

ORIGINAL ARTICLE

**Assessment of technique and adherence to hand hygiene in the central of materials and sterilization center**

*Avaliação da técnica e adesão à higiene de mãos no centro de materiais e Esterilização*  
*Evaluación de la técnica y adherencia a la higiene de manos en el centro de materiales y esterilización*

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**ABSTRACT**

**Background and Objectives:** Hand hygiene should be encouraged among the nursing team of the materials and sterilization center, as various processes can be sources of microorganism transmission. The objective is to assess the quality of hand hygiene technique and adherence in the materials and sterilization center, according to the recommendations of the World Health Organization. **Methods:** This is an observational, descriptive, and prospective study, in which weekly visits were conducted from February to May 2023. On-site direct observation was used, followed by notes on an adapted form. **Results:** Out of 364 observations made, only 91 (25%) performed hand hygiene, and only 7 (1.9%) executed the correct technique. Moments with the highest adherence were upon arrival at the unit (35.1%), upon leaving the unit (12.1%), and before handling packaging and health products. Among the supplies used, liquid soap had the highest frequency (51.6%). Males showed higher adherence compared to females ( $p < 0.01$ ). **Conclusion:** Adherence to hand hygiene was low among the nursing staff, and few executed the correct technique according to the steps recommended by the World Health Organization. The results underscore the need for awareness-raising and training actions regarding this preventive measure in the materials and sterilization center.

**Keywords:** *Hand disinfection. Sterilization. Nursing. Infection Control.*

**RESUMO**

**Justificativa e Objetivos:** A higienização das mãos deve ser incentivada entre a equipe de enfermagem do centro de materiais e esterilização, uma vez que diversos processos podem ser fontes de transmissão de microrganismos. O objetivo é avaliar a qualidade da técnica e adesão

à higiene de mãos no centro de materiais e esterilização de acordo com as recomendações da Organização Mundial da Saúde. **Métodos:** Este é um estudo observacional, descritivo e prospectivo, no qual foram realizadas visitas semanais durante o período de fevereiro a maio de 2023. Utilizou-se observação direta no local e, posteriormente, foram feitas anotações em um formulário adaptado. **Resultados:** No total de 364 observações realizadas, apenas 91 (25%) realizaram a higienização das mãos, e somente 7 (1,9%) executaram a técnica correta. Os momentos com maior adesão foram ao chegar à unidade (35,1%), ao sair da unidade (12,1%) e antes de manusear embalagens e produtos para a saúde. Entre os insumos utilizados, o sabonete líquido obteve maior frequência (51,6%). O sexo masculino apresentou maior adesão quando comparado ao feminino ( $p < 0,01$ ). **Conclusão:** A adesão à higiene de mãos foi baixa entre a equipe de enfermagem e poucos realizaram a técnica correta de acordo com os passos recomendados pela Organização Mundial da Saúde. Os resultados reforçam a necessidade de ações de sensibilização e treinamento em relação a esta medida preventiva no centro de materiais e esterilização.

**Descritores:** *Desinfecção das mãos. Esterilização. Enfermagem. Controle de Infecções.*

## RESUMEN

**Justificación y Objetivos:** La higiene de manos debe ser fomentada entre el personal del centro de materiales y esterilización, ya que varios procesos pueden ser fuentes de transmisión de microorganismos. El objetivo de este estudio es evaluar la calidad de la técnica y la adherencia a la higiene de manos en el centro de materiales y esterilización según lo recomendado por la Organización Mundial de la Salud. **Métodos:** Este es un estudio observacional, descriptivo y prospectivo, en el cual se realizaron visitas semanales durante el período de febrero a mayo de 2023. Se utilizó la observación directa en el lugar y, posteriormente, se realizaron notas en un formulario adaptado. **Resultados:** De un total de 364 observaciones realizadas, solo 91 (25%) realizaron la higiene de manos, y solo 7 (1,9%) ejecutaron la técnica correcta. Los momentos con mayor adherencia fueron al llegar a la unidad (35,1%), al salir de la unidad (12,1%) y antes de manipular envases y productos de salud. Entre los suministros utilizados, el jabón líquido tuvo la mayor frecuencia (51,6%). Los hombres mostraron una mayor adherencia en comparación con las mujeres ( $p < 0,01$ ). **Conclusión:** La adherencia a la higiene de manos fue baja entre el personal de enfermería y pocos ejecutaron la técnica correcta según lo recomendado por la Organización Mundial de la Salud. Los resultados refuerzan la necesidad de acciones de sensibilización y capacitación con respecto a esta medida preventiva en el centro de materiales y esterilización.

