



## Hand Hygiene Practices among Nurses in South Sulawesi Hospitals

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### ABSTRACT

Healthcare professionals' adherence to hand hygiene protocols is paramount to prevent Healthcare-Associated Infections (HAIs) and ensure patient safety. This study evaluates compliance with the World Health Organization's (WHO) "Five-Moment Hand Hygiene" protocol among nurses in two Indonesian hospitals: Regional General Hospital X in Makassar City and Provincial General Hospital Y in South Sulawesi Province. A total of 60 nurses participated, with demographic analysis revealing significant differences between the hospitals. Utilizing a comprehensive observation tool provided by the WHO, data analysis indicated variations in hand hygiene practices, particularly after touching patient surroundings. Despite these differences, the data followed a normal distribution, enhancing the reliability of statistical analyses. Significant disparities in hand hygiene practices were found after touching patient surroundings ( $p$ -value = 0.008;  $\alpha$  < 0.05), underscoring the urgent need for targeted interventions among nurses to improve their compliance and enhance patient safety. This study recommends comprehensive training, resource provision, regular audits, fostering a supportive organizational culture, and integrating robust hand hygiene modules into nursing education. The study also suggests further research to identify barriers and improvement strategies. Addressing these recommendations collectively will bolster patient safety and reduce healthcare-associated infection burdens in Indonesian healthcare settings. The study's identification of specific deficiencies in hand hygiene practices provides actionable insights for healthcare administrators, infection control practitioners, and frontline healthcare workers, emphasizing the urgency of sustained efforts to promote proper hand hygiene practices.

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## INTRODUCTION

This study emphasizes the critical need for robust support mechanisms to ensure compliance with World Health Organization (WHO) guidelines, particularly regarding hand hygiene facilities and staff education within hospital settings. Inadequate implementation of hygienic practices has profound implications, as it can lead to an increased risk of procedure or Healthcare-Associated Infections (HAIs), resulting in unnecessary suffering and preventable fatalities. Moreover, insufficient hygienic and secure healthcare practices within hospital settings can have far-reaching consequences, providing broader implications for both the healthcare system and society. For example, these infections not only strain healthcare resources but also impose significant financial burdens on patients and their families.<sup>1</sup>

Furthermore, HAIs can prolong hospital stays, induce long-term disabilities, and contribute to the emergence of antimicrobial resistance, which complicates treatment options and threatens public health on a global scale. Thus, addressing the gaps in implementing hygienic practices is not only essential for patient safety but also critical for ensuring the sustainability and effectiveness of healthcare systems worldwide.<sup>2</sup>

The global impact of HAIs (also known as nosocomial infections), highlighted by the WHO, is alarming, with certain infections causing 1.4 million daily deaths worldwide. Notably, in Europe and the United States alone, nosocomial infections account for tens of thousands of fatalities annually, emphasizing the urgent need for effective management strategies across all healthcare facilities.<sup>3</sup>

Data from reputable sources like the Centers for Disease Control and Prevention (CDC) reveal concerning trends, such as a substantial increase in surveillance of Hospital-Acquired Dermatitis (IAD) and Urinary Tract Infections (UTI) over recent years.<sup>4</sup>

Scholars believe the effectiveness of preventive measures, including hand hygiene protocols, depends on their comprehensive implementation across all hospital units. When conducted comprehensively, these measures not only emphasize the importance of environmental hygiene but also play a crucial role in combating antimicrobial resistance.<sup>5</sup>

To address these challenges, various programs are initiated, ranging from occupational health to infection identification and management, adopting an epidemiological perspective to break the chain of infection.<sup>6</sup> One practical example of such a program is the Infection Prevention and Control (IPC) program.

In Indonesia, adherence to healthcare standards, particularly concerning HAIs, is regulated by the Ministry of Health. Failure to meet these standards can have severe consequences, including the revocation of operating permits for hospitals with high incidences of nosocomial infections. Despite regulatory efforts, current data from hospitals like Robert Wolter Mongisidi Regional Hospital consistently exceed established targets, indicating persistent challenges in infection control.<sup>7</sup>

In hospital practice, hand hygiene should follow specific guidelines, such as the Five Moments for Hand Hygiene, outlined by the WHO. These moments include those before touching a patient, before cleaning/aseptic procedures, after body fluid exposure risk, after touching a patient, and after touching a patient surrounding. To adhere to these guidelines, healthcare workers should follow specific steps for hand hygiene.<sup>8</sup>

The steps involve wetting hands with water, applying enough soap to cover all hand surfaces, rubbing hands palm to palm to create lather, rubbing the palms together with fingers interlocked, rubbing the backs of fingers against the opposing palm with fingers interlocked, rubbing the left thumb rotationally clasped in the right palm, and vice versa, rubbing rotational rubbing of the right palm over the back of the left hand with fingers interlaced, and vice versa, rinsing hands thoroughly with water, drying hands thoroughly with a single-use towel or air dryer, and using the towel to turn off the faucet and disposing of it properly.

