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BED BATH PROTOCOL FOR INFECTION REDUCTION: A QUASI-EXPERIMENTAL STUDY

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ABSTRACT

Objective: To analyze the effect of implementing a bed bath protocol in relation to infection-free time and the prevalence of Healthcare-Associated Infections.
Method: A quasi-experimental study with a comparison between two groups. In the Control Group, the data were retrospectively collected between January and April 2018. Implementation of the bed bath protocol in an Intensive Care Unit took place from May to October 2018. Data from the Intervention Group were collected from November 2018 to February 2019 through daily follow-up during the hospitalization period.
Results: There were 157 participants in the Control Group and 169 in the Intervention Group, with a mean age of 56 and 54 years old, respectively, and majority of male individuals. The occurrence of Healthcare-Associated Infections was higher in the Control Group (n=32; 20.4%) compared to the Intervention Group (n=10; 5.9%), which presented a 2.86 times lower risk of developing Healthcare-Associated Infections (p<0.01). The Intervention Group presented a longer infection-free time when compared to the Control Group, which had a mean of 2.46 times higher risk of developing infections in the Intensive Care Unit (95%CI: 1.18; 5.11).
Conclusion: The study provides support for standardizing the bed bath technique and to preventing health-care associated infections. There is a limitation in generalization of the results, as the groups come from a quasi-experimental before-after design with a non-equivalent Control Group due to the absence of random distribution in the compared groups.

DESCRIPTORS: Hospital-acquired infection. Baths. Hygiene. Nursing care. Critical care.

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PROTOCOLO DE BANHO NO LEITO PARA REDUÇÃO DE INFECÇÕES: ESTUDO QUASE EXPERIMENTAL

RESUMO

Objetivo: Analisar o efeito da implementação de um protocolo de banho no leito em relação ao tempo livre de infecção e à prevalência de Infecção Relacionada à Assistência à Saúde.
Método: Estudo quase experimental, com comparação entre dois grupos. No grupo controle, os dados foram coletados retrospectivamente entre janeiro e abril de 2018. A implementação do protocolo de banho no leito em uma Unidade de Terapia Intensiva ocorreu de maio a outubro de 2018. Os dados do grupo intervenção foram coletados de novembro de 2018 a fevereiro de 2019, por meio do acompanhamento diário durante o período de internação.
Resultados: 157 participantes no grupo controle e 169 no grupo intervenção, com média de idade de 56 e 54 anos, respectivamente, sendo a maioria do sexo masculino. A ocorrência de Infecção Relacionada à Assistência à Saúde foi maior no grupo controle (n=32;20,4%) comparado ao grupo intervenção (n=10;5,9%), este que apresentou 2,86 menor risco de desenvolver Infecção Relacionada à Assistência à Saúde ($p<0,01$). O grupo intervenção apresentou maior tempo livre de infecção comparado ao grupo controle, estes que tem, em média,2,46 vezes maior risco de desenvolver infecção na Unidade de Terapia Intensiva (IC95%1,18;5,11).
Conclusão: O estudo oferece subsídios para padronização da técnica do banho no leito e prevenção de infecções relacionadas à assistência à saúde. Há limitação na generalização dos resultados, pois os grupos são oriundos de um delineamento quase experimental antes-depois com grupo controle não equivalente, devido à ausência de distribuição aleatória nos grupos comparados.

DESCRITORES: Infecção hospitalar. Banhos. Higiene. Cuidados de enfermagem. Cuidados críticos.

PROTOCOLO DE HIGIENE DE PACIENTES EN LA CAMA PARA REDUCIR INFECCIONES: ESTUDIO CUASIEXPERIMENTAL

RESUMEN

Objetivo: analizar el efecto de implementar un protocolo de higiene de pacientes en la cama en relación con el tiempo sin infección y la prevalencia de Infecciones Relacionadas con la Atención de la Salud.
Método: estudio cuasi experimental con comparación entre dos grupos. En el Grupo Control, los datos se recolectaron retrospectivamente entre enero y abril de 2018. La implementación del protocolo de higiene de pacientes en la cama de una Unidad de Cuidados Intensivos tuvo lugar entre mayo y octubre de 2018. Los datos del Grupo Intervención se recolectaron entre noviembre de 2018 y febrero de 2019 por medio del seguimiento diario durante el período de internación.
Resultados: hubo 157 participantes en el Grupo Control y 169 en el Grupo Intervención, con una media de edad de 56 y 54 años, respectivamente, y la mayoría del sexo masculino. La incidencia de Infecciones Relacionadas a la Atención de la Salud fue mayor en el Grupo Control (n=32;20,4%) que en el Grupo Intervención (n=10;5,9%), y este último presentó 2,86 veces menos riesgo de desarrollar Infecciones Relacionadas a la Atención de la Salud ($p<0,01$). El Grupo Intervención presentó mayor tiempo sin infección en comparación con el Grupo Control, cuyos participantes tuvieron un promedio de 2,46 veces mayor riesgo de desarrollar infecciones en la Unidad de Cuidados Intensivos (IC95%: 1,18;5,11).
Conclusión: el estudio ofrece aportes para estandarizar la técnica de higiene de pacientes en la cama y prevenir infecciones relacionadas con la atención de la salud. Existe cierta limitación en cuanto a la generalización de los resultados, puesto que los grupos provienen de un diseño cuasiexperimental del tipo “antes-después” con un Grupo Control no equivalente, debido a la ausencia de distribución aleatoria en los grupos comparados.