**Palabras Clave:** *Desinfección de manos. Esterilización. Enfermería. Control de Infecciones.*

## INTRODUCTION

Health Care-Related Infections (HCRI) are defined as those acquired and/or manifested by the patient during the hospitalization period or after discharge, becoming a problem for health services, because they are associated with increased morbidity and mortality.<sup>1</sup> These infections are transmitted by direct and indirect contact, droplets and aerosols, being closely linked to the care that the patient receives, as well as to the hands of health professionals, considered one of the main sources of microorganism dissemination.<sup>2</sup>

In this context, hand hygiene (HH) emerges as a low-cost preventive measure and high capacity to prevent and reduce HCRI, constituting itself as an indicator of quality of care, especially concerning patient safety.<sup>3</sup> Accordingly, in 2009, the World Health Organization (WHO) released the Multimodal Strategy for Improving Hand Hygiene guide containing relevant tools to assist in the implementation of programs aimed at increasing adherence rates and the effectiveness of the technique in health services.<sup>4</sup>

HH is recommended by the WHO at five times during the assistance provided: before contact with the patient, before aseptic procedures, after exposure to organic fluids, after contact with the patient and after contact with the environment where the patient is.<sup>5</sup> The importance of hand hygiene and corresponding actions during observed moments extends beyond the sectors directly involved in direct patient care, reaching also the support sectors that perform indirect functions in the assistance, such as the Materials and Sterilization Center (MSC).

MSC is referred to as a unit responsible for the processing of Health Products (HP), which performs cleaning, inspection, preparation, sterilization or disinfection, storage and distribution for surgical, outpatient and care units, contributing to a safe practice of care. In this support sector, HH should be encouraged among the nursing staff, since several processes can be sources of transmission of microorganisms to the HP.<sup>6</sup>

A cross-sectional study highlighted that, among the moments with pre-established indications for hand hygiene at the sterilization center, only two reached a rate above 50%: at the beginning of the work shift and after removing the gloves.<sup>7</sup> However, the literature still needs to advance in research on the subject, since the research gap refers to the evaluation of this preventive measure, which is directly related only to adherence, without reporting the quality of the technique following the steps recommended by WHO.

This research presents the following guiding questions: Does the nursing team of MSC have a good adherence to hand hygiene? Is the quality of the technique in accordance with the steps recommended by WHO? Thus, the present study is necessary to evaluate this practice in the support sector, since the hands of professionals are directly linked to their health by dealing with contaminated products and with the users of the service, because they constitute a potential source of transmission of microorganisms that may exceed the final minimum biological load, even after all HP processing.

The objective of this study is to evaluate the quality of technique and adherence to hand hygiene in the materials and sterilization center, according to the recommendations of the World Health Organization.

## **METHODS**

### **Design**

This is an observational, descriptive and prospective study of a quantitative nature, conducted at the MSC of a public hospital in Juiz de Fora, MG, Brazil. This research used the tool STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) to guide the construction of methodological steps.<sup>8</sup>

### **Studied scenario**

The hospital is exclusively intended for users of the Unified Health System (UHS) and performs outpatient procedures and high complexity surgeries in the region of Zona da Mata, MG. The MSC is responsible for processing local health products and has an infrastructure that includes an ultrasonic washer and two autoclaves. Standard Operating Procedures (SOP) are available for digital consultation, and training is established according to a schedule prepared by the nurse responsible for the sector.

### **Population**

A sample calculation was performed by the Epi Info<sup>TM</sup> version 7 software to determine the number of observations necessary to achieve the study objectives. The reference population used by the researchers was the average of sterilized HP per month, given the interrelationship between the management of each item by professionals and the prevention of HCRI, including HH. In this scenario, the population size was the average of 6,899 products per month, with an expected frequency of 50%, a sampling error of 5% and a confidence interval of 95%; thus, the minimum sample required was 364 observations. All HH observations were conducted in a population composed of three nurses and 18 nursing technicians.

### **Selection criteria**

The inclusion criteria were: involvement in any phase of processing of HP and appropriate use of institutional identification badge. Maintenance technicians of autoclaves and nursing students were excluded.