As argued earlier, effective implementation of hand hygiene protocols at these key moments is essential for preventing HAIs and reducing the risk of antimicrobial resistance. By adhering to these guidelines, hospitals can enhance patient safety and contribute to overall infection control efforts.

Among health professionals in the hospital role, nurses are prone to acquiring infections

and transmitting infectious agents. Thus, they play a significant role in healthcare settings. Furthermore, the comparison between nurses in provincial and city hospitals is essential. This comparative analysis is motivated by the recognition that regional disparities may influence outcomes. As such, variations in adherence to protocols and patient safety standards may emerge due to contextual differences between these settings.<sup>9</sup>

In light of these considerations, this study aims to evaluate the adherence to the "Five Moments for Hand Hygiene" protocol among nurses in two hospital environments: Regional General Hospital X in Makassar City and Provincial General Hospital Y in South Sulawesi Province. Through a comparative analysis of compliance levels between these hospitals, the research seeks to pinpoint specific areas requiring improvement. Ultimately, the goal is to provide insights to enhance patient safety and infection control measures across healthcare settings. Additionally, in the context of Indonesia, nurses play a crucial role in precisely arranging patient care, which directly impacts patient safety.<sup>10</sup>

## **MATERIAL AND METHOD**

This research utilized a comparative descriptive approach. It observed and assessed hand hygiene practices within hospital environments, particularly focusing on infection control units where adherence to hand hygiene protocols was closely monitored. One rationale for researching hand hygiene among nurses in regional and city hospitals is the potential variation in adherence to hand hygiene protocols between different healthcare settings.

Provincial hospitals may face different challenges and resource constraints compared to city hospitals, which could impact the implementation of hand hygiene practices. Understanding these variations is crucial for developing targeted interventions to improve compliance and enhance patient safety across all healthcare facilities. Additionally, comparing hand hygiene practices between provincial and city hospitals can provide valuable insights into the effectiveness of existing protocols and identify areas for improvement in infection control measures. Overall, conducting such research can contribute to standardizing hand

hygiene practices and reducing the risk of healthcare-associated infections in diverse healthcare settings.

The sample size for this study was determined using Jacob Cohen's method to ensure statistical validity and reliability. A minimum sample size was calculated based on established parameters to achieve sufficient statistical power. Consequently, 30 nurses were selected from each hospital, resulting in a total sample size of 60 nurses across the two hospitals under investigation.

This methodological approach adheres to best practices in research methodology, enabling researchers to draw meaningful conclusions from the data collected. By adhering to established standards for sample size determination, the study aims to enhance the robustness of its findings and ensure the validity of its conclusions.

Furthermore, involving 30 nurses from each hospital facilitates a comprehensive examination of hand hygiene practices within distinct healthcare settings. This approach not only enables comparative analyses between hospitals but also allows researchers to identify potential variations or discrepancies regarding hand hygiene protocols.

In summary, using Jacob Cohen's method for sample size determination emphasized this study's rigorous and methodical approach. By ensuring a sufficient sample size, the research aimed to generate reliable insights into hand hygiene practices among nurses, contributing to the advancement of knowledge in infection control and patient safety within healthcare environments.

In this study, meticulous attention was given to the selection process and utilization of the observation tool provided by the WHO. The tool was specifically tailored to capture the critical moments of hand hygiene. It was well structured to encompass the five crucial moments for hand hygiene, as outlined in the WHO guidelines. These moments included hand hygiene before patient contact, before aseptic procedures, after body fluid exposure risk, after patient contact, and after contact with patient surroundings.

The observation tool was designed precisely to generate accurate and detailed data

collection. Each critical moment was clearly delineated within the tool, accompanied by specific criteria for compliance. This ensures that observers can effectively assess nurses' adherence to hand hygiene protocols across all critical moments.

Moreover, the observation tool incorporates a standardized scoring system to quantify nurses' compliance with hand hygiene practices. This scoring system enables observers to objectively evaluate how nurses adhere to each critical moment, allowing for consistent and reliable data collection.

