Original Article

Oxy-hemodynamic effects of different bed baths: a randomized crossover clinical trial

Efeitos oxi-hemodinâmicos de diferentes banhos no leito: ensaio clínico randomizado cruzado

Efectos oxihemodinámicos de diferentes baños en cama: ensayo clínico aleatorizado cruzado

Luana Vieira Toledo[1] https://orcid.org/0000-0001-9527-7325
Patrícia Oliveira Salgado[1] https://orcid.org/0000-0002-0743-0244
Gabriela Tavares Boscarol[1] https://orcid.org/0000-0001-7694-0080
Carla de Fátima Januário[2] https://orcid.org/0000-0002-7036-3283
Lídia Miranda Brinati[3] https://orcid.org/0000-0003-0462-2096
Flávia Falci Ercole[4] https://orcid.org/0000-0002-1356-0854

How to cite:
Toledo LV, Salgado PO, Boscarol GT, Januário CF, Brinati LM, Ercole FF. Oxy-hemodynamic effects of different bed baths: a randomized crossover clinical trial. Acta Paul Enferm. 2022;35:eAPE02116.

DOI
http://dx.doi.org/10.37689/acta-ape/2022A00211666

Keywords
Baths; Intensive Care Units; Hemodynamics; Body temperature changes

Descritores
Banhos; Unidades de Terapia Intensiva; Hemodinâmica; Alterações na temperatura corporal

Descriptores
Baños; Unidades de Cuidados Intensivos; Hemodinámica; Cambios em la temperatura corporal

Submitted
August 1, 2021

Accepted
December 7, 2021

Corresponding author
Luana Vieira Toledo
E-mail: luana.toledo@ufv.br

Associate Editor (Peer review process):
Camila Takao Lopes
(https://orcid.org/0000-0002-6243-6497)
Escola Paulista de Enfermagem, Universidade Federal de São Paulo, SP, Brazil

Abstract

Objective: To compare the bed bath execution time using the traditional and dry method and its effects on the oxy-hemodynamic changes in critically ill patients.

Methods: This is a crossover, open, randomized clinical trial, with 50 patients submitted to two types of bed bath: traditional and dry. The duration of the baths and the oxy-hemodynamic variables (tympanic and axillary temperature, arterial oxygen saturation, respiratory rate, heart rate and mean arterial pressure), obtained at the beginning of the baths, at ten minutes, at the beginning and at the end of patient lateralization, at the end of the procedure and 15 minutes later. Paired Student's t-test and generalized estimating equations model were used for analysis.

Results: Dry bed bath was performed in less time than the traditional bath (18.59 versus 26.45 minutes; p<0.001). In traditional bath, over time, there was a reduction in axillary temperature and an increase in respiratory rate (p<0.001). In the dry bath, only the axillary temperature changed, becoming lower than the initial value (p<0.001).

Conclusion: Dry bath was superior to the traditional one, due to the shorter time of execution and lesser oxy-hemodynamic instability of patients between the periods observed. Monitoring patients is essential to identify such changes.

Resumo

Objetivo: Comparar o tempo de execução do banho no leito pelo método tradicional e a seco e seus efeitos sobre as alterações oxi-hemodinâmicas em pacientes críticos.

Métodos: Ensaio clínico randomizado crossover, aberto, com 50 pacientes submetidos aos dois tipos de banho no leito: tradicional e a seco. Avaliou-se o tempo de execução dos banhos e as variáveis oxi-hemodinâmicas (temperatura timpânica e axilar, saturação de oxigênio arterial, frequência respiratória, frequência cardíaca e pressão arterial média), obtidas no início dos banhos, aos dez minutos, no início e no fim da lateralização dos pacientes, ao final do procedimento e 15 minutos depois. Para análise utilizou-se Teste T de *Student* pareado e modelo de equações de estimação generalizadas.

Resultados: O banho no leito a seco foi executado em menor tempo que o tradicional (18,59 *versus* 26,45 minutos; p<0,001). No banho tradicional, ao longo do tempo, houve redução da temperatura axilar e elevação da frequência respiratória (p<0,001). No banho a seco, apenas a temperatura axilar sofreu alteração, tornando-se menor que o valor inicial (p<0,001).

[1]Department of Medicine and Nursing, Universidade Federal de Viçosa, Viçosa, MG, Brazil.
[2]Hospital of Clinics, Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil.
[3]Faculty of Nursing, Centro Universitário UNIFAMINAS, Muriaé, MG, Brazil.
[4]School of Nursing, Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil.
Conflicts in interest: nothing to declare.

