



"BOOSTING HAND HYGIENE IN PANDEMIC TIMES: A PROSPECTIVE STUDY ON QUALITY CONTROL CIRCLES"

Hospital Administration

Dr Ananya Singh MBBS, MD Hosp Adm Hospital Administration Department, AFMC, Pune

Col Dr. Saroj Kumar Patnaik MBBS, MHA Prof. & HoD, Hospital Administration Department, AFMC, Pune

Maj Dr. Neha Singh MBBS, MD Microbiology Assistant Prof, Microbiology Department, AFMC, Pune

Col Dr. Nandita Hazra* MBBS, MD (Microbiology) Prof., Microbiology Department, CH (SC), Pune
*Corresponding Author

ABSTRACT

Background: Hand hygiene (HH) is essential for infection control, as healthcare-associated infections (HAIs) increase illness, hospital stays, and costs. HCWs' hands are a primary transmission route for HAIs. WHO recommends HH observation and feedback to enhance compliance. This study assessed HH compliance among HCWs in ICUs and examined the impact of quality circles on continuous quality improvement. **Methods:** A team of three HCWs conducted covert direct observation using the WHO patient safety template to assess current HH compliance among staff during routine care. With compliance below 50%, the quality circle team implemented interventions, including scheduled lectures, bedside practices, and awareness posters per WHO (2009) guidelines. **Results:** Following these interventions, HH compliance improved from 33.86% (95% CI: 29.89% - 37.71%) to 50.71% (95% CI: 46.57% - 54.85%), with an achievement index of 79.70% and improvement index of 49.76%. This pre- and post-intervention improvement was statistically significant ($p = 0.00001$). Stratified analysis by HCW category showed a marked improvement, especially among auxiliary staff, boosting overall HH compliance. **Conclusion:** This study emphasizes the importance of a quality circle team, i.e., involving the personnel from the respective department (workplace) itself so that day-to-day issues may be addressed and an action plan may be discussed and implemented for the development of a good work culture under patient safety and quality care.

KEYWORDS

Hand Hygiene, Quality Control Circle, Infection Control, Patient Safety, Quality care, Covert observations

INTRODUCTION

Hospital-acquired infections, or healthcare-associated infections (HAI), are nosocomial infections often not present or incubating upon admission, typically manifesting 48 hours' post-admission. These infections are monitored diligently by organizations like the National Healthcare Safety Network (NHSN) at the Center for Disease Control and Prevention (CDC). HAI infections include CLABSI, CAUTI, SSI, Hospital-acquired Pneumonia (HAP), and Ventilator-associated Pneumonia (VAP) (1).

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), with its high infectivity, exhibits a healthcare-related cross-transmission incidence as high as 40%. (2)

Hospital-acquired infections can spread rapidly among patients and healthcare workers, placing significant pressure on the healthcare workforce to control transmission. A strong infection control team, including well-trained non-medical staff and caregivers, is essential to support these efforts. The team's composition and responsibilities are shown in Table 1. (3)

Table 1: Composition and responsibilities of HICC

Composition of HICC	Responsibilities of HICC
Medical Administrator	Framing infection control guidelines
Microbiology faculty (infection control officer)	Implementing antibiotic stewardship
Representatives from clinical departments	Conduction of hospital surveillance
Nursing staff	Monitoring disinfection procedures
A pharmacist	Frame guidelines to control and prevent hospital infection outbreaks
Member from central sterile	Identification and prevention of

supplies department (CSSD)	infection hazards in hospital setting
Representative each from the bio-medical, and maintenance department	

Hand hygiene (HH) is crucial for infection control. In the mid-1800s, Ignaz Semmelweis in Vienna and Oliver Wendell Holmes in Boston highlighted its importance in healthcare. In 2009, the WHO launched the "SAVE LIVES: Clean Your Hands" campaign, building on its first Global Patient Safety Challenge: Clean Care is Safer Care. (4)

Over time, compliance with HH practices has been observed to be low on a global scale. Numerous studies conducted in India have indicated HH compliance rates ranging from 20% to 85.5%. (5)

