

Hand Hygiene Compliance of Healthcare Workers at a Public Hospital in South Africa: An Observational Study

¹Lefentse Vannesa Magale ¹Dumisani Wonderboy Mahlangu ¹Suzen Bokamoso Mokonyane ¹Letlotlo Malebo Makgatho, ¹Sebuti Delta Mokoena ¹Ntsakiso Lungile Manganye, ¹Avuyile Sibonelo Shongwe² and ²Siyanda Alex Ngema*

¹Sefako Makgatho Health Sciences University, School of Healthcare Sciences, Nursing Science Department, Garankuwa, South Africa

²Tshwane University of Technology, Faculty of Science, Adelaide Tambo School of Nursing Science, Pretoria, South Africa

ABSTRACT

Introduction:

Hand hygiene (HH) is crucial for preventing healthcare-associated infections (HAIs) in healthcare facilities.

Aim:

This observational study investigated the HH compliance of healthcare workers in the maternity departments of a public hospital in Gauteng.

Methods:

The study employed a quantitative, covert, observational design conducted at a public academic hospital in Gauteng Province, South Africa, with a focus on the maternity department. Convenience sampling was used to select HCWs directly involved in care and HH practices in September 2025. The WHO Hand Hygiene Observation Tool was utilised to record HH compliance. Each HH opportunity was noted as compliant or non-compliant.

Results:

A total of 783 HH moments were observed across selected wards. Overall compliance was critically low at 6.9%. By profession, nurses had 6.4% compliance, medical doctors 5.6%, and students 31.8%. Compliance varied by moment type: "After exposure to bodily fluids" showed the highest compliance at 20.9%, followed by "After touching patient" at 16.7%. The lowest compliance was observed for "After touching patient surroundings" at 1.7%.

Conclusion:

The results revealed low compliance with HH among nurses, doctors, and students. The data emphasise the urgent need for targeted interventions to improve hand hygiene compliance across all professional categories, thereby enhancing patient safety and reducing the risk of healthcare-associated infections throughout the maternal care continuum. These findings underscore the urgent need for expanded research and targeted interventions to improve HCW HH practices.

Keywords: Hand hygiene, Healthcare-associated infections, Maternity, Compliance, Doctor, Nurse, Students

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Corresponding Author: Siyanda Alex Ngema

Email: ngemasa@tut.ac.za

Tshwane University of Technology, Faculty of Science, Adelaide Tambo School of Nursing Science, Pretoria, South Africa

INTRODUCTION

Healthcare-associated infections (HAIs) remain a persistent challenge worldwide. HAIs, also known as nosocomial or hospital-acquired infections, are infections acquired by a patient while receiving care in a healthcare setting (World Health Organisation [WHO], 2016, 2022). These infections are neither present nor incubating at the time of a patient's admission and may manifest during hospitalisation or after discharge (WHO, 2016, 2022). Additionally, HAIs may be contracted by healthcare workers during the process of providing care.

HAIs have profound consequences for patients, healthcare workers, and healthcare systems. They are associated with prolonged hospital stays, long-term complications, disability, and increased mortality (McFee, 2009; WHO, 2009b). Furthermore, HAIs impose significant social and psychological burdens on patients, their families, and

communities, while increasing workloads and healthcare costs for institutions (WHO, 2009b). The burden of HAIs highlights the importance of effective infection prevention and control (IPC) measures. It has been estimated that among every 100 patients admitted to acute-care hospitals, approximately seven patients in high-income countries and 15 patients in low- and middle-income countries (LMICs) will acquire at least one HAI during their hospital stay (Allegranzi et al., 2011; WHO, 2011).

To mitigate the spread of HAIs and improve patient safety, the World Health Organisation introduced the Five Moments for Hand Hygiene in 2009 (WHO, 2009b). These moments provide a standardised framework for hand hygiene (HH) practice in healthcare settings worldwide and include: (1) before touching a patient, (2) before a clean or aseptic procedure, (3) after exposure to

body fluids, (4) after touching a patient, and (5) after touching the patient's surroundings (WHO, 2009b). This framework is widely used as an evidence-based approach to reduce the transmission of microorganisms in healthcare environments.

