

ORIGINAL ARTICLES

Current compliance with surgical hand hygiene practices among surgical staff at An Giang General Hospital, 2024

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ABSTRACT

Objective: To evaluate the compliance with the surgical hand hygiene protocol among healthcare workers directly involved in surgical procedures at An Giang Provincial General Hospital in 2024.

Methods: A cross-sectional study was conducted on 83 healthcare workers directly participating in surgeries at An Giang Provincial General Hospital. Each participant was observed twice during scheduled surgical procedures, yielding a total of 166 observation opportunities. Surgical hand hygiene practices were monitored via surveillance cameras installed in the hand hygiene area before the operating room. Compliance was assessed using a checklist based on Decision No. 3916/QĐ-BYT.

Results: Of the 166 observations, 156 (93.9%) complied with the surgical hand hygiene protocol. Compliance rates for Steps 1 through 4 were 96%, 93.9%, 95.8%, and 100%, respectively. Among the healthcare workers, scrub nurses exhibited the lowest compliance, while surgeons showed the highest compliance.

Conclusion: Overall compliance with the surgical hand hygiene protocol was 93.9%, ranging from 93.9% to 100% across the four steps

Keywords: protocol compliance, surgical hand hygiene, healthcare workers, surgical procedures.

INTRODUCTION

Surgical hand hygiene (SHH) is a key measure to reduce healthcare-associated infections (HAIs), particularly surgical site infections (SSIs), which account for 14–16% of HAIs and affect about 5% of surgical patients (1–3). Rates are higher when post-discharge surveillance is applied (4). Since healthcare workers' hands are a major source of pathogens, proper SHH is the most effective preventive measure (5).

Evidence shows SHH interventions improve compliance and reduce SSI rates. At Aga Khan University Hospital, video-based feedback increased compliance from 14.6% to 80.7% and reduced SSIs from 6.3% to 2.1% (6). In

Islamabad orthopedic wards, compliance rose from 48% to 80.4% after PDSA interventions (7). In Germany, perioperative compliance was only 41%, with surgeons lowest (8). In Vietnam, SHH compliance has improved to 30–40% (1), with higher rates reported by Nguyen Hoai Thu (79.3%) and Ngo Quoc Chien (94.8%) (9, 10). Nonetheless, surgeons remain the lowest-performing group. Compliance is influenced by individual factors (age, education) and systemic factors such as training, supervision, equipment, professional environment, and service quality (9–11).

In 2017, the Ministry of Health issued Decision 3916/QĐ-BYT on the Guidelines for Hand Hygiene Practices in Healthcare Facilities,



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which included an updated protocol for SHH (1). Based on this guideline, An Giang Central General Hospital issued Decision 904/QD-BVAG on November 23, 2022, detailing the practice of hand hygiene—including the SHH protocol—and providing an evaluation checklist for the process. However, these checklists primarily focus on the timing and methods of hand hygiene opportunities, while the assessment of SHH compliance among healthcare workers still largely depends on the subjective judgments of evaluators. To provide scientific evidence that supports the evaluation process and to develop intervention measures to improve SHH compliance, we conducted the study “Current Compliance with the Surgical Hand Hygiene Practices among Surgical Staff at An Giang Central General Hospital, 2024.” This study aims to describe the current state of SHH compliance among healthcare workers directly involved in surgical procedures at An Giang Central General Hospital in 2024.

METHODS

Study Design: Cross-sectional study.

Study site and time: The study period spanned from January 1, 2024, to October 1, 2024, with data collection taking place between May and July 2024. The study was carried out at An Giang Central General Hospital.

Study Subjects: The study was conducted among licensed healthcare professionals directly involved in elective surgery at An Giang Central General Hospital, including primary and assistant surgeons, anesthesiologists/resuscitators, and scrub nurses.