Improving hand hygiene (HH) reduces the transmission of healthcare-associated pathogens and the burden of HAIs. In developing regions, HAIs are up to 18 times more common than in developed areas. However, enforcing infection prevention and control (IPC) measures, with HH as a key practice, can prevent many of these infections. (6)

Consequently, organizations like the WHO, CDC, and European Center for Disease Prevention advocate for universal implementation of HH practices and interventions across all healthcare facilities globally. (7)

Quality Control Circles (QCC) aim to improve HH compliance among HCWs by boosting morale, enhancing problem-solving skills, improving healthcare environments, raising care standards, reducing management costs, and increasing service efficiency. QCC activities begin with a brainstorming session involving the circle head and members, using real-time data to identify daily problems. Suggestions are then analyzed and refined with quality management approaches. Effective circle meetings are key to successful QCC execution, leading to both tangible and intangible results. In contrast, ineffective meetings, marked by lack of discussion, indecision, or failure to implement decisions, hinder progress. (8)

Methodology:

A Cross-sectional study was planned at the Medical and Surgical Intensive care units of a 1082-bed tertiary care hospital, which offers healthcare services to defence personnel, local inhabitants, and the dependent populations. The first step towards this was the formation and execution of QCC activity.

There are 10 basic steps of QCC activity, with step 1 being theme selection to the last step of review and improvement, as mentioned in Fig.1. It generally follows the PDCA (plan, do, check, and act) cycle (Deming cycle).



Fig 1: Basic Steps of QCC activities

Training: The QCC activities including purpose, operational procedure, and methods of carrying out activities of QCC were taught to the HCWs team, focusing on strengthening a "hoping to do, wanting to do, and able to do" attitude.

Forming The Circle Team: A team was formulated comprising of Infection Control officer (ICO), Infection control nurse (ICN), overall coordinator (resident from Hospital administration department) and resident from microbiology department. The team formulated the operating strategy as per Fig.1. in which theme was selected as Infection control and activity as HH, as mentioned in Fig.2.



Fig 2: Deming's PDCA Cycle

Method Of Analysis- Pittet et al. pioneered direct hand hygiene (HH) observation in 1994, identifying factors linked to non-compliance. While direct observation is considered the gold standard, it can introduce observation bias (Hawthorne effect). To eliminate this, covert observation was conducted by a team of three HCWs in MICU and SICU over two weeks. Using WHO's patient safety observation form, the team assessed HH compliance across five moments (prior to patient contact, aseptic procedures, bodily fluid exposure, patient contact, and contact with patient surroundings). Each observation, completed within a 20 ± 10-minute window, followed the WHO Hand Hygiene Technical Reference Manual (HHTRM). (9)

The HCWs were divided into the following professional categories: (1) Doctors, (2) Nursing staff, (3) Nursing students (4) Technicians and (5) Auxiliary staff (housekeepers).

Covert observations were conducted in short sessions across different settings and HCWs to ensure a representative sample. Only one or two HCWs were observed per session, following the Hand Hygiene Observational Audit SOPs (September 2014). HH indications were based on WHO guidelines. Positive HH was recorded based on ABHR use, handwashing with soap and water, or both, while negative HH was also documented in the observation chart. Glove use was not recorded. (10)

Awareness interventions, including scheduled lectures (PowerPoint and video-assisted) and regular bedside HH practice sessions, were conducted to improve staff awareness, knowledge, and decision-making, following WHO guidelines (2009). After one month, covert observations were repeated to assess post-intervention compliance. The study began with direct HH compliance monitoring, and findings were presented at the Hospital Infection Control Committee (HICC) meeting.