### **Data collection**

The data collection was carried out by the researchers themselves in the period from February to May 2023, through weekly visits using direct observation on site and, subsequently, annotations in an adapted form, based on the information from a previous study that evaluated HH in the sterilization center.<sup>7</sup> The instrument contained the following variables: professional

category (nurses or nursing technicians), sex, shift of work, presence (or not) of ornaments during observation, if the hand hygiene was performed (or not), the input used (liquid soap and/or alcohol preparation) and finally the correct technique was performed according to the six steps recommended by WHO.<sup>5</sup> To reduce the Hawthorne effect, which refers to the change in people's behavior due to awareness of being evaluated, unidentified observation and visit at non-scheduled times were adopted.<sup>9</sup>

### **Data analysis**

The data were analyzed by means of simple descriptive statistics to present absolute and relative values about the data collection instrument. The chi-square test, and when necessary, the exact Fisher test, was used to compare the proportions between nominal variables and occupational categories. In this case, the IBM Statistical Package for the Social Sciences version 21 was used. The rate of adherence to HH, as observed by the researchers, was calculated by the following formula: number of HH actions divided by the number of moments observed, multiplied by 100. To calculate the quality of the HH technique, referred to as the proper execution following the six steps of the WHO, the same formula was applied. However, the adherence was considered complete and noted by the researchers only when all items described in the technique were performed by the team.<sup>5</sup>

### **Ethical considerations**

This study was approved by the Research Ethics Committee (REC), under opinion number: 5,660,025 and Certificate of Presentation of Ethical Appreciation (CAAE): 62352022.5.0000.5133, on September 22, 2022. All aspects contained in the Ordinance no 466/2012 and Resolution no 510/2016 of the Ministry of Health were respected.

### **RESULTS**

Of the 364 observations evaluated, only 91 (25.0%) performed hand hygiene and only 7 (1.9%) used the correct technique. It is important to mention that, of the actions observed, 301 were performed by nursing technicians and 63 by nurses. In this sense, a compliance rate of 24.2% was identified, with six actions using the correct technique (2.0%), while nurses' adherence rate was 28.6%, with only one use of the WHO recommended technique (1.6%). Males showed higher adherence to HH when compared to females ( $p < 0.01$ ) (Table 1).

**Table 1.** Evaluation of hand hygiene technique and adherence in the materials and sterilization center, Juiz de Fora, MG, Brazil. (n=364)

Variables	Obs* (n)	Adherence to HH**			Correct technique, according to WHO		
		Actions performed	Rate of adherence (%)	p-value	Actions performed	Rate of adherence (%)	p-value
<b>Professional category</b>							
Nurse	63	18	28.6	0.28 <sup>π</sup>	01	1.6	0.65 <sup>ψ</sup>
Nur. Tec.	301	73	24.2		06	2.0	
Overall rate	364	91	25.0		07	1.9	
<b>Sex</b>							
Female	227	43	18.9	0.00 <sup>π</sup>	03	1.3	0.24 <sup>ψ</sup>
Male	137	48	35.0		04	2.9	

Note: \*Obs = observations; \*\*HH = hand hygiene; <sup>π</sup> = Chi-square test; <sup>ψ</sup> = Fisher's exact test.

The use of liquid soap is the most frequent product when performing the technique (51.6%) and then the alcoholic preparation (44%). Few used the two inputs in a complementary way during the work routine. The use of the product did not have statistical difference between the professional category ( $p > 0.05$ ).

In relation to the moments and opportunities observed during hand hygiene practice, there is a higher adherence of the nursing team when arriving at the unit (35.1%), when leaving the unit (12.1%) and before handling packaging and health products (7.6%) (Table 2).

**Table 2.** Observed moments and actions for hand hygiene in the materials and sterilization center, Juiz de Fora, MG, Brazil. (n=91)

Observed moments	n	Percentage
When arriving the unit	32	35.1
When leaving the unit	11	12.1
Before handling packaging and health products	07	7.6
After putting on gloves	06	6.6
Before assembling boxes and trays	05	5.4
Before handling processed health products (looking for a health product or changing places to clean the shelf)	04	4.4
After administrative activities (using the telephone, computer and books)	04	4.4
Before assembling a load of health products in the autoclave	03	3.3
After checking and recording consignments	03	3.3
At the beginning of the work shift	03	3.3
Before storing processed health products	02	2.2
Before packaging health products (boxes, linens)	02	2.2

Before distributing health products to the units	02	2.2
Before distributing health products to the units	01	1.1
Before removing the load from the autoclave	01	1.1
After recording the unit's productivity	01	1.1
After recording contaminated health products received from consumer units*	01	1.1
After putting on protective gear	01	1.1
After disinfecting benches	01	1.1
Before preparing the Bowie and Dick test	01	1.1

## DISCUSSION

This study showed that, among the 364 observations recorded by the researchers, 25% included the practice of HH, which worsened when evaluating the quality of the technique according to the steps recommended by the WHO, reaching only 1.9%. Low adherence is reported in the literature not only at the sterilization center, but also in care sectors, describing values that vary from 29% to 38.2%, with more than 400 opportunities observed.<sup>5,10</sup>

In the MSC, there are still several gaps regarding the use of this preventive measure as a strategy for preventing HCRI, as demonstrated in this study. Corroborating, a survey conducted in this support sector reinforced that HH was not valued by the nursing team in the clean area, providing an unsafe practice.<sup>7</sup> This finding highlights the urgent need for targeted interventions to improve adherence and quality of hand hygiene in support sectors that provide indirect patient care.