DESCRIPTORES: Infección hospitalaria. Higiene de pacientes. Higiene. Atención de Enfermería. Cuidados críticos.

INTRODUCTION

In Intensive Care Units (ICUs), procedures under the responsibility of the Nursing team are performed several times a day by nurses and nursing technicians. For critically ill patients, whose clinical conditions determine high dependence, immobility and instability degrees, body hygiene performed in bed is the only and safest bath option. Commonly, bed baths are conducted using soap and water although some alternatives have been widely used, such as waterless baths with disposable moistened towels[1–3].

Due to the complexity of critically-ill patients, although necessary, be baths are not without of complications and may pose safety risks, such as the risk of Healthcare-Associated Infections (HAIs), falls from the bed and displacement of care devices[2,4]. Such procedure can further cause or worsen hemodynamic instability, with oscillations in heart rate and blood pressure, in addition to respiratory and neurological changes, as well as reduced body temperature and decreased arterial oxygen saturation. Thus, to increase patient safety, continuous monitoring of parameters during body hygiene procedures is necessary[2,5].

Certain practices adopted in the bed bath technique may contribute to the increase in HAIs[6]. The absence of technical standardization, observed, for example, by the use of the same bath compress for all body regions, the adoption of different way to sanitize the bath basins or using them for other purposes such as storage of personal items, makes this procedure conducive to microbial growth[4,6].

HAIs contribute to increased morbidity, mortality, and healthcare costs, as well as to prolonged hospitalization times. In this sense, recognizing intensive care environment as a potential risk factor for the development of HAIs favors the search for prevention strategies and enhances patient safety[5].

It is estimated that from 20% to 30% of the HAIs can be prevented by implementing hospital protocols[7]. Evidence-based practices ensures accountability and support in clinical decision-making and contributes to better results with the use of proven more effective practices, with the best and most up-to-date scientific evidence[2,4,7].

Given the various bathing methods employed, the importance of implementing protocols as tools to ensure technical standardization and patient safety, and given the recognition of the existence of factors related to bed baths that contribute to the development of HAIs, the objective of this study was to analyze the effect of implementing a bed bath protocol in relation to infection-free time and prevalence of Healthcare-Associated Infection (HAIs).

METHOD

A quasi-experimental study[8] with comparison between two groups, before (Control Group – CG) and after (Intervention Group – IG) the intervention of implementing a bed bath protocol. The research was conducted in a 17-bed general ICU of a public teaching hospital located in the state of São Paulo, Brazil.

A convenience, consecutive and non-probability sample, delimited by the data collection time, was recruited according to the following inclusion criteria: subjects admitted to the ICU where the study was conducted, aged ≥18 years old. The exclusion criteria were as follows: subjects admitted with a sepsis diagnosis.

During the study period, 488 participants admitted to the ICU where the study was conducted and aged ≥18 years old were eligible. Of them, 162 were diagnosed with sepsis and were thus excluded from the study. Therefore, the study consisted of 326 adults: 157 in the CG and 169 in the IG. The IG subjects entered the research within 24 hours of ICU admission. Figure 1 shows the flowchart corresponding to selection of the study participants.