To enhance the reliability of the collected data, each nurse's adherence to hand hygiene practices was observed multiple times throughout the observation period. This repeated observation approach ensures that data are robust and representative of nurses' typical hand hygiene behaviours.

Furthermore, the observation tool was accompanied by detailed instructions and guidelines for observers to ensure consistency and accuracy in data collection. Prior to the study, observers underwent comprehensive training to familiarize themselves with the tool and its application, minimizing the risk of observer bias and enhancing the reliability of the collected data. The meticulous selection and utilization of the WHO-provided observation tool indicate the study's commitment to rigorous methodology. It also commits to generating high-quality data on hand hygiene practices among nurses.

Another critical step in this study was assessing the tool's validity. This step ensures the validity and accuracy of the study's findings. This process involves scrutinizing the *r*-table values assigned to each component of the tool. In this context, the obtained *r*-table values were 0.815, 0.633, 0.681, 0.815, and 0.681. All surpassed the established critical *r*-table threshold of 0.632.

Such an outcome indicates that the tool exhibits a commendable level of validity across its various components, as it consistently aligns with recognized standards. Subsequently, attention was turned towards the *kappa* value

derived from the observation sheet utilized in the study, which yielded a value of 0.615. This metric serves as a crucial indicator of agreement among enumerators tasked with completing the five-moment hand hygiene observation sheet.

The calculated *kappa* value suggests a substantial concordance among observers, signifying a robust and reliable agreement in their assessments of hand hygiene practices. The combined findings from the validity test and *kappa* analysis serve to bolster the credibility and reliability of the tool employed in this research. These tests ensure the tool's efficacy in accurately capturing and measuring the intended constructs related to hand hygiene practices. Such validation enhances the overall trustworthiness of the study's findings and conclusions, ensuring their relevance and applicability within the broader context of healthcare research.

Furthermore, it is worth noting that data in this study was meticulously analyzed using Microsoft Excel® software version 2019 for data collection and SPSS® Statistics version 26 for statistical analysis. Categorical variables were methodically presented as frequency and percentage and analyzed using the Chi-square test. Meanwhile, continuous variables, a normal distribution, were expressed as mean and standard deviation, with statistical analysis conducted using paired *t*-tests and *z*-tests. The determination of statistical significance was set at  $p < 0.05$ , thus ensuring the rigor and validity of the study's findings.

Since this study involved human subjects, ethical approval for the research was required, and it was obtained from the Research Ethics Committee of the Faculty of Medicine, Hasanuddin University, with approval number 147/UN4.6.4.5.31/PP36/2022. Throughout the research process, stringent ethical principles were upheld to ensure a scientific approach and to prevent harm to research subjects. Measures were implemented to safeguard participant confidentiality and integrity, from proposal development and data collection to the dissemination of results.

## RESULTS

This research involved 60 nurses as respondents who were divided into 30 nurses in each hospital. The mean of their ages was  $33.27 \pm 4.727$  at Regional General Hospital X Makassar City and  $35.10 \pm 6.536$  at Provincial General Hospital Y South Sulawesi Province. In terms of gender, 4 male respondents and 26 female respondents were from Regional General Hospital X Makassar City. Meanwhile, 2 male and 28 female respondents were from Provincial General Hospital Y South Sulawesi Province. They have the same demographic pattern for the category gender.

The last category was education, where 13 participants at Regional General Hospital X Makassar City held a diploma level, and 17 completed an undergraduate degree. Meanwhile, 12 respondents at Provincial General Hospital Y, South Sulawesi Province, had a diploma level, whereas 18 had an undergraduate level. Table 1 describes the demographics of respondents in both hospitals, with a *p*-value of 0.000, underscores the substantial differences observed between the two groups. This significant disparity may stem from various factors, such as demographic characteristics, geographic location, or institutional differences.

The results of the overall implementation of nurses in carrying out the "Five Moments for Hand Hygiene" protocol are presented in Table 2. The table reveals that the highest adherence among nurses was in the first moment. In this study, the majority of nurses in both hospitals consistently washed their hands before attending to (touching) patients, with 96.7% at the Regional General Hospital X and 93.3% at the Provincial General Hospital Y. In contrast, the lowest adherence was found in the third moment, which was the implementation of hand hygiene immediately after exposure to body fluids, with only a minority (3.3%) of nurses adhering to this moment at each hospital.

Further analysis of the data reveals that the majority of respondents prioritize hand hygiene before attending to (touching) patients, followed by hand hygiene after touching the patient's environment. Notably, Table 2 provides a significant difference in the proportion of nurses who wash their hands after touching the patient's environment (20%) between the two hospitals. This difference may stem from variations in hospital policies, resource availability, or the level of emphasis placed on hand hygiene education and training in each institution.