Sample Size For Compliance Assessment:

A total of 1123 observations were recorded: 561 before intervention (280 in MICU, 281 in SICU) and 562 after intervention (280 in MICU, 282 in SICU). Given that both MICU and SICU have 20 beds each, these observations were sufficient. Overall compliance was calculated by dividing the number of HH actions performed by the total opportunities, with compliance >50% considered good. (11)

Evaluation

The performance of QCC activity was evaluated via Achievement Index and Improvement Index. (12)

Achievement Index = [(Post-improvement data value – Pre-improvement data value) / (Goal value – Pre-improvement data value)] x 100%

Improvement Index = [(Post-improvement data value – Pre-improvement data value) / Pre-improvement data value] x 100%

RESULTS

In June 2021, HAI cases, particularly CLABSI rates, rose in MICU (10.2%) and SICU (6.09%), prompting the formation of a team for covert observations. A total of 561 HH opportunities were observed in both ICUs, with overall compliance at 33.86% (95% CI: 29.89%–37.71%, p=0.00001). Compliance varied by ICU: MICU at 35.71% (95% CI: 30.10%–41.32%, p=0.0003) and SICU at 32.02% (95% CI: 26.56%–37.48%, p=0.00001). Compliance also differed by HCW category, with nurses at 46.22%, doctors at 45.61%, and auxiliary staff at 17.04%. Fig.3

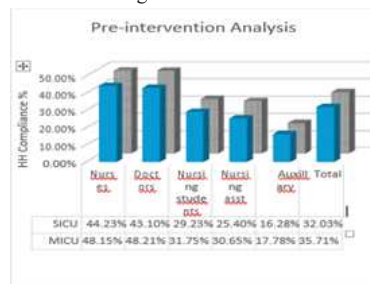


Fig 3: HH Compliance status in MICU and SICU before intervention (with respect to HCW Category)

According to indications for HH; a highest of 48.27% after body fluid exposure risk to a minimum of 26.78% before patient contact, was observed. (Fig.4).

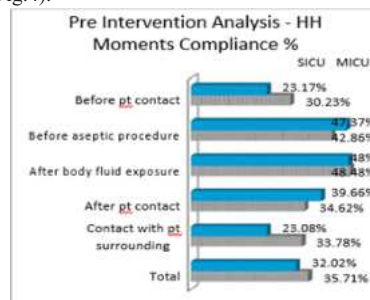


Fig 4: HH Compliance status in MICU and SICU before intervention (with respect to Five Moments of HH)

As the overall compliance was less than 50%, interventions as mentioned in the methodology were conducted. The staff was also informed about the rise in HAI Cases and the importance of HH was correlated. Simultaneously self-reported reasons for non-compliance were discussed among HCWs, and a Fishbone analysis was done, as shown in Fig.5.

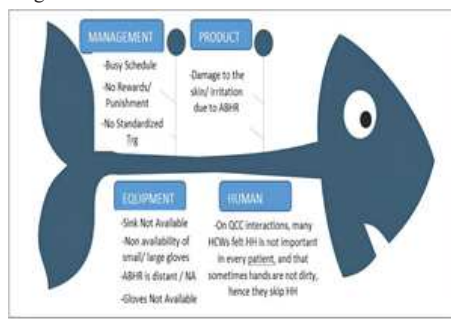


Fig 5: Fish bone analysis with respect to reasons for HH Non-compliance

After interventions, covert observations showed a reduction in HAI cases (MICU: 1.2%, SICU: 2.4%), as assessed by HICC. Overall HH compliance increased from 33.86% (95% CI: 29.89%–37.71%) to 50.71% (95% CI: 46.57%–54.85%), a statistically significant change ($p=0.00001$). SICU compliance rose from 32.02% (95% CI: 29.89%–37.71%) to 49.64% (95% CI: 43.80%–55.48%), also significant ($p=0.00001$). MICU compliance increased from 35.71% (95% CI: 30.10%–41.32%) to 51.78% (95% CI: 45.93%–57.63%), with a p -value of 0.0001. Fig 6 Compliance varied by healthcare worker type, with nurses and doctors achieving 61.90% and 60.36%, while auxiliary staff had 37.20%. (Fig 8)

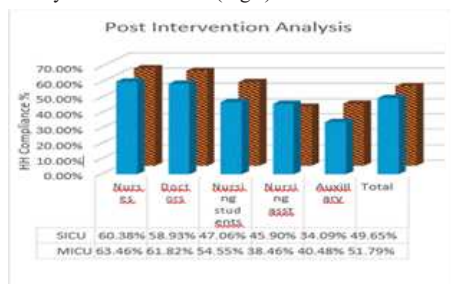


Fig 6: HH Compliance status in MICU and SICU after intervention (with respect to HCW Category)