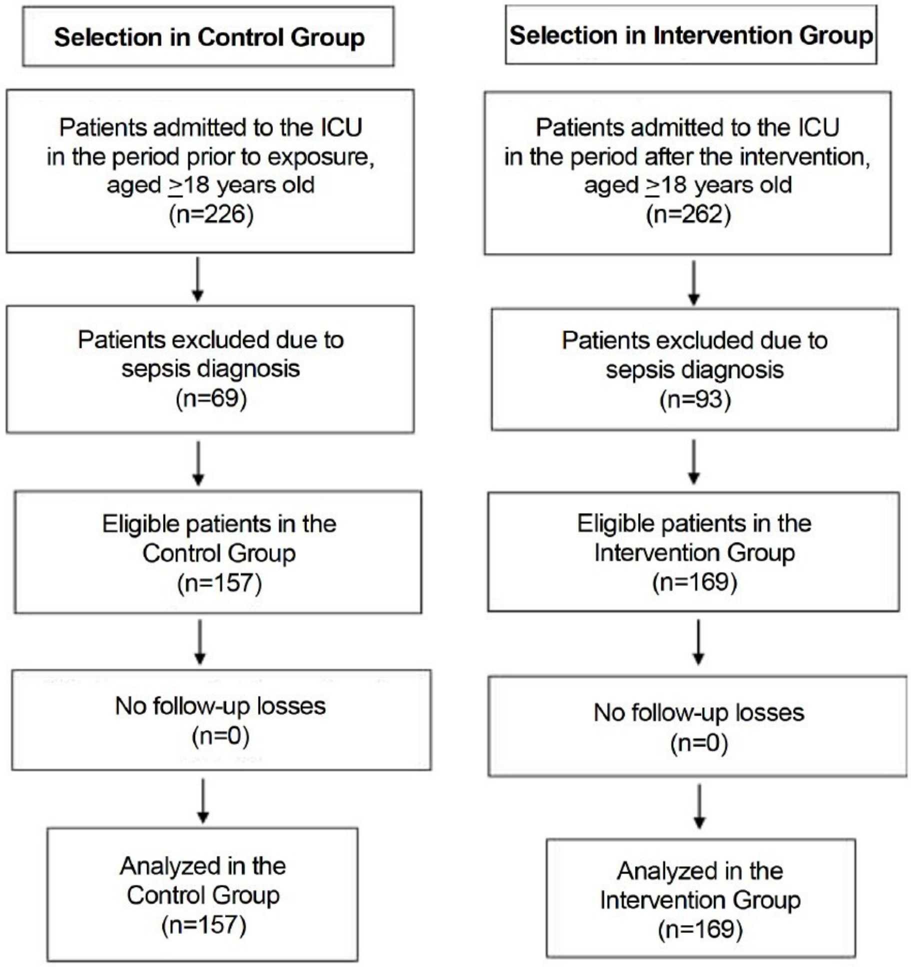

Figure 1 – Flowchart corresponding to selection of the participants in implementing a bed bath protocol, according to the control and intervention groups. São José do Rio Preto, SP, Brazil, 2019. (n=326).

The study was conducted over a 14-month period. The CG data were collected retrospectively between January and April 2018 through electronic medical records, referring to the period prior to implementing the intervention. Implementation of the protocol (intervention) took place from May to October 2018. The IG data were collected from November 2018 to February 2019.

As data collection protocol, it was established that all subjects admitted to the ICU would be evaluated for the eligibility criteria on the first hospitalization day. Subjects diagnosed with sepsis at ICU admission were excluded from the research, and the other participants were considered eligible.

In both groups, the data were collected through electronic medical records. In the CG, collection was retrospective, while in the IG it took place prospectively, with daily follow-up of the participants by the researcher during the ICU hospitalization time. The participants were followed-up until discharge from the unit or until a death outcome. It is worth reporting the absence of follow-up losses among the participants in both groups.

For the CG, a protocol for the use of compresses in bed baths in the ICU had not been made available. Thus, each professional bathed the patients according to their own experience, and criteria such as sequence to be followed, minimum number of compresses, product used (bar or neutral liquid soap), number of basins and jar were not established.

The IG underwent a bed bath protocol developed according to literature references[9–16] and reviewed by three nurses with expertise in intensive care and hospital-acquired infection control.

Initially, each professional gathered all the necessary materials for the bed bath, namely: liquid neutral soap, a minimum of 20 disposable cotton swabs, bedding, at least two bath towels, procedural gloves, a basin and a jar for conditioning clean and heated water. Subsequently, they explained the procedure to the patient, investigating the functional capacity level and any need for help. The participant was provided with privacy, hand hygiene was performed, procedure gloves were placed, height of the bed was adjusted, and the protection grid was lowered.

The bed bath sequence was performed according to the division of the body areas, with the need to respect the body wash sequence described in Figure 2, using 10 compresses moistened with liquid soap and water applied in long and firm movements, always respecting the direction from the cleanest to the dirtiest place, and discarded after use following the indicated numbering. After cleaning each body area, a rinse procedure was carried out with another 10 compresses moistened with water in long and firm movements, always respecting the direction from the cleanest to the dirtiest place. After rinsing, each body area was dried with a towel: one towel for the anterior region of the body and one for the posterior region. The skin was moisturized with sunflower oil or moisturizer.

It is important to note that, even with the participant in a lateral position, the mattress was disinfected with biguanide, the bedding was changed, and a disposable diaper was applied. For both groups, in order to ensure the participants' safety, the baths were always performed by two employees from the Nursing team and lasted approximately 20 minutes. During this procedure, the head of the bed was kept elevated, and the vital signs of heart rate and pulse oximetry were monitored. The basins and jars used were previously sterilized in the materials center.

In order to ensure correct performance of the technique, the entire ICU Nursing team was trained during an expository class taught by the main researcher. In addition to that, illustrative images were made available in the beds to assist in identifying body areas and the bath sequence. In the training and post-intervention period, the only change in the routine that took place in the ICU was the implementation of the bed bath technique.