Conclusão: O banho a seco foi superior ao tradicional em decorrência do menor tempo de execução e menor instabilidade oxi-hemodinâmica dos pacientes entre os períodos observados. A monitorização dos pacientes é fundamental para identificar tais alterações.

Resumen

Objetivo: Comparar el tiempo de ejecución del baño en cama mediante el método tradicional y a seco y sus efectos sobre las alteraciones oxihemodinámicas en pacientes críticos.

Métodos: Ensayo clínico aleatorizado crossover, abierto, con 50 pacientes sometidos a dos tipos de baño en cama: tradicional y a seco. Se evaluó el tiempo de ejecución de los baños y las variables oxihemodinámicas (temperatura timpánica y axilar, saturación del oxígeno arterial, frecuencia respiratoria, frecuencia cardíaca y presión arterial promedio), obtenidas al comienzo de los baños, a los diez minutos, al comienzo y al final de la lateralización de los pacientes, al final del procedimiento y 15 minutos después. Para el análisis se utilizó el Test-T de *Student* pareado y el modelo de ecuaciones de estimación generalizadas.

Resultados: El baño en cama a seco fue ejecutado en menor tiempo que el tradicional (18,59 versus 26,45 minutos; p<0,001). En el baño tradicional, a lo largo del tiempo, hubo reducción de la temperatura axilar y elevación de la frecuencia respiratoria (p<0,001). En el baño a seco, solo la temperatura axilar estuvo alterada, fue menor que el valor inicial (p<0,001).

Conclusión: El baño a seco fue superior al tradicional como consecuencia del menor tiempo de ejecución y menor inestabilidad oxihemodinámica de los pacientes entre los períodos observados. El monitoreo de los pacientes es fundamental para identificar tales alteraciones.

Brazilian Clinical Trials Registry (ReBEC): RBR-5qwkqd

Introduction

Due to the severity of the health condition, most critically ill patients are not able, by themselves, to bathe, and the nursing team is responsible for performing it in the form of a bed bath.[1,2] Traditionally, bed baths are performed using compresses, bath towels, soap, water, sheet, gloves, basin and pitcher.[3] However, studies show the association of this intervention with a reduction in arterial oxygen saturation (SpO_2) and body temperature, in addition to an increase in heart rate (HR).[4,5]

In this context, the dry bed bath has been an alternative of choice for nursing professionals to the detriment of traditional bed bath. For its realization, pre-moistened cotton towels in an emollient and moisturizing solution, free of soap and alcohol, are used.[6] The performance of this new bath method in removing dirt and skin microbiota has been shown to be similar to the traditional bed bath method.[7,8] Results of a Brazilian clinical study demonstrated the superiority of dry bath in removing the microbial load from hospitalized patients.[3] However, it appears that there is still a shortage of studies with high scientific evidence that assess this nursing care technology, especially with regard to its effect on the oxy-hemodynamic variables of critically ill patients.[6] It is noteworthy the presence of a quasi-experimental study that compared the two bed bath methods and identified benefits of dry bath, especially in maintaining blood pressure (BP) and respiratory rate (RR).[9]

Considering that the dry bed bath is an alternative to the traditional method, it is essential to recognize the effects generated by this care technology on critically ill patients. Thus, the existence of differences between the execution time and the effects of these two types of baths on the oxy-hemodynamic variables in critically ill patients is questioned. From studies that seek to answer this question, it will be possible to implement care that promotes the maintenance of patients' body hygiene in a safer way.

Considering the lack of knowledge about the best nursing care in performing a bed bath, this study was carried out with the aim of comparing the bed bath duration with the traditional and dry methods and its effects on oxy-hemodynamic changes in critically ill patients.

Methods

This is an open, crossover, randomized clinical trial based on the CONSORT guideline for crossover trials.[10] The duration of traditional and dry baths, and the effects on oxy-hemodynamic changes in critically ill patients admitted to an Intensive Care Unit (ICU) of a teaching hospital, were assessed.

The aforementioned ICU has six beds, aimed at caring for critically ill patients resulting from clinical and surgical conditions. The ICU's room temperature is kept between 21 and 24°C, according to institutional protocol. In each 12-hour shift, the team of ICU professionals is made up of two nurses, a coordinator and an on-call doctor, two doctors, a physiotherapist and four nursing technicians, responsible for carrying out the interventions to maintain patients' body hygiene, in the beginning of each shift.