Also, improved rate of compliance to indications for HH was observed, a highest of 82.45% after body fluid exposure risk to a minimum of 38.09% before patient contact. Fig 7

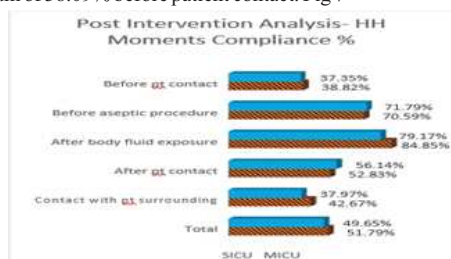


Fig 7: HH Compliance status in MICU and SICU after intervention (with respect to Five Moments of HH)

DISCUSSION

Hand hygiene (HH) is the key method for preventing hospital-acquired infections (HAIs). Despite global efforts to improve compliance, our study found that busy schedules and limited access to HH facilities were major barriers. Although Alcohol-Based Hand Rub (ABHR) was available, it was often placed far from work areas, and the inconsistent availability of gloves posed additional challenges. Studies show that easy access to ABHR is critical for improving HH compliance in

healthcare settings. (13)

In the present study, the overall HH compliance observed was 33.86% before intervention, consistent with rates reported in China (30%) and Kuwait (33.4%). (14) The improved compliance after the intervention may result from close trainer supervision and recent curriculum changes, introducing IPC (infection prevention and control) and HH as new modules for HCWs.

In our study, HH compliance was almost similar among doctors and nurses, 45.61% and 46.22%, respectively. This aligns with the findings of many studies in the literature, including a meta-analysis. (15). However, compliance among nurses in our study is higher than the doctors; this was similar to the observation of Randle et al. (16). Conversely, in a study conducted by Sharma et al., higher compliance was observed among doctors.

The lower compliance of doctors as was observed emphasized on the busy schedule of the doctors, running around in various wards and managing patients. Understaffing, patient overcrowding, & insufficient time are some common causes as are mentioned by Bharara et al (2020).

The comparatively low compliance rate observed among auxiliary staff (housekeeping, etc.) was 17.04% before intervention, suggesting less knowledge and awareness among auxiliary staff towards HH and its importance in infection control. Also, the increased compliance (37.20%) after intervention suggests that continuous training and close supervision by incharge of the ward may further improve the HH compliance.

Before intervention, HH compliance was lower before patient contact (26.78%) than after (37.27%). Post-intervention, overall compliance improved from 33.86% to 50.71%, but compliance before patient contact (38.09%) remained lower than after patient contact (54.54%). This mirrors findings from other studies, including a meta-analysis showing lower compliance before (21%) versus after patient contact (47%). HCWs are more focused on protecting themselves from infections than safeguarding patients. Similar to our study, Shobowale et al. in Nigeria reported higher compliance (60%) after exposure to body fluids, with our own study showing a rise from 48.27% to 82.45% (average 65.36%) after intervention. (17)

Furthermore, all taps analyzed in our study were manually operated. This aligns with findings from studies by Busari et al. in Nigeria (100%) (18), Devnani et al. in India (99.5%) (19), and Amanzian et al. in four Mediterranean countries (Egypt, Morocco, Algeria, and Tunisia) (93%) (20). Hand-operated sinks pose an elevated risk of hand contamination and subsequent cross-transmission. (21) Current recommendations advocate for the utilization of elbow-sensor-operated or automated taps for handwashing. (22), (23)

Some HCWs were observed not following proper alcohol application protocols, such as using tissues to dry excess alcohol or applying insufficient ABHR, which hindered full HH compliance. These behaviours should be documented and addressed in HCW education to improve proper HH practice. Direct observation method has a few limitations. It is time-consuming, necessitates a dedicated trained staff, and carries the risk of observation bias, known as the Hawthorne effect. However, our hospital does not have electronic soap dispensers/electronic surveillance technology. Therefore, a single-observer direct observation technique was used, and compliance with all 5 moments of HH was evaluated. (24)

This marks our initial effort to enhance HH practices and consequently prevent HAIs within our establishment. Our study highlights the importance of targeted, multifaceted approach starting from administrative support, policy formulation, dedicated staff, and availability of consumables such as ABHRs in improving HH in a healthcare setup.