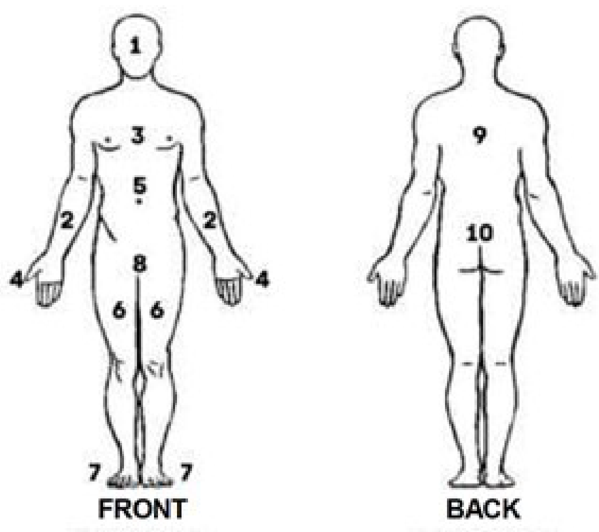

Figure 2 – Body wash sequence according to division of the body areas for bed baths using 10 compresses. São José do Rio Preto, SP, Brazil, 2019. (n=326).
1: Eyes and then face with clean water and/or neutral soap, so that there is no irritation in the eyes; 2: Upper limbs, from the direction of the fingers to the armpit; 3: Chest; 4: Both hands; 5: Abdomen; 6: Lower limbs; 7: Feet; 8: Perineum, change the procedure gloves; 9: After lateralizing the patient, dorsal region (from the neck base to the sacral region); 10: Buttocks and anus.

The following sociodemographic and clinical data of the participants were collected: gender (male or female), age, ICU hospitalization time (in days), duration of the antibiotic therapy (in days), number of antibiotics used, main reason for ICU admission, number of chronic diseases presented by the participants and what the diseases were, in addition to the ICU hospitalization outcome (discharge or death).

The invasive devices investigated were the following: central venous catheter, hemodialysis catheter, arterial catheter, indwelling urinary catheter, mechanical ventilation and chest drain, categorized as present or absent, with the corresponding total use time (in days). The variables investigated were defined by the increased risk of HAIs in the presence of invasive devices.

Occurrence of HAIs or not was investigated, diagnosed according to the Brazilian guidelines set forth by the National Health Surveillance Agency (*Agência Nacional de Vigilância em Saúde*, ANVISA)[17], for being the guidelines followed by the In-Hospital Infection Control Commission (*Comissão de Controle de Infecções Hospitalares*, CCIH) of the study locus. HAIs were defined as any and all infections acquired after the patient's admission to the hospital, with the possibility of manifesting themselves during hospitalization or after discharge, provided that they are related to the patient's permanence in the institution or to hospital procedures[17]. The HAIs researched were the following: Ventilator-Associated Pneumonia, Urinary Tract Infection, Primary Bloodstream Infection and Surgical Site Infection (SSI). Cultures (blood culture, urine culture and tracheal aspirate) were only collected from the participants with suspected infections, as indicated by the health institution.

The infection-free time was evaluated, as well as the non-infection probability at 15 days and 30 days by means of a statistical test that considers the time (in days) between the ICU admission date and the infection occurrence date or last known date (discharge or death).

The data were entered into Microsoft Office Excel for Windows 10 spreadsheets and later transferred to the Statistical Analysis System (SAS) 9.4 software, in which the statistical analyses were performed.

Initially, the data were described by means of absolute and percentage frequencies (qualitative variables) and through measures such as mean, standard deviation, minimum, median and maximum (quantitative variables). A simple comparison of the groups regarding the quantitative variables (age, ICU hospitalization time and duration of the antibiotic therapy) was made using the Mann-Whitney test, as the normality assumption in each group was not observed. For simple comparisons involving the qualitative variables (gender, number of antibiotics, reason for admission, presence of chronic disease and hospitalization outcome), the chi-square test was used.

The comparison of the groups regarding the invasive devices used was performed using the Mann-Whitney test (for the quantitative variables) and the chi-square test (for the qualitative variables). The comparison of the groups in terms of presence of healthcare-associated infections and consequent estimation of the unadjusted and adjusted Relative Risks for possible confounding factors was performed using the Poisson regression model with robust variance and logarithmic, simple, and multiple linkage function[18].

To analyze the infection-free time in the ICU, survival analysis techniques were used considering the time (in days) between the ICU admission date and the infection occurrence date or last known date (discharge or death). Kaplan-Meier curves were drawn, and the groups were compared using adjusted Cox regression[19]. The comparisons were adjusted (when possible) by age, hospitalization time before ICU admission, use of central venous catheter, use of hemodialysis catheter, use of arterial catheter, use of indwelling urinary catheter, use of mechanical ventilation and use of chest tube, possible confounding variables, as defined by theoretical criteria. Some of these variables were not included as confounding variables in certain analyses due to non-convergence of the regression model in their presence. A 5% significance level was adopted for all comparisons.