The study population consisted of all critically ill patients admitted to the aforementioned ICU, between September 2018 and February 2019. Critical patients aged 18 years or over and who presented the nursing diagnosis "Bathing self-care deficit" were included in the sample. Patients with alterations that affected the regulation of body temperature, such as neurological alterations and extensive burns, were excluded. Discontinuity from the study, discharge from the ICU, transfer or death before receiving the two types of bed bath was adopted.

The sample size was calculated from the results of a pilot study that included 15 critically ill patients undergoing both types of bed baths. In the pilot study, it was observed that the traditional bed bath had a longer performance than the dry bath and triggered increases in patients' RR. The dry bath, in turn, did not cause significant changes in the respiratory parameters of patients, which was also found in this study.[6] For sample size calculation, the difference in mean RR of patients between the two types of bed bath at different times was used: at the beginning of the bath (1.47), at ten minutes of execution (7.2), at the beginning and end of patient lateralization (4.87 and 0.13 respectively), at the end of the bath (3.93) and 15 minutes after closing (2.93). RR was chosen as a parameter for the sample calculation due to its clinical importance for critically ill patients and because it was the variable that estimated the largest sample. The calculation was performed using the Repeated Measures with Attrition: Sample Sizes for 2 Groups (RMASS2®), adopting a statistical power of 80% and a significance level of 5%. A correlation of 0.6 between repeated measures was considered. A sample of 47 participants was estimated and 50 patients were included in the sample.

Participants were randomized, by a researcher outside the study, into blocks with ten people, containing the permutation of the order in which the two types of bed bath (traditional and dry) were performed. The website (http://www.randomization.com/) was used. The random sequence of baths for each patient was distributed in sequential, numbered, opaque and sealed envelopes by the same external researcher. The envelopes were opened by the researchers only when the baths were performed. During the course of the study, it was not possible to guarantee the blinding of researchers and participants given the existence of differences between the types of baths to be performed. However, the outcomes were collected by an auxiliary researcher, a nurse, previously trained to accurately record the information, who did not know the study objectives/hypotheses and remained at the bedside, monitoring the timer and recording the variables assessed.

Each bath's execution time, obtained from a digital stopwatch (Stopwatch® ZSD-009) and recorded in minutes, were considered as primary outcomes, and oxy-hemodynamic variables tympanic temperature obtained from the auricular digital clinical thermometer (Incoterm® TH809), recorded in degrees Celsius (ºC); Axillary temperature, used in the routine of the researched institution, obtained by axillary digital clinical thermometer (G-TECH® TH1027) and recorded in ºC; SpO2, measured from an adult oximetry sensor coupled to the multi-parameter monitor (Dixtal® Dx2023) and recorded in percentage (%); RR, measured by thoracic impedance measurements from the electrocardiogram electrodes of the multiparameter monitor (Dixtal® Dx 2023) or the mechanical ventilator (Newport® E 360br) and recorded in respiratory incursions per minute (irpm); HR, obtained from the electrodes of the multiparameter monitor (Dixtal Dx® 2023) and recorded in beats per minute (bpm); and mean arterial pressure (MAP), collected from the multiparameter monitor (Dixtal Dx® 2023), by the oscillometric method and recorded in millimeters of mercury (mmHg). The oxy-hemodynamic variables were measured at six times: at the beginning of each procedure (T0); after ten minutes of execution (T1); at the beginning and end of patient lateralization for dorsal hygiene (T2 and T3, respectively); at the end of the bath (T4); and 15 minutes after its closure (T5).

In addition to the primary outcomes, data related to environmental issues, such as ambient temperature and humidity, obtained from a thermo-hygrometer (Incoterm® 7663), recorded in ºC and %, and clinical condition of patients (age, sex, origin, Braden scale score, use of medications, use of invasive devices, hemoglobin dosage, hematocrit concentration and presence of complications during interventions) were recorded.

Each participant received both types of bed baths, with an interval of 24 hours between them (washout period), in order to avoid a residual effect of one intervention over the other (carryover). The decision on which bath would be performed first (traditional or dry) was made based on the randomization sequence, which defined the order of execution of the baths in each patient. They were considered to belong to the Control Group (CG) during the traditional bed bath and to the Experimental Group (EG) when they received the dry bath.