Sample size and sampling methods

Sample size: The study applied the sample size formula for a proportion (using relative error) to calculate the required number of SHH observation opportunities.

$$n = Z^2_{(1 - \alpha/2)} \frac{p(1-p)}{(p\epsilon)^2}$$

Include: n: The minimum required sample size, in this case, the number of SHH opportunities; $Z(1-\alpha/2)$: The critical value for the desired confidence level; with $\alpha = 0.05$ (i.e., 95% confidence), $Z(1-\alpha/2) = 1.96$; p: The compliance rate of SHH observation, which is 25% according to the study by Dinh Thi Thu Tham et al. at Hospital 199 in Da Nang in 2022 (11), hence $p = 0.25$; ϵ : The relative error between the sample parameter and the population parameter, here, $\epsilon = 0.3$ is chosen. The minimum required sample size is 129 SHH opportunities. Given that there are 83 healthcare workers (HCWs) performing the surgical procedures, each HCW must be observed for 2 SHH practices, resulting in a total of 166 observation opportunities.

Sampling method: Each HCW performing SHH on two separate surgery days was observed. Four surgical cases per day were randomly selected from the daily surgery schedule generated by FPT software. Surgical videos were subsequently extracted, and the investigator reviewed the footage, marking an “x” on the SHH observation checklist for each observed episode. On the second day, the same process was repeated. On the third day and beyond, any HCWs who had already been observed twice were excluded from the observation pool.

Study variables and qualitative research topics: The study's variables included general characteristics of participants; availability of equipment for SHH; preparation for SHH; and SHH practices using antimicrobial soap. Surgical procedures included in the study were classified as Class I (clean) and Class II (clean-contaminated) surgeries, as defined by CDC criteria. Class I surgeries involve uninfected operative wounds where no entry into the respiratory, alimentary, genital, or urinary tracts occurs, and there is no break in aseptic technique. Class II surgeries involve controlled entry into these tracts without unusual contamination. The

SHH procedure was evaluated according to Decision No. 3916/QĐ-BYT (2017) issued by the Ministry of Health, comprising four steps and 25 assessment criteria. Each technique was classified as correctly performed, incorrectly performed, or not performed. A standardized checklist was used for data coding, where 0 indicated full compliance (no violation) and 1 indicated non-compliance or omission of a required step.

Processing and analyzing data: Observational data were linked with the corresponding subject information and entered into an Excel file. The data were cleaned and analyzed using SPSS 21.0. Descriptive statistics were employed to assess the current compliance with the surgical hand hygiene protocol among healthcare workers directly involved in surgical procedures. The results were presented in terms of frequencies and percentages.

Research ethics: This study was approved by the Institutional Review Board of the School of Public Health under Decision No. 136/2024/YTCC-HD3 dated May 2, 2024. It also received approval from the management board of An Giang Central General Hospital to conduct data collection on-site.

RESULTS

The study was conducted on 83 healthcare workers involved in surgeries in the operating rooms of the Department of Surgery – Anesthesia and Resuscitation. Among these participants, 53 (63.8%) were male and 51 (61.4%) were over 30 years old. Primary and assistant surgeons constituted the largest group at 72.3%, followed by anesthesiologists at 8.4% and scrub nurses at 19.3%. In terms of educational background, 48% held postgraduate degrees, 33% had a university degree, and 19% possessed mid-level/college qualifications.

A total of 166 surgical hand hygiene (SHH), 98 observations (59%) were made during morning sessions and 68 observations (41%) during the afternoon. Regarding the characteristics of the surgical cases, 109 procedures were classified as type 1 or higher (66%), while 57 procedures were classified as type 2 or lower (34%). Among 166 SHH observed opportunities, the preoperative preparation practices by healthcare workers were excellent, with all preparation steps achieving 100% compliance. However, it is noteworthy that a few elements had slightly lower compliance, such as removal of jewelry (97.5% compliance) and wearing a cap to fully cover the hair (96.3% compliance).

Table 1. Compliance Rate for Step 1 – Nail Scrubbing with a Brush (n=166)

Activity	Compliant		Non-compliant	
	N	%	N	%
Wetting hands	166	100	0	0,0
Applying 3–5 mL of disinfectant soap to the hand brush.	166	100	0	0,0
Scrubbing the interdigital spaces of each hand using a brush	160	96	6	4,0
Maintaining a 30-second duration	166	100	0	0,0
Overall compliance for Step 1	160	96	6	4,0

Table 1 shows that among 166 opportunities for healthcare workers to perform nail scrubbing with a brush, 160 instances (96%) adhered to the protocol. In particular, the steps

of wetting the hands and applying disinfectant soap were fully compliant (100%), and the 30-second scrubbing duration was also achieved in 100% of cases.