This research conducted with human beings complies with National Health Council Resolution Nº. 466/12 and was approved by two Research Ethics Committees. The participants were asked to waive application of the Informed Consent Form, as most of them were unconscious and submitted to sedation. In addition, the baths followed the institution's protocol and were performed on all participants. For those who were conscious, the intervention was explained before initiating it and due authorization was requested to conduct it, ensuring everyone the necessary privacy.

RESULTS

Of all subjects admitted to the ICU, 488 met the inclusion criterion (age ≥18 years old) and were recruited to take part in the study. Of them, 162 were diagnosed with sepsis and were thus excluded from the study. Therefore, the study consisted of 326 participants divided into two groups: before implementing standardization of the protocol for the use of compresses in bed baths (CG: n=157) and after implementing the protocol/intervention (IG: n=169). The sociodemographic and clinical data of the patients from both groups are presented in Table 1. There was a difference in the sample of participants between the groups (Control and Intervention) regarding ICU hospitalization time (p<0.01), duration of the antibiotic therapy (p<0.01), number of antibiotics used (p<0.01), ICU hospitalization outcome (discharge or death) (p<0.01), respiratory failure as the main reason for ICU admission (p=0.02) and presence of Systemic Arterial Hypertension as underlying chronic disease (p<0.01).

The Central Venous Catheter (CVC) use time was longer in the CG than in the IG, with an estimated difference of 2 days. As for the other invasive devices, the groups showed differences regarding the CVC (p<0.01) and hemodialysis catheter (p=0.01) use, CVC (p<0.01), arterial catheter (p<0.01) and Indwelling Urinary Catheter (IUC) (p<0.01) dwell time, as shown in Table 2.

Table 1 – Sociodemographic and clinical data of the participants in implementing a bed bath protocol according to the control and intervention groups. São José do Rio Preto, SP, Brazil, 2019. (n=326).

Variables	Group		p-value
	CG[*] (n=157)	IG[†] (n=169)	
Gender [n (%)]			0.45[‡]
Male	92 (58.6)	106 (62.7)	
Female	65 (41.4)	63 (37.3)	
Age			0.37[§]
[Mean (SD[||])]	56.4 (18.1)	54.4 (18.9)	
[Median (Minimum-Maximum)]	59 (19-92)	56 (19-93)	
ICU[¶] hospitalization time in days			<0.01[§]
[Mean (SD[||])]	7.8 (7.2)	5.1 (4.8)	
[Median (Minimum-Maximum)]	6 (0-36)	4 (0-41)	
Duration of the antibiotic therapy in days			<0.01[§]
[Mean (SD[||])]	12.8 (17.6)	8 (12.0)	
[Median (Minimum-Maximum)]	8 (0-156)	3 (0-83)	
Number of antibiotics [n (%)]			<0.01[§]
None	19 (12.1)	46 (27.2)	
1-2	81 (51.6)	88 (52.0)	
3-4	44 (28.0)	27 (16.0)	
5+	13 (8.3)	8 (4.7)	

Table 1 – Cont.

Variables	Group		p-value
	CG* (n=157)	IG† (n=169)	
Main reason for admission [n (%)**]			
Post-surgical care	52 (33.1)	47 (27.8)	0.30‡
Respiratory failure	45 (28.7)	30 (17.7)	0.02‡
Cardiovascular diseases	10 (6.4)	7 (4.1)	0.37‡
Liver diseases	10 (6.4)	9 (5.3)	0.69‡
Gastrointestinal diseases	13 (8.3)	12 (7.1)	0.69‡
Neurological diseases	17 (10.8)	23 (13.6)	0.44‡
External causes	27 (17.2)	44 (26.0)	0.05‡
Orthopedic reasons	10 (6.4)	9 (5.3)	0.69‡
Other shocks	5 (3.2)	3 (1.8)	0.41‡
Other diagnoses	12 (7.6)	24 (14.2)	0.06‡
Number of chronic diseases [n (%)]			0.52§
None	37 (23.6)	49 (29.0)	
One	66 (42.0)	62 (36.7)	
Two	35 (22.3)	33 (19.5)	
More than two	19 (12.1)	25 (14.8)	
Presence of chronic diseases [n (%)‡]			
Systemic Arterial Hypertension	72 (45.9)	53 (31.4)	<0.01‡
Diabetes *Mellitus*	32 (20.4)	38 (22.5)	0.64‡
Heart diseases	16 (10.2)	20 (11.8)	0.64‡
Psychiatric disorders	16 (10.2)	13 (7.7)	0.43‡
Chronic Renal Failure	13 (8.3)	12 (7.1)	0.69‡
Liver diseases	8 (5.1)	11 (6.5)	0.59‡
Human Immunodeficiency Virus	9 (5.7)	6 (3.5)	0.35‡
Stroke	8 (5.1)	6 (3.5)	0.49‡
Cancer	8 (5.1)	5 (3.0)	0.32‡
Chronic Obstructive Pulmonary Disease	1 (0.6)	3 (1.8)	0.35‡
Dyslipidemia	1 (0.6)	6 (3.5)	0.07‡
ICU¶ hospitalization outcome [n (%)]			<0.01‡
Discharge	96 (61.1)	129 (76.3)	
Death	61 (38.8)	40 (23.7)	