The baths were performed by two nurses (principal researcher and an assistant researcher). All baths were carried out uninterruptedly, and hygiene of the oral cavity and scalp was not performed during the procedures. In both baths, the sequence of carrying out the areas for body hygiene followed the cephalopodal direction - from the least contaminated region to the most contaminated. Each part of the body was exposed only at the time of cleaning, being kept protected by a copper bed while it was not being cleaned. The head of the bed was kept at 45º throughout the execution of the interventions.[6] During the traditional bed bath, the bath water temperature was monitored by a thermo-hygrometer (Incoterm® 7663) and maintained at or above 40°C, considered as a protective effect for oxy-hemodynamic changes.[5]

The collected data were entered by two researchers into Microsoft Office Excel, version 2013. Descriptive and inferential analysis was performed using SPSS, version 22. The Kolmogorov-Smirnov test was applied to verify data normality. Paired tests (Wilcoxon test, Paired Student's t-test and McNemar test) were used to assess the homogeneity of patients' clinical conditions during the two interventions. The absence of a statistically significant difference between the values of the oxy-hemodynamic variables measured at the beginning of each bath was assessed, in order to confirm the possibility of comparing the groups.

Comparison of the mean time to perform the two types of bed baths was performed using the paired Student's t-test. To assess the effect of bathing over time on the primary outcomes (oxy-hemodynamic variables), generalized estimating equations (GEE) were used. The traditional bath and the mean of each oxy-hemodynamic variable obtained at T0 were fixed as a reference standard. It was verified the existence of statistically significant differences from the model parameters for each oxy-hemodynamic variable.

The model was adjusted by the covariates: Braden scale, medications (sedatives, vasoconstrictors, vasodilators); invasive devices (continuous infusion pump, peripheral venous access, central venous access, indwelling urinary catheter, nasoenteric catheter, orotracheal tube, tracheostomy, mechanical ventilation, nasal catheter oxygen therapy, face mask oxygen therapy, drains, ostomies, hemoglobin and hematocrit dosage).

To compare the means of oxy-hemodynamic variables during each of the two types of baths, the Bonferroni post hoc multiple comparison test was applied, identifying which means were really different. A p value <0.05 was considered statistically significant.

The study was approved by the Research Ethics Committee of the sponsoring institution (Opinion 2550.114) (CAAE (*Certificado de Apresentação para Apreciação Ética* - Certificate of Presentation for Ethical Consideration) 84050118.3.0000.5149) and registered on the Brazilian Clinical Trials Registry (ReBEC - *Registro Brasileiro de Ensaios Clínicos*) platform under RBR-5qwkqd, UTN U1111-1218-0075. Patients who met the inclusion criteria and had a preserved level of consciousness were instructed about the research objectives and invited to participate in its realization by signing the Informed Consent Form. Patients who presented altered level of consciousness, such as those using sedatives, were included in the research with the authorization of their leg representative.

Results

Of the 54 patients eligible to participate in the study, four died before receiving the second type of bath. Participants who did not complete follow-up (two types of bed bath) were not included in the study analysis and were replaced. All patients included in the analysis received a bed bath by the traditional and dry method, following the order of randomization, with an interval of 24 hours between them. Thus, patients who were randomized to Group 1, initially received dry bed bath, remained without any bath for 24 hours, and subsequently received the traditional bed bath. For patients randomized to Group 2, the bath order was reversed, starting with the traditional bed bath method, ending with a dry bed bath. Figure 1 illustrates the flowchart of recruiting study participants.

The mean age of patients was 68.64 years (±18.99 years). There was a predominance of male patients (28 – 56.00%), coming from the emergency services (20 – 40.00%) and who were not using sedative drugs (40 - 80.00%). Data referring to patients' clinical condition during the two baths did not show statistically significant differences, which confirms the homogeneity between the groups. The mean time of execution of the two baths was statistically different. Dry bed bath was considered faster than traditional bed bath ($p<0.001$). The traditional method of taking a bed bath lasted about 26.45 minutes (CI 95% 25.07 – 27.82). Dry bed bath lasted about 18.59 minutes (95% CI 17.41 – 19.77). No statistically significant differences were identified in temperature (CG = 24.13°C ±0.92; EG = 24.33°C ±0.99) and humidity in the ICU environment (CG = 60.20% ±9.37; EG =