Hand hygiene is frequently overlooked despite being one of the most effective measures for preventing HAIs. According to the WHO (2025), most HAIs are preventable through appropriate HH practices performed at the right moments during patient care. HH involves either washing hands with soap and water or using alcohol-based hand rubs and other hand disinfectants (Centers for Disease Control and Prevention [CDC], 2024). Effective HH significantly reduces the transmission of pathogens, including antibiotic-resistant microorganisms, thereby protecting both patients and healthcare workers (CDC, 2024).

Sub-Saharan Africa (SSA) presents a unique context for exploring HH and IPC practices. A systematic review examining HH compliance among birth attendants in low- and middle-income countries found compliance rates ranging from 0% to 100%, reflecting substantial variability in adherence to recommended HH practices (Gon et al., 2020). These findings indicate persistent challenges in ensuring compliance with IPC measures, particularly in maternal healthcare settings within LMICs (Gon et al., 2020). Furthermore, a narrative review conducted in SSA identified insufficient knowledge among healthcare workers as a major barrier to HH compliance (Ataiyero et al., 2019). Hand hygiene practices in Sub-Saharan African maternity departments require improvement, particularly in infrastructure, training, and policy (Ngema et al., 2026).

Evidence consistently demonstrates that the importance of HH is not sufficiently recognised among healthcare practitioners, contributing to persistently low levels of compliance (Bale et al., 2021; Bredin et al., 2022; Ngema et al., 2024). This challenge exists despite the well-established role of HH in reducing healthcare-associated infections and improving patient safety. While studies examining HH compliance have been conducted in various healthcare settings globally, there remains a paucity of research focusing specifically on maternity departments in South Africa. To the best of the researchers' knowledge, no published study has investigated HH compliance among healthcare workers in maternity departments within Gauteng Province.

Maternity departments represent critical healthcare environments where lapses in HH can have serious implications for maternal and neonatal health. Women during pregnancy, childbirth, and the postnatal period, as well as newborns, are particularly vulnerable to infection, making strict adherence to IPC measures essential. Understanding HH compliance among healthcare workers in maternity settings is therefore important for identifying gaps in practice and informing targeted interventions aimed at improving patient safety. Identifying levels of

HH compliance may reveal areas of practice that are inconsistent with WHO evidence-based guidelines and provide valuable insights for hospital management and infection prevention and control teams. These findings may support the development of context-specific strategies to improve HH adherence and strengthen infection prevention efforts within maternity care services. This study aimed to investigate HH compliance among healthcare workers in the maternity department of a selected public hospital in Gauteng, South Africa.

METHODS

Study setting

The study was conducted at a public hospital in Gauteng Province, South Africa. The selected hospital is an academic hospital that serves as a referral centre for several district and regional hospitals within the province. It provides a wide range of specialised healthcare services, including paediatrics, neonatology, renal care, reproductive health, orthopaedics, internal medicine, oncology, family medicine, gynaecology, and maternity services.

The facility was chosen because it provides maternity services to the surrounding communities. These services include antenatal, intrapartum, and postnatal care. The study focused on the maternity department, comprising the antenatal, labour, and postnatal wards. The antenatal ward manages pregnant women with low- and high-risk pregnancies requiring monitoring or treatment before delivery. The labour ward provides intrapartum care, including emergency obstetric interventions such as caesarean sections. The postnatal ward cares for mothers and newborns after delivery, with a focus on recovery, breastfeeding support, and newborn monitoring.

Study Design

This study employed a quantitative, covert observational research design to assess healthcare workers' compliance with HH practices in the maternity department. Covert observation is a systematic data collection method in which participants are unaware of the researcher's identity, the purpose of the study, and the observation process (McKechnie, 2008). This design was chosen to minimise the Hawthorne effect, whereby individuals may alter their behaviour when they know they are being observed. Consequently, it enabled the researcher to capture authentic and naturally occurring HH practices within the clinical environment.

Study Population and Sampling

The study population comprised HH opportunities observed during patient care interactions in the maternity department. Although these opportunities involved healthcare workers such as doctors, nurses, and students, the primary unit of observation was the HH moment rather than the individual practitioner. HH opportunities were

sampled through convenience sampling as they naturally occurred within the designated wards during the data collection period. This approach enabled the assessment of routine HH practices under normal clinical conditions and facilitated the collection of data on naturally occurring events in a real-world healthcare setting.

Data Collection

This cross-sectional study collected data through non-participatory covert observations conducted in September 2025 across both day and night shifts. HH-related practices of healthcare workers in the antenatal, labour, and postnatal wards were observed during patient care activities.