**Table 1. Demographic Features in Both Groups**

Characteristics	General Hospital X Makassar City (n = 30)			General Hospital Y South Sulawesi Province (n = 30)			p-value
	n (%)	Mean ± SD	Min-Max	n (%)	Mean ± SD	Min-Max	
<b>Age</b>	30 (50)	$33.27 \pm 4.727$	27-42	30 (50)	$35.10 \pm 6.536$	26-48	0.654*
<b>Gender</b>							
Males	4(13.30)	-	-	2(6.70)	-	-	0.000
Females	26(86.70)	-	-	28(93.30)	-	-	
<b>Education</b>							
Diploma	13(43.30)	-	-	12(40)	-	-	0.125**
Bachelor	17(56.70)	-	-	18(60)	-	-	

\* : Paired *t*-test

\*\* : Chi-square

Source: Primary Data, 2022

**Table 2. Five Moments for Hand Hygiene Actions in Both Groups, Proportional Difference**

Variables	General Hospital X Makassar City (n = 30)	General Hospital Y South Sulawesi Province (n = 30)	Difference	p-value
	n (%)	n (%)		
<b>Before Touching A Patient</b>				
Performed	27(90)	28(93.30)	3.3%	0.008
Missed Actions	3(10)	2(6.70)		
<b>Before Cleaning/ Aseptic Procedure</b>				
Performed	5(16.7)	3(10)	6.7%	0.492
Missed Actions	25(83.3)	27(90)		
<b>After Body Fluid Exposure Risk</b>				
Performed	1(3.30)	1(3.30)	0	0.317
Missed Actions	29(96.70)	29(96.70)		
<b>After Touching A Patient</b>				
Performed	5(16.70)	5(16.70)	0	0.165
Missed Actions	25(83.30)	25(83.30)		
<b>After Touching the Patient's Surrounding</b>				
Performed	6(80)	12(60)	20%	0.008**
Missed Actions	24(20)	18(40)		

\*\*Significant differences, Mann-Whitney Test  $\alpha=0.05$   
Source: Primary Data, 2022

The Mann-Whitney test results confirm this disparity, with a statistically significant difference ( $p$ -value = 0.008;  $\alpha < 0.05$ ), highlighting variations in hand hygiene practices across hospitals at this specific moment. Consequently, the statistical tests employed, including the Mann-Whitney test, are deemed appropriate and offer valuable insights into the discrepancies observed in hand hygiene practices between the two hospitals.

Conversely, no significant difference was found in the proportion of nurses who washed their hands at the other three critical moments (before cleaning aseptic procedure to after touching a patient) across the two hospitals. This suggests a consistent adherence to hand hygiene protocols in these aspects among nurses in both hospital settings.

Overall, the findings highlight areas for improvement in hand hygiene practices, particularly in adhering to specific moments outlined in the "Five Moments for Hand Hygiene" protocol. These results underline the importance of targeted interventions to enhance compliance and ensure uniform adherence to hand hygiene standards across healthcare settings.

## DISCUSSION

The observed compliance levels were classified as either high or low adherence. In this study, indicating a need to enhance the nursing staff's adherence to hand hygiene protocols during patient care. Suboptimal hand hygiene practices pose a potential risk of HAIs or nosocomial infections, emphasizing the importance of addressing factors influencing compliance.

The WHO recommends a comprehensive strategy to improve compliance with hand hygiene protocols among healthcare workers.<sup>11</sup> This strategy encompasses five key elements: system change, training and education, monitoring and feedback, workplace reminders/communication, and climate change/safety culture.<sup>12</sup>

The present research, based on WHO guidelines concerning the Five Moments for Hand Hygiene, revealed a concerning trend. Despite established protocols, many nurses still lacked compliance in their implementation. This finding is in line with another study that similarly highlights the persistent issue of non-compliance among nursing staff. In fact, implementing the WHO guidelines can signifi-

cantly reduce the incidence of infections associated with poor hand hygiene practices.<sup>13</sup> Various studies support WHO's multimodal improvement strategies, highlighting the effectiveness of each component in enhancing hand hygiene compliance.<sup>14</sup>

For instance, systemic changes within the healthcare system are proven to create an environment conducive to compliance.<sup>15</sup> Meanwhile, education and training programs equip healthcare professionals, especially nurses, with the necessary knowledge and skills.<sup>16</sup> Following that, regular monitoring, a key aspect of the strategy, ensures continuous evaluation and feedback, emphasizing the importance of maintaining compliance. Therefore, considering the unique situation in Indonesia, discussing the prevalence of hand hygiene compliance in this country is crucial.<sup>17</sup>