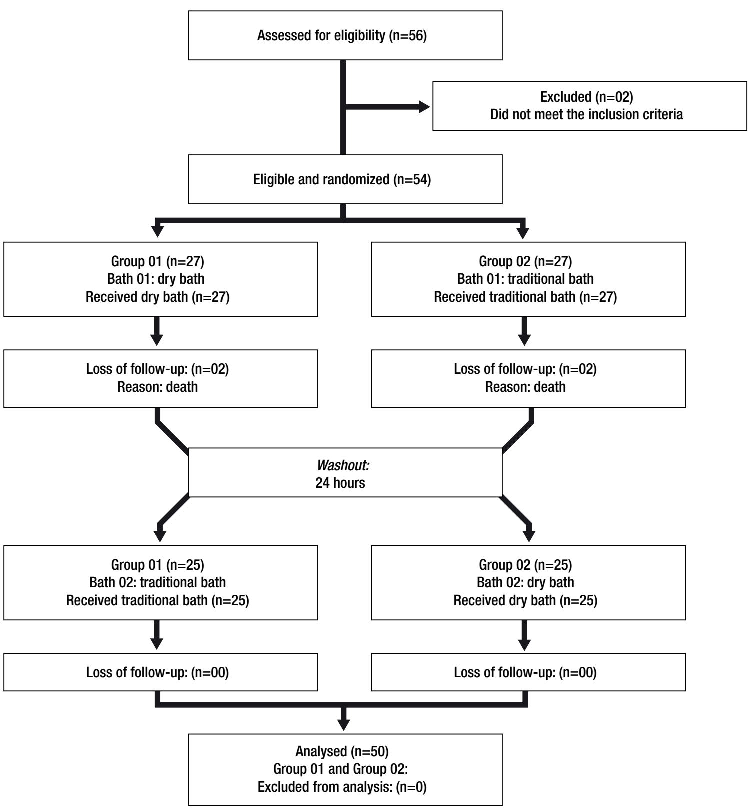

Figure 1. Flowchart of procedures for inclusion, allocation, follow-up and analysis of the research sample (n=50)

Table 1. Comparison of the mean differences of the oxy-hemodynamic variables of critically ill patients between traditional bed bath and dry bed bath (n=50)

Variables/time	Traditional bath m (SD)	Dry bath m (SD)	p-value[1]	95% CI
Tympanic temperature (°C)				
T0	37.09 ±0.70	37.00 ±0.67	1.000	-0.37;0.55
T1	37.11 ±0.78	37.01 ±0.66	1.000	-0.39;0.58
T2	37.04 ±0.70	37.00 ±0.71	1.000	-0.43;0.51
T3	37.07 ±0.76	37.03 ±0.66	1.000	-0.43;0.52
T4	37.13 ±0.73	37.08 ±0.68	1.000	-0.43;0.51
T5	37.07 ±0.70	37.01 ±0.66	1.000	-0.40;0.51
Axillary temperature (°C)				
T0	36.34 ±1.00	36.09 ±0.91	1.000	-0.39;0.89
T1	35.93 ±0.97	35.74 ±0.95	1.000	-0.45;0.83
T2	35.93 ±0.96	35.72 ±0.96	1.000	-0.43;0.85
T3	36.11 ±1.01	35.86 ±1.06	1.000	-0.45;0.93
T4	36.12 ±0.90	35.92 ±0.90	1.000	-0.40;0.80
T5	36.18 ±0.92	35.95 ±0.87	1.000	-0.36;0.83
Arterial oxygen saturation (%)				
T0	96.64 ±2.90	96.50 ±3.11	1.000	-1.86;2.14
T1	95.96 ±4.03	94.72 ±4.57	1.000	-1.63;4.11
T2	95.44 ±3.58	94.84 ±4.62	1.000	-2.15;3.35
T3	95.02 ±4.00	95.62 ±3.60	1.000	-3.14;1.94
T4	95.66 ±4.31	95.62 ±3.81	1.000	-2.67;2.75
T5	96.24 ±2.94	96.20 ±3.11	1.000	-1.98;2.06
Respiratory rate (irpm)				
T0	21.26 ±7.54	21.04 ±6.51	1.000	-4.48;4.92
T1	23.38 ±8.17	22.46 ±8.51	1.000	-4.64;6.48
T2	23.70 ±7.68	22.44 ±8.26	1.000	-4.06;6.58
T3	24.58 ±8.34	23.06 ±8.38	1.000	-4.05;7.09
T4	23.58 ±7.70	22.38 ±8.04	1.000	-4.05;6.45
T5	20.96 ±6.75	20.56 ±7.58	1.000	-4.39;5.19
Heart rate (bpm)				
T0	86.86 ±19.21	81.88 ±17.41	1.000	-7.25;17.21
T1	87.10 ±17.78	83.38 ±17.09	1.000	-7.91;15.35
T2	88.82 ±18.53	83.28 ±16.93	1.000	-6.30;17.38
T3	88.74 ±19.08	84.80 ±17.47	1.000	-8.26;16.14
T4	87.60 ±19.28	84.62 ±19.49	1.000	-9.95;15.91
T5	85.92 ±21.21	80.78 ±17.28	1.000	-7.76;18.04
Mean arterial blood pressure (mmHg)				
T0	95.44 ±17.03	97.30 ±20.10	1.000	-14.28;10.56
T1	97.32 ±19.43	93.66 ±22.16	1.000	-10.24;17.56
T2	94.62 ±22.81	93.90 ±21.48	1.000	-14.05;15.49
T3	97.64 ±25.69	92.46 ±20.81	1.000	-10.41;20.77
T4	96.58 ±17.48	97.02 ±20.52	1.000	-13.51;12.27
T5	92.54 ±17.98	92.84 ±16.94	1.000	-11.95;11.35