Table 2. Compliance Rate for Step 2 - First Handwashing (n=166)

Activity	Compliant		Non-compliant	
	N	%	N	%
Wetting hands up to the elbows	166	100	0	0,0
Applying 3–5 mL of disinfectant soap to the palm	165	99	1	0,1
Scrubbing the palm 5 times	166	100	0	0,0
Scrubbing the back of the hand 5 times	166	100	0	0,0
Scrubbing between the fingers 5 times	160	96,3	6	3,7
Scrubbing the back of the fingers 5 times	160	96	6	4,0
Scrubbing the thumb 5 times	158	95	8	5,0
Scrubbing the wrist and forearm up to the elbow	164	98	2	2,0
Rinsing hands under running water from fingertips to the elbow to completely remove the disinfectant	166	100	0	0,0
Maintaining a 1 minute 30-second duration	156	93,9	10	6,1
Overall compliance for Step 2	156	93,9	10	6,1

Table 2 indicates that among 166 instances of the first-handwashing, healthcare workers complied in 156 cases (93.9%). Among the ten steps of this protocol, the steps “wetting hands up to the elbows,” “scrubbing both

palms,” and “scrubbing the back of the hands” achieved 100% compliance. The steps with the lowest compliance were “scrubbing the thumb 5 times” (95%) and “Maintaining a 1 minute 30-second duration” (93.9%).

Table 3. Compliance Rate for Step 3 – Second Handwashing (n=166)

Activity	Compliant		Non-compliant	
	N	%	N	%
Applying 3–5 mL of disinfectant soap to the palm	166	100	0	0,0
Scrubbing the palm 5 times	163	98,2	3	1,8
Scrubbing the back of the hand 5 times	160	96,4	6	3,6
Scrubbing between the fingers 5 times	159	95,8	7	4,2
Scrubbing the back of the fingers 5 times	159	95,8	7	4,2
Scrubbing the thumb 5 times	162	97,6	4	2,4
Scrubbing the wrist and forearm up to the elbow	160	96,4	6	3,6
Rinsing hands under running water from fingertips to the elbow to completely remove the disinfectant	166	100	0	0,0
Maintaining a 1 minute 30-second duration	159	95,8	7	4,2
Overall compliance for Step 3	159	95,8	7	4,2

Among 166 second-handwashing opportunities, overall compliance for Step 3 was 95.8%. Among the nine steps in this phase, the actions “applying 3–5 mL of disinfectant soap to the palm” and “rinsing hands under running water from the fingertips to the elbow to completely remove the disinfectant” achieved 100% compliance.

Next, the actions “scrubbing the palm 5 times” and “scrubbing the thumb 5 times” were compliant at 98.2% and 97.6%, respectively, while “scrubbing the back of the thumb 5 times,” “scrubbing the interdigital spaces of the thumb,” and “maintaining a 1 minute 30-second duration” each had a compliance rate of 95.8%.

Table 4. Compliance Rate for Step 4 – Hand Drying (n=166).

Activity	Compliant		Non-compliant	
	N	%	N	%
Drying hands: Drying the entire hand, wrist, and forearm with a sterile towel (first use)	166	100	0	0,0
Flipping the towel to dry the forearm to prevent recontamination	166	100	0	0,0
During the entire hand hygiene procedure, ensuring that the fingertips of the observed subject remain above the forearm level	166	100	0	0,0
Overall compliance for Step 4	166	100	0	0,0

Among the 166 observed SHH opportunities, all 166 (100%) complied with Step 4 (hand drying), and the specific action “the observed

subject’s fingertips always remain above and the hand always remains higher than the forearm” achieved 100% compliance.

