at the recommended times and exactly at the health care point, without professionals having to leave the place to perform HH. A health care point is understood as a place characterized by the presence of three important elements, simultaneously, such as patient, health professional and care, assistance or treatment carried out, which involves contact with patients and/or their surroundings.⁷ However, the present study

found the absence of dispensers or bottles of alcohol gel at the point of assistance. Other studies have shown that the deficient structure of a HH unit is related to low adherence of these professionals to HH.¹⁰

HH must be performed in the five (5) moments that represent care, which are: 1) before touching a patient; 2) before clean/aseptic procedures; 3) after body fluid exposure/risk; 4) after touching a patient; 5) after touching patient surroundings.¹⁴

A study found a significantly higher adherence rates to HH in the neonatal ICU sector due to better infrastructure, with bottles of alcoholic preparations available within reach of professionals and washbasins with taps that cannot be operated by hands.⁹ On the contrary, the aforementioned source found that, in the semi-intensive sector, which had less accessibility to alcoholic preparations at the point of care, the adherence rate was significantly lower ($p \leq 0.001$),⁹ which demonstrates the impact of unit infrastructure on HH adherence by health professionals, highlighting MS' explanatory model for HH adherence, and infrastructure is the main element recommended and encouraged by the WHO.^{13,14}

It happened in the semi-intensive sector, which had less accessibility to alcoholic preparations at the point of care and, consequently, there was significantly less adherence to HH ($p \leq 0.001$).⁹

It is known that HH prevents HAIs and the spread of microbial resistance to antimicrobials, but it is also a fundamental strategy for preventing SARS-CoV-2 trans-

mission in health services.¹⁵ Studies show that ICUs are the main places for the occurrence of HAIs, due to the health status of patients in this environment, as they are critically ill patients and, for the most part, immunosuppressed.² Therefore, it is an essential condition that health institutions contain appropriate conditions for HH in each clinical environment, such as clean running water, liquid soap and disposable towels as well as alcohol-based dispensers at each assistance point.¹⁴

In contrast to the present study, it is noted that simple measures can be implemented in order to increase HH adherence rates and, consequently, prevent the spread of SARS-CoV-2. A study carried out in the pediatric ICU of a hospital in Haiti highlighted the importance of installing automatic dispensers for HH, providing paper towels, lectures on the five moments for HH and use of posters as a way of reminding professionals to clean their hands in the five moments. With this intervention, it was evident that adherence to HH improved significantly ($p \leq 0.001$) compared to the pre-intervention period (48.66%) and the post-intervention phase (82.99%).¹⁶

The COVID-19 pandemic has revived efforts for education and information about HH, both for health professionals and the general public. There was a frequent dissemination of news through videos, advertisements, reminders, billboards about the importance of HH as well as the execution of the correct technique, as it is considered effective in reducing SARS-CoV-2 transmission.⁶

It is worth noting that to encourage HH in health institutions, the main interventions include improving physical infrastructure, a favorable safety climate, training and posters on HH indications and techniques in the workplace. These strategies have shown positive results in reducing HAIs in critical environments and in other health sectors.¹⁷ A prospective study conducted in a COVID-19 ICU in southern India found that HH audit and provision of timely feedback were factors that significantly improved HH adherence rates, recording rates from 26.7% in 2020 to 68.4% in 2021 ($p \leq 0.001$).¹⁸

A study with multimodal interventions carried out in a hospital in Qatar included training on patient safety and HH, ongoing education on HAI control, changes to unit structure, such as installation of sinks, alcohol gel dispensers, taps with automatic activation, in addition to feedback for health professionals and provision of posters with the five moments visible in the washbasins.¹⁹ It is important to highlight that the entire intervention took place with immediate and superior management support and encouragement.