[1]Post hoc Bonferroni analysis; 95% CI - 95% Confidence Interval; T0 - start of the bath; T1 - ten minutes after starting the bath; T2 - beginning of patient lateralization; T3 - end of patient lateralization; T4 - end of bath; T5 - 15 minutes after the end of the bath

Table 2. Comparison of the mean differences of critical patients' oxy-hemodynamic variables over time during traditional bed bath and dry bed bath (n = 50)

Time	Traditional bath		Dry bath	
	Difference of means	p-value[1]	Difference of means	p-value[1]
Tympanic temperature (°C)				
T0-T1	37.09 - 37.11	1.000	37.00 - 37.01	1.000
T0-T2	37.09 - 37.04	1.000	37.00 - 37.00	1.000
T0-T3	37.09 - 37.07	1.000	37.00 - 37.03	1.000
T0-T4	37.09 - 37.13	1.000	37.00 - 37.08	1.000
T0-T5	37.09 - 37.07	1.000	37.00 - 37.01	1.000
Axillary temperature (°C)				
T0-T1	36.34 - 35.93	<0.001*	36.09 - 35.74	0.001*
T0-T2	36.34 - 35.93	<0.001*	36.09 - 35.72	<0.001*
T0-T3	36.34 - 36.11	0.013*	36.09 - 35.86	0.015*
T0-T4	36.34 - 36.12	0.020*	36.09 - 35.92	0.038*
T0-T5	36.34 - 36.18	0.424	36.09 - 35.95	0.155
Arterial oxygen saturation (%)				
T0-T1	96.64 - 95.96	1.000	96.50 - 94.72	0.077
T0-T2	96.64 - 95.44	0.192	96.50 - 94.84	0.376
T0-T3	96.64 - 95.02	0.137	96.50 - 95.62	0.597
T0-T4	96.64 - 95.66	1.000	96.50 - 95.62	0.930
T0-T5	96.64 - 96.24	1.000	96.50 - 96.20	1.000
Respiratory rate (irpm)				
T0-T1	21.26 - 23.38	0.557	21.04 - 22.46	1.000
T0-T2	21.26 - 23.70	0.247	21.04 - 22.44	1.000
T0-T3	21.26 - 24.58	0.029*	21.04 - 23.06	1.000
T0-T4	21.26 - 23.58	0.933	21.04 - 22.38	1.000
T0-T5	21.26 - 20.96	1.000	21.04 - 20.56	1.000
Heart rate (bpm)				
T0-T1	86.86 - 87.10	1.000	81.88 - 83.38	1.000
T0-T2	86.86 - 88.82	1.000	81.88 - 83.28	1.000
T0-T3	86.86 - 88.74	1.000	81.88 - 84.80	0.597
T0-T4	86.86 - 87.60	1.000	81.88 - 84.62	1.000
T0-T5	86.86 - 85.92	1.000	81.88 - 80.78	1.000
Mean arterial blood pressure (mmHg)				
T0-T1	95.44 - 97.32	1.000	97.30 - 93.66	1.000
T0-T2	95.44 - 94.62	1.000	97.30 - 93.90	1.000
T0-T3	95.44 - 97.64	1.000	97.30 - 92.46	1.000
T0-T4	95.44 - 96.58	1.000	97.30 - 97.02	1.000
T0-T5	95.44 - 92.54	1.000	97.30 - 92.84	0.367

[1]Post hoc Bonferroni analysis; T0 - beginning of the bath; T1 – ten minutes after starting the bath; T2 - beginning of patient lateralization; T3 - end of patient lateralization; T4 - end of bath; T5 - 15 minutes after the end of the bath. *Statistically significant ($p < 0.05$)

60.64% ±8.75) between the two types of bed bath. Regarding the comparison of oxy-hemodynamic variables between groups, no significant differences were found, as shown in Table 1.