Data were collected using the World Health Organization (WHO) Hand Hygiene Observation Tool (World Health Organization [WHO], 2009a). The tool is based on the WHO's Five Moments for Hand Hygiene framework and has been widely used internationally to assess hand hygiene compliance in healthcare settings (WHO, 2009b). Each observed HH opportunity was recorded as either compliant or non-compliant in accordance with established WHO guidelines. Prior to formal data collection, the observation tool was pilot tested in the maternity department to assess its suitability and ensure accurate observation recording. Results of the pilot test confirmed the tool's appropriateness for the study setting. Data were collected by trained research assistants who were healthcare professionals familiar with the clinical environment but not directly responsible for supervising the observed healthcare workers. Before data collection commenced, the study supervisor provided structured training on the use of the WHO Hand Hygiene Observation Tool, identification of hand hygiene opportunities, observation procedures, and accurate data recording. Pilot observations were conducted to promote consistency and reliability among observers.

Measures to minimise Bias

Several measures were implemented to minimise potential bias. Covert observation was used to reduce behavioural changes associated with awareness of being observed (Hawthorne effect). A standardized WHO Five Moments for HH observation tool was employed to ensure consistency in data collection. Prior to the study, the observers were trained on the identification and recording of HH opportunities and compliance. Observations were based on predefined criteria and focused on objectively observable behaviours, thereby reducing subjective interpretation. Data were recorded immediately after each observation to minimise recall bias. Although observers were trained prior to the commencement of the study to maintain consistency across all observations, the possibility of observer bias cannot be eliminated.

Data Management

Completed observation records were securely stored in the university's protected electronic storage system.

Access to the data was restricted through password protection to maintain confidentiality and ensure data security.

Data analysis

Data were analysed descriptively. The number of observed HH opportunities, compliant actions, and missed opportunities were counted and summarised using frequencies and percentages. Hand hygiene compliance was calculated by dividing the number of compliant actions by the total number of observed HH opportunities and expressing the result as a percentage. Compliance rates were reported overall, by the World Health Organization (WHO) Five Moments for HH, and by healthcare worker category (nurses, doctors, and students). The results are presented in tables (Tables 1 - 4).

Ethical Considerations

The study utilised covert observation to minimise the Hawthorne effect and obtain an accurate reflection of routine HH practices among healthcare workers (Goodwin et al., 2017). Ethical principles relating to confidentiality, anonymity, and data protection were maintained throughout the study. No personal identifiers were collected, and all information was stored securely for research purposes only. The research was conducted in strict accordance with the ethical standards governing scholarly inquiry. The study adhered to the Declaration of Helsinki and the moral principles and respect for human dignity, as well as the protection of personal information, enshrined in the Constitution of the Republic of South Africa and the Protection of Personal Information Act 4 of 2013. Ethical approval for this study was obtained from the Sefako Makgatho Health Sciences University (SMUREC ID: 2982) and the Department of Health (Gauteng) (Ref no: GP_202507_062). Before accessing the maternity department, permission was sought from the relevant head of department within the facility. Due to the covert nature of the data collection process in this study, permission from the head of the department was obtained to commence data collection through observations.

RESULTS

A total of 783 HH opportunities were observed across three maternity wards over a week. The overall HH compliance rate was critically low at 6.9%, with only 54 compliant actions recorded against 729 missed opportunities. The current study revealed low compliance among HCWs regarding HH. Table 1 summarises HH details of specific moments when HH was observed, including before touching a patient, before performing aseptic techniques, after exposure to body fluids, after touching a patient, and after contact with a patient's surroundings.

Table 1: Table 1 Overall moments observed by types of HH moments (n:783)

5 Moments of HH	Observed Moments (n)	Compliance overall
After touching patient surroundings	361	1.7% (6/361)
Before touching a patient	56	5.8% (9/156)
Before aseptic procedures	97	9.3% (9/156)
After touching the patient	126	16.7% (21/126)
After exposure to bodily fluids	43	20.9% (9/43)

Table 2 demonstrates the nurses' compliance rates. Nurses represented the largest proportion of observed moments with 534 opportunities, achieving a compliance rate of 6.4% (34 compliant actions).