*CG: Control Group; † IG: Intervention Group; ‡Chi-square test; §Mann-Whitney test; ||SD: Standard Deviation; ¶ICU: Intensive Care Unit. **The participant may have had more than one reason for admission and more than one chronic disease.

The occurrence of HAIs was higher in the CG when compared to the IG (CG: n=32 [20.4%] and IG: n=10 [5.9%]). Subjected to the implementation of a bed bath protocol, the IG presented a 2.86 times lower risk of developing HAIs (p<0.01) and a 2.76 times lower risk of occurrence of Ventilator-Associated Pneumonia (p=0.03), when compared to the CG. There was no evidence of a difference in the risks of Urinary Tract Infection, Primary Bloodstream Infection and Surgical Site Infection between both groups (Table 3). The data related to the HAIs are shown in Table 3.

Table 2 – Use of invasive devices according to the control and intervention groups. São José do Rio Preto, SP, Brazil, 2019. (n = 326).

Variables	Group		p-value
	CG* (n=157)	IG† (n=169)	
Central venous catheter use, [n (%)]	125 (79.62%)	107 (63.31%)	<0.01‡
Total central venous catheter dwell time in days, [Median (Q1 - Q3)]	7 (3.5 – 12)	5 (2 – 7)	<0.01§
Hemodialysis catheter use, [n (%)]	32 (20.38%)	18 (10.65%)	0.01‡
Total hemodialysis catheter dwell time in days, [Median (Q1 – Q3)]	7.5 (3.5 – 11)	6 (3 – 9)	0.50§
Arterial catheter use, [n (%)]	121 (77.07%)	115 (68.05%)	0.07‡
Total arterial catheter dwell time in days, [Median (Q1 – Q3)]	5 (3 – 8)	4 (2 – 6)	<0.01§
Indwelling urinary catheter use, [n (%)]	137 (87.26%)	137 (81.07%)	0.13‡
Total indwelling urinary catheter dwell time in days, [Median (Q1 - Q3)]	5 (3 – 10)	4 (2 – 6)	<0.01§
Mechanical ventilation use, [n (%)]	94 (59.87%)	83 (49.11%)	0.05‡
Chest drain use, [n (%)]	59 (37.58%)	48 (28.4%)	0.08‡

*CG: Control Group; †IG: Intervention Group; ‡Chi-square test; §Mann-Whitney test.

Table 3 – Comparison of groups regarding Healthcare-Associated Infections. São José do Rio Preto, SP, Brazil, 2019. (n=326),

Variables	CG* (n=157)	IG† (n=169)	Unadjusted		Adjusted	
			RR‡ (95%CI)	p-value	RR‡ (95%CI)	p-value
Healthcare-Associated Infections [n (%)]						
No	125 (79.6)	159 (94.1)	-			
Yes	32 (20.4)	10 (5.9)	3.44 (1.75; 6.77)	<0.01	2.86§ (1.4; 5.83)	<0.01
Healthcare-Associated Infections [n (%)]						
Ventilator-Associated Pneumonia	20 (12.7)	7 (4.1)	3.08 (1.34; 7.07)	<0.01	2.76§ (1.13; 6.77)	0.03
Urinary Tract Infection	4 (2.5)	3 (1.8)	1.44 (0.33; 6.31)	0.63	0.95‖ (0.25; 3.68)	0.94
Primary Bloodstream Infection	3 (1.9)	1 (0.6)	3.23 (0,34;30,72)	0.31	3.09‖ (0.19; 50.29)	0.43
Surgical Site Infection	8 (5.1)	2 (1.2)	4.31 (0,93;19,97)	0.06	2.91¶ (0.51; 16.54)	0.23

*CG: Control Group; †IG: Intervention Group; ‡RR: Relative Risk; §Poisson regression model with robust variance adjusted for age, days between admission and Intensive Care Unit hospitalization, central venous catheter use, hemodialysis catheter use, arterial catheter use, indwelling urinary catheter use, mechanical ventilation and drain use. ‖Poisson regression model with robust variance adjusted for age, days between admission and Intensive Care Unit hospitalization, hemodialysis catheter and drain use. ¶Poisson regression model with robust variance adjusted for age, days between admission and Intensive Care Unit hospitalization, central venous catheter use, hemodialysis catheter use, arterial catheter use, mechanical ventilation and drain use.