Over time, it was found that, regardless of the type of bath, ax T° suffered a reduction when compared to baseline values. Furthermore, it was found that at the end of patient lateralization (T3) during the traditional bed bath, RR underwent a statistically significant increase ($p = 0.029$) compared to the value initially measured (Table 2).

Discussion

In this study, the dry bath execution mean time was shorter than that of the traditional method and statistically different. This finding reinforces the results of other researches in which the dry bath was also carried out in less time.[6,9] It is believed that the greater agility in carrying out this bathing method may be related to its operationalization, which excludes the rinsing and drying steps present in traditional bed bath.

The shorter running time of dry bath can be considered an advantage for patients, professionals and managers.[11,12] For critically ill patients, bed bath presents risks for oxy-hemodynamic stability when its execution exceeds 20 minutes.[5] For nursing professionals, less time spent in dry bath means less work overload and less physical strain.[12] Managers can benefit from the lower operating cost of dry bed bath, when compared to traditional bath, taking into account the human and material resources involved.[12]

Regarding the effect of the baths, during the performance of dry bath, only the change in axillary temperature was considered significant. It is believed that, in this study, the high technical rigor and the use of copper bed protection, with exposure of areas to be cleaned only at the time of cleaning, may have contributed to the absence of significant changes in the other oxy-hemodynamics variables. However, in the daily routine of health services, it is observed that professionals do not prioritize technical rigor when bathing in the bed. It has been carried out mechanically and the monitoring of patients during its execution has been neglected by the nursing team, which makes it difficult to recognize changes that have occurred.[13,14]

It was found that in both interventions, the effect of axillary temperature reduction was considered transitory, as 15 minutes after the end of the baths, values were close to the baseline. Despite being transient, heat loss should not be ignored and, therefore, measures to minimize it should be encouraged. The findings of a systematic review showed that the application of a hot towel on patients' skin before starting the bath ensures the supply of heat, being a useful intervention to avoid a reduction in body temperature and to promote greater comfort for patients undergoing the bed bath.[15] Furthermore, it cannot be ignored that axillary temperature can be influenced by variables such as age, HR, BP and room temperature.[16] Thus, it is important that care is provided individually, taking into account individual and environmental issues.[17]

In addition to body temperature, negative effects of the traditional bed bath were also observed on the RR values measured at the end of patient lateralization. The mean at that time was considered higher and statistically different from the RR obtained at the beginning of the procedure. Similarly, a study conducted with critical cardiovascular patients identified changes in this variable as a result of manipulation and frequent change of position during traditional bed bath.[18] This finding may be related to the fact that during lateralization, patients remain with a smaller body area in direct contact with the bed, which can generate body imbalance and, consequently, hemodynamic instability.

Therefore, it is understood that the monitoring of patients during the bed bath should be seen as an inseparable part of the procedure, in order to contribute to the implementation of a safer practice. The shorter execution time and the presence of significant changes only in the axillary temperature mean that dry bed bath is seen as a promising alternative method to traditional bed bath. However, considering that traditional bed bath is still widely used in health services, nurses should perform it in the shortest time possible, maintaining continuous oxy-hemodynamic monitoring and respecting the technical rigor of the procedure.

Among the study limitations, it should be noted that blinding of researchers and participants was not used due to the existence of differences between the types of baths. However, the outcomes were collected by an auxiliary researcher who did not know the study's objectives/hypotheses and did not participate in the execution of body hygiene procedures. Finally, the generalization of results is limited, since the study setting comprises a single ICU. However, it is noteworthy that the sample in this study was larger than that used in most clinical studies on bed baths found in the literature.

Conclusion

This study showed that the dry bed bath was faster than traditional bed bath. Regarding the effects generated by the baths on oxy-hemodynamic variables, it was found that when comparing groups, no significant differences were found. When comparing the effect of time, it was observed that during the traditional bath there was a reduction in axillary temperature and an increase in respiratory rate. During dry bath, in turn, only the reduction in axillary temperature was statistically significant. Considering that bed bath is a routine activity of ICU nursing team, the identification of the best intervention, based on an adequate protocol and based on the best evidence, can impact the quality of care provided. Thus, it is believed that the positive aspects of dry bed bath found in this study can be used as justifications for its incorporation into the routine of health services. Also, the importance of clinical assessment of patients before and during bathing is highlighted, in order to prevent the occurrence of possible oxy-hemodynamic changes.