Table 5. Compliance Rates for Each Step of the SHH Process by by Surgical Team Based on Observed Opportunities (n = 166)

Steps in SHH process	Surgeons n (%)	Anesthesiologists n (%)	Scrub Nurses n (%)
Step 1	114 (95%)	14 (100%)	32 (100%)
Step 2	109 (90.8%)	12 (85.7%)	30 (93.8%)
Step 3	113 (94.2%)	12 (85.7%)	30 (93.8%)
Step 4	120 (100%)	14 (100%)	32 (100%)
Overall SHH	109 (90.8%)	12 (85.7%)	29 (90.6%)

The highest compliance was observed for Step 4, with a 100% compliance rate across all three professional groups. Step 1 showed similarly high compliance, reaching 100% among anesthesiologists and scrub nurses, and 95% among surgeons. Steps 2 and 3 had identical compliance rates among anesthesiologists

(85.7%) and scrub nurses (93.8%). Among surgeons, compliance was 90.8% for Step 2 and 94.2% for Step 3. Overall compliance with the SHH procedure was 90.4%, with the highest rate observed among surgeons (90.8%), followed closely by scrub nurses (90.6%), and the lowest among anesthesiologists (85.7%)

DISCUSSION

The study showed an overall SHH compliance rate of 93.9% across 166 observations at An Giang Central General Hospital. This rate is similar to that reported by Ngo Quoc Chien at Thu Duc General Hospital (94.8%) (9), and higher than results from Nguyen Hoai Thu at Vinmec Times City International General Hospital (82.8%) (10), Nguyen Thi Hong at Thu Duc District Hospital (48.6%) (12), and Chu Lan Anh at Ho Chi Minh City ENT Hospital (23.8%) (13). The hospital's high compliance likely reflects adequate facilities, strong staff awareness of SHH's role in preventing nosocomial infections, and active institutional support. In 2024, four infection control training sessions, including SHH, were organized under Decision No. 3916/QĐ-BYT (2017), combined with leadership commitment, which further strengthened adherence and contributed to improved surgical outcomes.

Compliance rates for Step 1 sub-steps were high: both "wetting hands" and "applying 3–5 mL of disinfectant soap" achieved 100% compliance, exceeding results by Nguyen Hoai Thu (2019) and Ngo Quoc Chien (2019) (9,10). This may be explained by our classification of the initial wetting as part of Step 2; in practice, staff often wet their hands up to the elbow due to sink design and automatic outlets, which we recorded as compliant. This observation is consistent with findings from Thu Duc Hospital (12).

In Steps 3 and 4, "scrubbing the palm 5 times" and "scrubbing the thumb 5 times" reached compliance rates of 96% and 100%, respectively. Inappropriate brushing, however, may increase bacterial dissemination by damaging the epidermis (14). Notably, Decision 3916 (MOH) advises against routine brush use, permitting it only when visible dirt is present in interdigital spaces and only for the first surgical case of the day (1). Hence, reducing unnecessary brush use remains essential. Overall, when accounting for action sequence, our Step 1 compliance

exceeded that reported by Dang Ngoc Lieu (2018), Ngo Quoc Chien (2019), and Nguyen Thi Hong (2020) (9,12,15)

Overall, compliance with each action in Step 2 exceeded 95%. Complete adherence was observed for "wetting the hands up to the elbows," "scrubbing both palms five times," "scrubbing the back of the hands five times," and "rinsing hands under running water from the fingertips to the elbows to completely remove the disinfectant." These steps are straightforward and, similar to those in Step 1, are routinely performed during standard handwashing, resulting in high compliance. Our results are similar to those from a study at Thu Duc Hospital in Ho Chi Minh City (12), likely because both studies employed a surgical hand hygiene method using a 4% chlorhexidine soap solution; however, compared to a study at Vinmec Times City International General Hospital (10), our compliance for "wetting the hands up to the elbows" was higher. Lower compliance rates were observed for the following actions: "applying 3–5 mL of disinfectant soap to the palm" (99% compliance), "scrubbing between the fingers five times" (96.3%), "scrubbing the back of the fingers five times" (96%), and "scrubbing the thumb five times" (95%). These steps were often omitted or performed insufficiently. This may be due to the independent anatomical position of the thumb, which can be easily overlooked during the procedure, and the assumption that prior nail brushing and overall hand scrubbing adequately cover these areas. Nonetheless, the fingertips and thumb are critical in surgical settings, as they frequently contact patients and surgical instruments, and glove perforations are most commonly found at the fingertips. Proper adherence to the surgical hand hygiene protocol significantly reduces microbial load. According to Ministry of Health Decision 3916, a study at 108 Central Military Hospital (2017) demonstrated that healthcare workers who performed hand hygiene correctly had a

significantly lower microbial count on their hands compared to those who did not (15).