The non-infection probability at 15 days (95%CI) was 0.57 (0.39, 0.72) in the CG and 0.78 (0.59, 0.89) in the IG. The non-infection probability at 30 days (95%CI) was 0.37 (0.17, 0.58) in the CG and 0.78 (0.59, 0.89) in the IG. The Cox regression model evidenced that the CG participants have a mean of nearly 2.46 times higher risk of infection in the ICU when compared to the IG (95%CI: 1.18; 5.11) (Table 4). Using the Kaplan-Meier curve (Figure 3), we observed that the IG participants had longer infection-free times than the CG, as the CG participants developed infections faster than the IG.

Table 4 – Comparison of the groups regarding infection-free time in the ICU**.** São José do Rio Preto, SP, Brazil, 2019. (n=326).

Infection-free time in the ICU*	**Groups**	
	CG† (n=157)	**IG‡ (n=169)**
Kaplan-Meier		
Number of patients with events (infections) [n (%)]	32 (20.4)	10 (5.9)
Non-infection probability at 15 days [days (95%CI)]	0.57 (0.39;0.72)	0.78 (0.59;0.89)
Non-infection probability at 30 days [days (95%CI)]	0.37 (0.17; 0.58)	0.78 (0.59; 0.89)
Cox regression		
Hazard ratio: GC vs. GI (95%CI)§	2.46 (1.18; 5.11)	Ref.
p-value	0.02	

*ICU: Intensive Care Unit; †CG: Control Group; ‡IG: Intervention Group §Estimated through Cox regression adjusted by age, days between admission and ICU hospitalization, central venous catheter use, hemodialysis catheter use, arterial catheter use, indwelling urinary catheter use, mechanical ventilation and drain use.

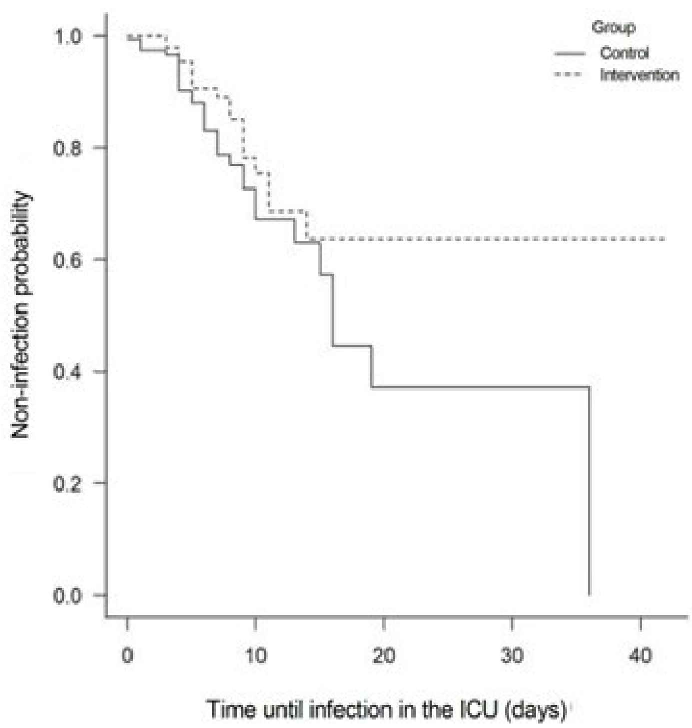

Figure 3 – Non-infection probability and infection-free time by groups. São José do Rio Preto, SP, Brazil, 2019. (n=326). Kaplan-Meier curves.

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DISCUSSION

In this study we analyzed the effect of implementing a bed bath protocol performed according to the body wash sequence technique, as per the division of body areas, in 326 individuals divided between CG (n=157) and IG (n=169). A significant difference was observed between the groups regarding the use and dwell time of invasive devices such as central venous catheter, hemodialysis catheter, arterial catheter and indwelling urinary catheter. In addition to that, differences were found in ICU hospitalization time, duration of the antibiotic therapy, the number of antibiotics used, ICU hospitalization outcome (discharge or death), presence of respiratory failure as the main reason for ICU admission, and incidence of Systemic Arterial Hypertension as an underlying chronic disease. As this is a quasi-experimental study[8], with evaluation of two groups comprised by unpaired participants in the period before and after an intervention, this difference between the clinical characteristics between the groups was already expected due to the methodological design conducted. Regarding use and dwell time of invasive devices, a number of studies have pointed out their use in ICUs, as well as the duration of exposure to these devices, as potential risk factors for the development of healthcare-associated infections[20–22].