Table 2: Nurses Compliance

Moment	Total Observed	Compliant	Missed	Compliance Rate
Before touching patient	94	2	92	2.1% (2/94)
Before aseptic procedure	73	8	65	11.0% (8/73)
After bodily fluid exposure	30	6	24	20.0% (6/30)
After touching patient	81	13	68	16.0% (13/81)
After touching surroundings	256	5	251	2.0% (5/256)
TOTAL	534	34	500	6.4% (34/534)

Table 3 demonstrates that doctor compliance was observed in 231 opportunities, with a compliance rate of 5.6% (13 compliant actions).

Table 3: Doctors' compliance

Moment	Total Observed	Compliant	Missed	Compliance Rate
Before touching patient	59	2	57	3.4% (2/59)
Before aseptic procedure	24	1	23	4.2% (1/24)
After bodily fluid exposure	13	3	10	23.1% (3/13)
After touching patient	42	6	36	14.3% (6/42)
After touching surroundings	93	1	92	1.1% (1/93)
TOTAL	231	13	218	5.6% (13/231)

Students, despite the smallest sample size of 22 observations, demonstrated the highest compliance rate at 31.8% (7 compliant actions). Table 4 shows data for students' compliance.

Table 4: Healthcare students' compliance

Moment	Total Observed	Compliant	Missed	Compliance Rate
Before touching patient	3	0	3	0% (0/3)
Before aseptic procedure	3	0	3	0% (0/3)
After bodily fluid exposure	0	0	0	N/A
After touching patient	3	2	1	66.7% (2/3)
After touching surroundings	13	5	8	38.5% (5/13)
TOTAL	22	7	15	31.8% (7/22)

Overall, 783 hand hygiene opportunities were observed, revealing an overall compliance rate of 6.9%. Compliance varied across the five WHO hand hygiene moments and

among healthcare worker categories. The highest compliance was observed after exposure to bodily fluids (20.9%), while the lowest compliance was observed after

DISCUSSIONS

The current study assessed compliance among HCWs in the maternity department of a selected public hospital in Gauteng, South Africa. The compliance levels across all categories (doctors, nurses, and students) were low. Similarly, an observational study in Rwanda reported suboptimal HH compliance among healthcare workers, including inappropriate glove use without HH between patient contacts. Although glove-use practices were not specifically evaluated in the current study, the low overall compliance observed similarly highlights deficiencies in infection prevention practices (Umuhoza et al., 2023). Another study in Cambodia (Nalule et al., 2021) revealed that low HH compliance during uncomplicated vaginal births was observed, and HH compliance worsened as the birth process progressed among HCWs. Comparable findings have also been reported in high-income settings. A systematic review conducted across multiple countries found that HH compliance among healthcare workers remained suboptimal despite established infection prevention programmes, indicating that HH non-compliance is a worldwide challenge rather than one confined to resource-limited settings (Bredin et al., 2022). This demonstrates that HH non-compliance is a global threat, especially in maternity departments, thereby posing a risk to the safety of women giving birth in various healthcare settings. It is therefore crucial to initiate strategies that empower healthcare workers to understand the importance of HH in maternity departments, thereby safeguarding patient safety and ensuring the delivery of quality healthcare. Although conducted in different settings, evidence suggests that educational interventions can meaningfully improve healthcare providers' knowledge and practices related to infection control (Ngema et al., 2025).

The current study revealed low compliance among doctors, with compliance rates below 10%. Similar findings were reported at a teaching hospital in Ghana, where doctor compliance was also below 10% (Yawson & Hesse, 2013). In contrast, Nance (2022) reported substantially higher compliance rates among obstetric physicians at a California teaching hospital, with compliance exceeding 50% before the intervention was implemented. The difference between the Ghanaian and United States findings may reflect variations in infection prevention resources, institutional safety culture, continuous monitoring systems, staff-to-patient ratios, and the availability of alcohol-based hand-rub products. Nevertheless, the decline observed after intervention in the California study suggests that maintaining high

compliance remains challenging even in high-income healthcare settings.

Nurses exhibited low HH compliance in the current study. The moment with poor HH compliance was the moment of "after touching the surroundings of the patient" in the labour ward. Similarly, a study in Bangladesh among healthcare workers showed that, although nurses exhibited the highest score of HH compared to other healthcare workers, their compliance remained low (Harun et al., 2023). Furthermore, the Bangladesh study highlights the lack of supply of alcohol-based hand rubs as a barrier leading to low compliance with HH by HCWs (Harun et al., 2023). The omission of HH after touching patients in this area may be due to infrastructural challenges at the facility, such as the lack of hand disinfectant and the absence of HH reminders in the ward, as observed in this study. This highlights the need for enhanced adherence to and compliance with HH practices recommended by Pittet and colleagues, such as multifaceted approaches involving reminders, routine system monitoring, and management within the maternity department (Pittet et al., 2000).