The aforementioned study concluded that reestablishing issues pertaining to unit structure and also to professionals' behavior, emotion and intellect was able to increase HH adherence rates from 60.78% to 94.14%, which highlights the need for institutional administration support in the process, with a view to creating and/or maintaining a favorable safety climate. In this regard, a study found that the use of interventionist strategies based on providing positive feedback to professionals and motivation during care activities facilitated aware-

ness of patient safety and the installation of a favorable safety climate, which led to lasting behavioral change could be sustained over time.²⁰

Thus, it is important to consider that the investment in the first and fundamental element of MS "change in the system", represented by the investment in adequate physical structure and inputs for HH, consists of a primordial element of the aforementioned strategy, without which the other elements become compromised. However, when used in isolation and disconnected from the other components, it is also not capable of sustaining and promoting improvements in HH adherence. It is necessary to ensure the implementation of all elements of the aforementioned strategy, such as training with provision of individual and collective feedback, adequate monitoring of adherence and involvement of managers.^{20,8}

It is noted that the involvement of the institution's management is seen as one of the main components for improvements to occur in patient care provision. A study demonstrated that positive results in safety perception assessment regarding teamwork climate and safety climate domains corroborated lower HAI rates.²¹

It was observed in the present study that SAQ scores for all domains demonstrated weaknesses, which is in line with national studies and therefore represents that the team's safety perception was impaired.²² Perceptions of hospital administration and perceptions of unit management domains presented the lowest scores in all professional categories, which reflected professionals' low perception regarding support and consent to management actions regarding patient safety in the hospital. This same finding was also found in a study carried out in two ICUs of a public hospital in the state of Goiás, which found negative scores for the management perceptions domain and concluded that management involvement is essential for safety culture consolidation and dissemination.²²

The safety climate domain also presented low scores in all professional categories, which is in line with international studies that also used the SAQ with health professionals in an ICU, as this is an instrument considered valid in various cultures and nations, therefore facilitating data interpretation, reliability and comparison.²³

The same was found in a national study carried out in 11 public hospitals in the Federal District, which found that the safety climate was negative [57.7 (SD = 21.4) to 68.8 (SD = 19.1); $p = 0.001$], as no hospital presented a value higher than 75, which could be harmful to health practices by professionals.²⁴

It was noted that in working conditions and stress recognition domains, physiotherapists and nursing technicians had the lowest medians among the professional categories, which can directly influence the care provided to patients. The work overload of nursing technicians may be related to their peculiar, uninterrupted work, with the provision of direct care to patients, often in quantity and quality beyond that recommended by current legislation - still added, almost mostly, to the double and even triple working hours that are necessary for their subsistence.²³

Regarding work stress in the nursing team, a study

carried out in Spain highlighted some factors that can influence this condition, such as environmental factors experienced in the workplace, exhausting working hours, anxiety generated due to working conditions and lack of resources to carry out their assistance activities during the pandemic. A significant correlation was noted with emotional exhaustion ($p=0.001$), depersonalization ($p=0.02$) and personal satisfaction ($p=0.05$) as well as work overload ($p=0.001$).²⁵

Among the limitations of this study is the fact that data collection was carried out in a short period of time due to the closure of activities in the sector under study and also the fact that it was carried out in only one COVID-19 ICU, which undermines the external validity of results.

The findings of this study suggest the urgent need to develop and execute strategies that aim to promote a positive safety culture in institutions, in order to contribute to the development of best care practices with an emphasis on patient safety. The negative impact of low management involvement in patient safety actions and the sector's precarious infrastructure on adherence to HH by health workers was demonstrated.

It was concluded that all professional categories had a low organizational safety climate perception. The study found the negative impact of low management involvement perception in patient safety actions and precarious infrastructure for HH on adherence to this technique by health workers.

Given the data obtained, the urgent need for investment in the institution's physical structure is evident, since this is a MS' fundamental component for HH, and the absence, poor positioning and/or dysfunctionality of alcohol dispensers have a negative effect on HH adherence rates.

Facilitating and encouraging HH actions are necessary in order to increase adherence rates, with a view to reducing morbidity and mortality related to HAIs.

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Jéssica Regina Rossetto and **Marília Duarte Valim** contributed to article conception, design, analysis and writing;

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