The compliance rate for Step 3 was 95.8%. This compliance rate is comparable to that reported by Nguyen Thi Hong (2020) (12). One possible explanation is that some healthcare workers habitually use a brush for nail scrubbing and then proceed to scrub other areas of the hand and forearm, assuming the hand is already clean, which leads them to skip Step 3. Additionally, time constraints may cause some workers to shorten or omit actions such as “scrubbing the thumb” (compliance at 97.6%) and “scrubbing between the fingers” (compliance at 95.8%). These findings underscore the need to emphasize the importance of adhering to all procedural steps to ensure effective surgical hand hygiene.

In all 166 observations, the three assessed components of Step 4 (drying the entire hand, wrist, and forearm with a sterile towel; flipping the towel to dry the forearm to prevent recontamination; and maintaining fingertips above forearm level) were performed correctly, resulting in 100% recorded compliance. However, as these observations relied solely on available camera angles, there remains a possibility that subtle deviations, such as incomplete drying or accidental recontamination, may not have been captured. Ensuring correct execution of drying is critical, as errors at this stage can compromise the effectiveness of the entire procedure, a point emphasized in studies by Nguyen Hoai Thu and Nguyen Thi Hong (9, 12).

The notably high compliance rates with SHH procedures observed among surgeons in this study warrant further consideration. Beyond periodic training, the presence of a surveillance camera system in the operating room may have contributed to improved adherence by promoting greater accountability and awareness among staff. This aligns with prior studies indicating that real-time or

recorded monitoring can positively influence hand hygiene behavior. While differences in compliance among various staff roles were observed, these may reflect variations in perceived responsibility, workflow priorities, or the degree of involvement in aseptic tasks. Future investigations should explore the extent to which monitoring infrastructure—such as camera placement and visibility—impacts compliance, and how such systems can be leveraged not only for quality control but also for ongoing professional education.

The overall compliance rate for SHH among surgical team was 93.9% (156 out of 166 observations). Among the four SHH steps, the highest compliance was observed in Step 4 at 100%, followed by Step 1 and Step 3 with compliance rates of approximately 96% and 95.8%, respectively. The lowest compliance was observed in Step 2, at 93.9%. This lower compliance in Step 2 may be due to HCWs’ subjective perception that a thorough handwash in Step 1 already met the required duration, leading them to shorten or rush Step 2 before proceeding to Step 3, as both steps involve similar procedures.

Limitation: Observations were conducted retrospectively via video recordings, which limited the ability to identify the first surgical case of the day and to determine whether the nail-brushing step was appropriately omitted in subsequent cases, potentially affecting non-compliance rates. The accuracy of assessments was also influenced by camera placement, as suboptimal angles could obscure certain actions and prevent full evaluation of each step. Additionally, the analysis focused only on elective surgeries, excluding emergency cases—which account for approximately 16%, where factors such as patient severity, time pressure, and urgent clinical needs may lead to reduced SHH compliance. As such, the findings may overestimate the overall SHH adherence of observed HCWs in the hospital. Nevertheless,

the study provides timely and objective evidence of SHH compliance, contributing valuable data to the existing literature on this topic. .

CONCLUSION

Overall compliance with the surgical hand hygiene protocol among HCWs was high at 93.9%. Specifically, compliance rates were 96% for the four actions in Step 1 (nail brushing for 30 seconds), 93.9% for the ten actions in Step 2 (first handwashing for 1 minute 30 seconds), 95.8% for the nine actions in Step 3 (second handwashing for 1 minute 30 seconds), and 100% for the three actions in Step 4 (hand drying).

Recommendations: Hospitals should develop quality improvement initiatives focusing on infection control and SHH. Financial incentive–penalty policies may improve staff compliance. The Infection Control Department should enhance surveillance, especially via video monitoring with prompt feedback. Regular maintenance, calibration, and quality assurance of surveillance cameras, along with optimal placement to capture all critical steps, are essential to ensure accurate monitoring.

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