The bed bath technique involves not only the steps to be performed, but also the materials and products used for body hygiene. In relation to the materials, the main discussions in the literature involve the use of disposable industrialized bath basins or compresses. In the protocol of this study, bath basins, properly disinfected in the institution's Materials Center, were used to moisten the compresses with clean and heated water. In two studies that compared traditional bed baths using basins to baths with industrialized compresses, no differences were found in the incidence of HAIs and infections by multidrug-resistant microorganisms, nor in the outcomes of skin lesions, resistance during the bath and costs[1,23].

A randomized clinical trial conducted at a hospital in interior of São Paulo estimated the effectiveness of baths with industrialized compresses on the microbial loads of the skin of hospitalized individuals at 90% when compared to traditional baths, which showed low effectiveness (20%)[24]. Despite contradictory results among studies on the topic, there is consensus that bath basins constitute reservoirs and possible culture means for microorganisms in the hospital environment, acting as vehicles for the development of infections in general and, therefore, they should be avoided[1,24].

As for the bath technique itself, there is non-standardization of the procedure, both in American studies and in national research. It is noticed that each service has its own institutional protocol to be followed according to the reality and existing supplies, with professionals not complying with and omitting steps, which highlights the need for standardization based on scientific evidence[5,6,24].

However, despite this non-standardization, some practices consistent with the current evidence are common in different centers. A study described bath practices in different American intensive care units, most of which were similar to the technique used in this study, employing disposable and individual compresses for each part of the body and baths without any antiseptic agent[6].

In this study, an institutional protocol developed according to the evidence in the literature was used, which differs from the one published by the American Government Agency for Healthcare Research and Quality (AHRQ), which instructs a technique for bed baths with chlorhexidine compresses in all individuals admitted to ICUs. According to this recommendation, six compresses should be used, two for both upper limbs, another specific one for the abdomen and perineum, one for dorsal hygiene and another for cleaning the anus. In this study, we used mild soap and a total of 20 compresses[25].

Although much discussed, there is no evidence in the literature that using chlorhexidine when bathing critically-ill patients, instead of neutral soap, reduces healthcare-associated infections, mortality or ICU hospitalization times, according to a systematic review published by the Cochrane

Collaboration in 2019, due to the poor methodological quality of the published studies[26]. In addition to that, the importance of adopting criteria for chlorhexidine use stands out, given the possibility of general changes in the skin microbiota and microbial resistance to chlorhexidine[3].

In this study there were more HAIs in the CG than in the IG. In addition to that, the infection-free time was higher in the IG when compared to the CG. This result corroborates the AHRQ protocol that indicates the sequence to use chlorhexidine compresses for bed baths as a strategy to reduce infection by methicillin-resistant *Staphylococcus aureus* (MRSA) and bloodstream infections in ICUs for adults. Its implementation indicates a 44% reduction in all-cause bloodstream infections and a 37% decrease in MRSA clinical cultures when used. A study published in 2018 identified a drop in Central Catheter-Associated Bloodstream Infection rates from 2.81 to 1.12 per 1,000 catheters/day after implementing the AHRQ protocol[16,27].

In view of the positive results evidenced by the use of protocols for the bed bath procedure, it is understood that the protocol employed in this study can be implemented as a reference for health services in general, in search of a universal standardization of this technique and with a view to reducing the incidence of HAIs and a consequent reduction in mortality rates, hospitalization times and costs[1]. The importance of further studies to elucidate issues such as the number of compresses required and the possibility of using non-industrialized compresses in order to reduce expenses is highlighted.

The limitations of this study refer to generalization of the results, as the control and intervention groups were not randomly distributed. In addition to that, the sample was established for convenience, which makes it difficult to infer the results, with statistical rigor, on the general population. Along with the fact that, in the research protocol, it is not possible to establish the culture collection of all participants included in the study. For such verification, it is suggested to conduct new studies, this time paired, so that the participants included in the groups have the greatest possible similarity, which will result in greater control over the control and intervention groups.

CONCLUSION

With this study, it is observed that the infection-free time was longer after implementing the bed bath protocol, as the participants subjected to the protocol took longer to present some type of infection when compared to the others, who did not receive the intervention. In addition to that, the participants subjected to the protocol presented a lower risk for HAIs. It was ensured that the only modified intervention in the study unit during the data collection period was implementing standardization of the bath protocol. These results contribute to standardizing the bed bath technique in critically ill patients, which prevents skin colonization and healthcare-associated infections, in addition to reducing hospitalization times, mortality and costs.

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NOTES

ORIGIN OF THE ARTICLE

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APPROVAL OF ETHICS COMMITTEE IN RESEARCH

Approved by the Ethics Committee in Research of the Ribeirão Preto Nursing School belonging to *Universidade de São Paulo* under opinion No.3,069,070 and Certificate of Presentation for Ethical Appraisal No. 96279718.4.0000.5393, and by the Research Ethics Committee of the São José do Rio Preto Medical School, under opinion Nº.3,090,435 and Certificate of Presentation for Ethical Appraisal No. 96279718.4.3001.5415.

CONFLICT OF INTEREST

There is no conflict of interest.

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