Acknowledgments

We would like to thank the Minas Gerais Research Support Foundation (FAPEMIG - *Fundação de Amparo à Pesquisa do Estado de Minas Gerais*) – (Project 195425) and the Brazilian National Council for Scientific and Technological Development (CNPq - *Conselho Nacional de Desenvolvimento Científico e Tecnológico*) (Project 193627), for the approval of scientific initiation grants for assistant researchers.

Collaborations

Toledo LV, Salgado PO, Boscarol GT, Januário CF, Brinati LM and Ercole FF declare that they contributed to study design, data analysis and interpretation, article writing, relevant critical review of intellectual content and approval of the final version to be published.

References

1. Costa GS, Souza CC, Diaz FB, Toledo LV. Bed bath in critical care patients: an integrative review. Rev Baiana Enferm. 2018;32(1):e20483.
2. Toledo LV, Sampaio NV, Brinati LM, Domingos CS, Salgado PO, Ercole FF. Different types of bath in critically ill patients and factors associated with bed bathing. Rev Min Enferm. 2021;25:e-1353.
3. Paulela DC, Bocchi SC, Mondelli AL, Martin LC, Sobrinho AR. Effectiveness of bag bath on microbial load: clinical trial. Acta Paul Enferm. 2018;31(1):7-16.
4. Asfour HI. Oxygen desaturation and nursing practices in critically Ill patients. J Nurs Health Science. 2016;5(2):85-94.
5. Silva CJ, Santos Silva ME, Reis FF, Miranda GC, Santos L, Lima DV. Bed bath for infarcted patients: crossover of the hydrothermal control 40ºC versus 42.5ºC. Online Braz J Nurs. 2016;15(3):341-50.
6. Toledo LV, Salgado PO, Souza CC, Brinati LM, Januario CF, Ercole FF. Effects of dry and traditional bed bathing on respiratory parameters: a randomized pilot study. Rev Lat Am Enfermagem. 2020;28:e3264.
7. Matsumoto C, Nanke K, Furumura S, Arimatsu M, Fukuyama M, Maeda H. Effects of disposable bath and towel bath on the transition of resident skin bacteria, water content of the stratum corneum, and relaxation. Am J Infect Control. 2019;47(7):811-5.
8. Veje PL, Chen M, Jensen CS, Sorensen J, Primdahi J. Effectiveness of two bed bath methods in removing microorganisms from hospitalized patients: a prospective randomized crossover study. Am J Infect Control. 2020;48(6):638-43.
9. Ramos JM, Consuegra RV, Urrego KA. Modelo de adaptação de Roy em el baño en cama. Av Enferm. 2016;34(3):215-25.
10. Dwan K, Li T, Altman DG, Elbourne D. CONSORT 2010 statement: extension to randomized crossover trials. BMJ. 2019;366:14378.
11. Groven FM, Zwakhalen SM, Odekerken-Schröder G, Joosten EJ, Hamers JP. How does washing without water perform compared to the traditional bed bath: a systematic review. BMC Geriatrics. 2017;17:31.
12. Hordam B, Brandsen RV, Frandsen TK, Bing A, Stuhaug HN, Petersen K. Nurse-assisted personal hygiene to older adults 65+ in home care setting. J Nurs Educ Practice. 2018;8(2):23-8.
13. Marins IF, Cruz IC. Patient safety in personal hygiene of ICU patients: systematic literature review for a clinical protocol. J Specialized Nurs Care. 2016;8(1). Review.
14. Bastos SR, Gonçalves FA, Bueno BR, Silva GS, Ribeiro KR, Brasil VV. Bed-bath: the care-omitting behavior of the nursing team. Rev Fund Care Online. 2019;11(3):627-33.

15. Konya I, Nishiya K, Yano R. Effectiveness of bed bath methods for skin integrity, skin cleanliness and comfort enhancement in adults: a systematic review. Nursing Open. 2021;00:1-17.

16. Yoshihara T, Zaitsu M, Ito K, Chung E, Matsumoto M, Manabe J, et al. Statistical analysis of the axillary temperatures measured by a predictive electronic thermometer in healthy Japanese adults. Int J Environ Res Public Health. 2021;18(10):5096.

17. Toledo LV, Santos BX, Salgado PO, Souza LM, Brinati LM, Januário CF, et al. Changes in body temperature of critically ill patients submitted to bed bathing: a crossover clinical trial. Rev Bras Enferm. 2021;74(2):e20200969.

18. Silva LF, Miranda AF, Silva FV, Rabelo AC, Almeida PC, Ponte KM. Vital signs and nursing procedures in postoperative period of cardiac surgery. Rev Enferm UFPE On Line. 2014;8(3):719-25.