We also examined the impact of improved HH on HAIs, though observation bias may have influenced HCW behaviour. To mitigate this, a covert observational study could explore the Hawthorne effect. Additionally, WHO guidelines emphasize that integrating effective HH into healthcare processes is supported by initial interactions between patients, families, and the healthcare system.

Conclusion And Future Scope

Non-adherence to hand hygiene (HH) guidelines is a global issue that requires standardized approaches for research and monitoring. Improving HH compliance can be achieved by enhancing written protocols, supervision, feedback, and quality improvement initiatives. Patient empowerment strategies, like raising awareness about HH's role in preventing hospital-acquired infections (HAIs), can help sustain compliance. Patient Empowerment Tools (PETs), such as reminder images, encourage patients to prompt healthcare providers. Success depends on support from both patients and providers. Strong hospital leadership and ongoing infection control efforts are crucial in preventing HAIs.

Financial Support And Sponsorship: Nil

Conflicts Of Interest

There are no conflicts of interest.

REFERENCES

1. Boev C, Kiss E. Hospital-Acquired Infections: Current Trends and Prevention. *Crit Care Nurs Clin North Am* [Internet]. 2017 Mar 1 [cited 2022 Aug 4];29(1):51–65. Available from: <https://pubmed.ncbi.nlm.nih.gov/28160957/>
2. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical Characteristics of 138 Hospitalized Patients with 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA* [Internet]. 2020 Mar 3 [cited 2022 Aug 4];323(11):1061. Available from: </pmc/articles/PMC7042881/>
3. Sasi m. implementation of infection control strategies in covid-19 prevention in a tertiary health care facility in north kerala. *World J Adv Health Res* www.wjahr.com
4. WHO Guidelines on Hand Hygiene in Health Care First Global Patient Safety Challenge Clean Care is Safer Care. 2009;
5. Bharara T, Gur R, Duggal S, Chugh V. Evaluation of hand hygiene compliance over the years, in an intensive care unit of a north Delhi hospital preparing for accreditation: A 3-year study.
6. WHO guidelines on hand hygiene in health care.
7. Sax H, Allegranzi B, Uçkay I, Larson E, Boyce J, Pittet D. "My five moments for hand hygiene": a user-centred design approach to understand, train, monitor and report hand hygiene. *J Hosp Infect* [Internet]. 2007 Sep [cited 2022 Aug 4];67(1):9–21.
8. Wang LR, Wang Y, Lou Y, Li Y, Zhang XG. The role of quality control circles in sustained improvement of medical quality. *Springerplus* [Internet]. 2013 [cited 2022 Aug 16];2(1). Available from: <https://pmc/articles/PMC3639357/>
9. World health organization & WHO Patient safety. Hand Hygiene Technical Reference Manual: To be used by health-care workers, trainers and observers of hand hygiene practices.
10. Onyedibe KI, Shehu NY, Pires D, Isa SE, Okolo MO, Gomerep SS, et al. Assessment of hand hygiene facilities and staff compliance in a large tertiary health care facility in northern Nigeria: a cross sectional study. undefined. 2020 Feb 11;9(1).
11. Owusu-Ofori A, Jennings R, Burgess J, Prasad PA, Acheampong F, Coffin SE. Assessing hand hygiene resources and practices at a large african teaching hospital. *Infect Control Hosp Epidemiol* [Internet]. 2010 Aug [cited 2022 Aug 16];31(8):802–8. Available from: <https://pubmed.ncbi.nlm.nih.gov/20569112/>