Regarding the use of the correct technique, only seven (1.9%) did it as recommended by WHO, six being performed by nursing technicians and one by a nurse. A cross-sectional study conducted in the operating room of a public hospital in Natal (Brazil) showed that, out of 28 professionals, 19 had errors in relation to the procedure, violating the standardized step-by-step technique.<sup>2</sup>

This research showed that there was greater adherence by male professionals in relation to HH, when compared to female. The literature does not present a relationship between this variable and adherence, requiring further investigation with other methodological approaches to identify the reasons. It is important to mention that the technique performed at the times recommended by WHO still needs to be improved, which should be interpreted with caution. For this reason, educational strategies, the provision of adequate resources, regular supervision and the establishment of an organizational safety culture are fundamental approaches to promote adherence to hand hygiene among health professionals.<sup>1,3,7-10</sup>

In this sense, the literature seeks alternatives to reduce the complexity of the six steps for HH, proposing to reduce them by half, with a new approach to the execution of the technique. A study compared the two hand hygiene techniques in reducing microbial load (six steps of WHO versus three-step friction), showing that the first, respectively, was more effective in reducing microbial load, which requires reinforcing awareness and demystification actions of the complexity of the technique.<sup>11</sup>

Stratifying the data by professional category, this study points to a difference in the adherence rate between nursing technicians and nurses. However, the aspects that contribute to low adherence should be investigated in the work routine. Although the objective of this research is not to identify the factors that affect hand hygiene, it is highlighted that failures were observed related to infrastructure, as the availability of sinks in places of difficult access and the presence of equipment nearby that hinder the execution of the technique. A study published in 2021 listed some difficulties for adherence to patient safety goals by staff, including HH. Among them, the workload, exhaustion, inexperience, lack of knowledge, short time to perform tasks, forgetfulness and lack of observation of attitudes for safe assistance were cited.<sup>12</sup>

As for the most used inputs, the data show that liquid soap is the main choice by nursing staff, representing 51%, while the use of alcoholic preparation was 44%. Similar results were found in other sectors, such as the Neonatal Intensive Care Unit, where HH with water and soap achieved a compliance rate of 74%, while the use of alcohol preparation reached a low rate of 13%.<sup>13</sup> It is worth mentioning the WHO manual for health service professionals, which describes when it is necessary to use water and liquid soap or, preferably, alcoholic preparations.<sup>5,14</sup>

Evaluating the moments and opportunities for hand hygiene in MSC, the highest rates observed were on arrival and departure of the unit, before handling packaging and other HP. These results are similar to those of a survey conducted in Brazil, which found that, among the moments with pre-established indication for HH, only two indices presented satisfactory rates of adherence to the practice: the beginning of the work shift (when arriving at the unit) and after removing the gloves.<sup>7</sup>

The contribution of this study to clinical practice is linked to the results found in relation to adherence, mainly by following the six-step technique recommended by WHO. The values remained at alarming levels, reinforcing the need for permanent education about HH to reduce HCRI, as already pointed out by other researchers.<sup>15</sup>



This study presented a limitation that should be considered, which is the possible influence of the Hawthorne effect. For this reason, it was recommended the hidden observation as a method of evaluation and the alternation of times for data collection.

This study evaluated the hand hygiene practice and the quality of the technique as recommended by WHO. Among the observations made, the data alert to the need for actions that increase the adherence of nursing staff in the materials and sterilization center. Although liquid soap was the most frequently used by health professionals, it is necessary to implement strategies in the sector that aim to guide how to properly perform the technique and the recommended times for performing this preventive measure during the working day.

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#### **Authors' contributions:**

**Bruno Henrique Ataíde da Trindade, Braulio Roberto Gonçalves Marinho Couto and André Luiz Silva Alvim** contributed to the bibliographic research, writing of the abstract, introduction, methodology, discussion, interpretation and description of results, preparation of tables, conclusions, review and statistics. **Bruno Henrique Ataíde da Trindade, Vanessa Albuquerque Alvim de Paula, Thiago César Nascimento, Thais Vidal de Oliveira, Braulio Roberto Gonçalves Marinho Couto and André Luiz Silva Alvim** contributed to the writing of the abstract, critical reading of the manuscript, interpretation and review. **Bruno Henrique Ataíde da Trindade, Braulio Roberto Gonçalves Marinho Couto and André Luiz Silva Alvim** contributed to the writing of the abstract, review and statistics.

All authors have approved the final version to be published and are responsible for all aspects of the work, including ensuring its accuracy and integrity.