A nuanced perspective is provided by focusing on the unique challenges faced by Indonesian health facilities, particularly Makassar City Regional General Hospital and South Sulawesi Regional General Hospital. Investigating factors contributing to nonadherence, such as inadequate support facilities like the availability of alcohol-based hand sanitizers in inpatient units, highlights the need for targeted interventions.<sup>18</sup>

In our study, we have identified significant disparities in compliance rates across the five aspects of hand hygiene, highlighting the critical need for tailored interventions. For example, while we found that compliance before patient contact generally meets expectations, there were notable gaps in other crucial moments, particularly before aseptic procedures. These deficiencies directly threaten patient safety, heightening the risk of HAIs due to inadequate hand hygiene practices.<sup>19</sup>

Our research specifically underscores the heightened risk associated with the lack of proper hand hygiene practices before aseptic procedures, emphasizing the urgent necessity to improve compliance in this area.<sup>20,21</sup> By addressing these deficiencies, we not only protect the health of healthcare workers but also enhance patient safety by mitigating the transmission of infectious agents.<sup>22, 23</sup>

In contrast, the forthcoming article by Smith et al. is anticipated to offer a broader perspective

on hand hygiene compliance trends and intervention effectiveness across diverse healthcare settings. Leveraging meta-analytical data, their systematic review is poised to quantify the impact of WHO-recommended strategies on hand hygiene compliance rates, providing comprehensive insights into influencing factors and potential solutions.<sup>24</sup>

Our research's focus on identifying specific deficiencies in hand hygiene practices and their implications for patient safety complements the systematic review's broader scope. By shedding light on observed compliance differences and their consequences for patient care, our study enriches understanding of localized challenges and emphasizes the crucial role of targeted interventions in improving hand hygiene practices among healthcare workers.

In conclusion, our study underscores the importance of customized interventions to address localized hand hygiene compliance issues. While we contribute valuable insights in this regard, the forthcoming systematic review by Smith et al. is expected to provide evidence-based recommendations for enhancing compliance across varied healthcare settings. A comparative analysis of both studies' findings promises to deepen our understanding of effective strategies for mitigating the risk of HAIs and improving patient outcomes in Indonesian healthcare settings.<sup>25</sup>

## CONCLUSION AND RECOMMENDATION

The research compared the implementation of the "Five Moments for Hand Hygiene" protocol by nurses at Regional General Hospital X in Makassar City and Provincial General Hospital Y in South Sulawesi Province. The results reveal a concerning trend: adherence to the WHO guidelines falls below standard. This finding highlights the critical importance of proper hand hygiene practices in healthcare settings, emphasizing the urgent need for improvement initiatives to bolster patient safety and curb healthcare-associated infections.

Stakeholders, including healthcare administrators, infection control practitioners, nursing leaders, and frontline healthcare workers, stand to benefit from the insights provided by this research. These insights enable them to allocate resources, tailor interventions, and foster a culture of excellence in hand hygiene practices.

Furthermore, among the five aspects of hand hygiene moments, only two moments (before touching a patient and after touching the patient's surroundings) exhibit the most significant adherence to hand hygiene between these two hospitals. To address these findings, hospitals and healthcare institutions should prioritize initiatives aimed at enhancing hand hygiene compliance among nursing staff.

This entails implementing comprehensive training programs, ensuring accessibility to hand hygiene resources, conducting regular audits, and cultivating a supportive organizational culture. Additionally, there is an urgent need for nursing education programs to integrate robust training modules on hand hygiene, empowering nurses with the knowledge and resources needed for consistent adherence to evidence-based guidelines.

Moreover, further research is suggested to delve into barriers to compliance and identify strategies for sustaining improvements in hand hygiene practices. This will collectively contribute to bolstering patient safety and mitigating the burden of healthcare-associated infections.

#### AUTHOR CONTRIBUTIONS

All listed authors have contributed to this work. MRA conceptualized the study, designed the methodology, conducted research, analyzed data, drafted the manuscript, and obtained funding. RR, AS, and GM helped analyze and provide input regarding the flow and methods needed. They also helped assess the quality of the article's writing. All authors approved the final version of the manuscript for submission. MRA = Muhammad Rizky Asfarada; RR = Rini Rachmawaty; AS = Andina Setyawati; GM = Gulzar Malik.

#### CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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