12. Novoa AM, Pi-Sunyer T, Sala M, Molins E, Castells X. Evaluation of hand hygiene adherence in a tertiary hospital. *Am J Infect Control* [Internet]. 2007 Dec [cited 2022 Aug 16];35(10):676–83. Available from: <https://pubmed.ncbi.nlm.nih.gov/18063133/>
13. Li LY, Zhao YC, Jia JX, Zhao XL, Jia HX. Investigation on compliance of hand hygiene of healthcare workers. *Acta Acad Med Sin* [Internet]. 2008 Oct [cited 2022 Aug 16];30(5):546–9. Available from: <https://pubmed.ncbi.nlm.nih.gov/19024383/>
14. Al-Wazzan B, Salmeen Y, Al-Amiri E, Abul A, Bouhaimed M, Al-Taiar A. Hand hygiene practices among nursing staff in public secondary care hospitals in Kuwait: self-report and direct observation. *Med Princ Pract* [Internet]. 2011 May [cited 2022 Aug 16];20(4):326–31. Available from: <https://pubmed.ncbi.nlm.nih.gov/21576991/>
15. Erasmus V, Doha TJ, Brug H, Richardus JH, Behrendt MD, Vos MC, et al. Systematic review of studies on compliance with hand hygiene guidelines in hospital care. *Infect Control Hosp Epidemiol* [Internet]. 2010 Mar [cited 2022 Aug 16];31(3):283–94. Available from: <https://pubmed.ncbi.nlm.nih.gov/20088678/>
16. Randle J, Arthur A, Vaughan N. Twenty-four-hour observational study of hospital hand hygiene compliance. *J Hosp Infect* [Internet]. 2010 Nov [cited 2022 Aug 16];76(3):252–5. Available from: <https://pubmed.ncbi.nlm.nih.gov/20850899/>
17. Shehu N, Medicine NB-JJ of, 2015 undefined. *Health Care Environment: A War-zone*. ajol.info
18. Busari OA, Agboola MS, Oyekale OT, Ojo OM, Oje OJ, Ola YO. A Survey of Hand Hygiene Facilities in a Tertiary Hospital in Nigeria -. *TAF Prev Med Bull*. 2012;11(5):571–6.
19. Devnani M, Kumar R, Sharma RK, Gupta AK. A survey of hand-washing facilities in the outpatient department of a tertiary care teaching hospital in India. *J Infect Dev Ctries* [Internet]. 2010 Jul 21 [cited 2022 Aug 16];5(02):114–8. Available from: <https://jicd.org/index.php/journal/article/view/1003>
20. Amazian K, Abdelmoumène T, Sekkat S, Terzaki S, Njah M, Dhidah L, et al. Multicentre study on hand hygiene facilities and practice in the Mediterranean area: results from the NosoMed Network. *J Hosp Infect* [Internet]. 2006 Mar [cited 2022 Aug 16];62(3):311–8. Available from: <https://pubmed.ncbi.nlm.nih.gov/16376457/>
21. Leitner E, Zarfel G, Luxner J, Herzog K, Pekard-Amenitsch S, Hoenigl M, et al. Contaminated handwashing sinks as the source of a clonal outbreak of KPC-2-producing *Klebsiella oxytoca* on a hematology ward. *Antimicrob Agents Chemother* [Internet]. 2015 Jan 1 [cited 2022 Aug 16];59(1):714–6. Available from: <https://pubmed.ncbi.nlm.nih.gov/25348541/>
22. Pittet D, Allegranzi B, Sax H, Dharan S, Pessoa-Silva CL, Donaldson L, et al. Evidence-based model for hand transmission during patient care and the role of improved practices. *Lancet Infect Dis*. 2006 Oct;6(10):641–52.
23. Allegranzi B, infection DP-J of hospital, 2009 undefined. Role of hand hygiene in healthcare-associated infection prevention. *Elsevier* [Internet]. 2009 Dec [cited 2022 Aug 24];73(4):305–15. Available from: <https://www.sciencedirect.com/science/article/pii/S0195670109001868>
24. Alshammari M, Reynolds KA, Verhoughstraete M, O'Rourke MK. Comparison of Perceived and Observed Hand Hygiene Compliance in Healthcare Workers in MERS-CoV Endemic Regions. *Healthcare* [Internet]. 2018 Dec 1 [cited 2022 Aug 16];6(4). Available from: </pmc/articles/PMC6315729/>