In the current study, students demonstrated greater compliance with HH than nurses and doctors. Despite students having a higher compliance rate than nurses and doctors, the compliance rate among students was 27.5%. In another study conducted among medical students in Saudi Arabia during their objective structured clinical examination, it was found that nearly half were uncertain or unaware of hygiene indicators (Al Kadi & Salati, 2012). Only a small minority identified all five HH indicators correctly. Observed compliance was notably low, with no gender differences (Al Kadi & Salati, 2012). During the observations in the current study, most observations of students were conducted during the ward rounds, where seniors, including specialist doctors, qualified doctors, senior nurses, and other students were present. This may have influenced the behaviour of students towards HH compliance, especially given that most of the observed compliance was "after touching patients' surroundings". Therefore, improving HH compliance is imperative and requires a multilayered approach that addresses infrastructure challenges, hierarchical barriers to enforcing compliance across all healthcare staff levels, adequate staffing, and sustained behavioural change interventions beyond one-time training (Ngema et al. 2026).

To the best of the researchers' knowledge, this study is the first to assess HH compliance in maternity units in South Africa. The observed HH moments were recorded during various shifts spread over one week, minimising the likelihood of the Hawthorne effect (Goodwin et al., 2017). The study supervisor provided robust training of observers to ensure data quality.

Conclusion

Hand hygiene compliance among healthcare workers in the maternity department of the selected public hospital was suboptimal across all professional categories and WHO hand hygiene moments. Although students demonstrated relatively higher compliance than nurses and doctors, overall adherence remained low, highlighting significant gaps in infection prevention and control practices. Given the critical role of HH in preventing healthcare-associated infections and protecting maternal and neonatal health, these findings are concerning.

The study underscores the need for strengthened HH promotion strategies, including continuous training, routine monitoring, regular feedback, and improved availability of HH resources. Addressing these gaps through targeted and sustainable interventions may enhance compliance among healthcare workers, improve patient safety, and contribute to the delivery of high-quality maternity care.

Limitations

The current study had a few limitations. Firstly, a convenience sampling method was used, in which healthcare workers were observed based on their presence in the wards during the data collection period. Secondly, using a covert design whereby practitioners were unaware that they were being monitored, the data collectors or researchers may have missed crucial moments of HH while attempting not to display or make it evident that they were collecting data about the phenomenon without being noticed by the HCW. Thirdly, the data were collected over one week. The reality may be different if the study had been conducted over a more extended period.

Recommendations

To enhance HH practices and improve infection prevention strategies within maternity departments, future studies should include larger and more diverse participant groups across various settings, including allied health practitioners, such as dietitians, physiotherapists, social workers, psychologists, as well as cleaners. Qualitative and mixed-method studies can provide greater insights into the impediments and barriers to HH compliance. Longitudinal and interventional studies will further provide insights through monitoring changes in hygiene practices over time, thus evaluating the effectiveness of various training and interventions.

Regular assessments, monitoring of training, and constructive feedback are essential for reinforcing knowledge and adherence among healthcare workers. Fostering a culture of safety and accountability will encourage staff to report hygiene non-compliance without fear of repercussions, leading to greater commitment to best practices. Utilising technology to monitor HH

compliance can offer real-time insights, further supporting adherence to established standards. By addressing these areas, healthcare organisations can significantly improve hygiene practices, ultimately enhancing patient safety and the quality of care provided. Further research across multiple healthcare facilities is recommended to provide a broader understanding of HH practices in South African maternity settings and to inform evidence-based infection prevention interventions.

Abbreviations

HH Hand Hygiene

HCW Healthcare Workers

HAI Healthcare-Associated Infections

IPC Infection Prevention and Control

LICs Low-income countries

SSA Sub-Saharan Africa

WHO World Health Organisation

CDC Centers for Disease Control and Prevention

Competing interests

The authors declare no conflict of interest.

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Consent for publication

Not applicable. This study does not include any identifiable personal data, images, or other information requiring individual consent for publication.

Author contributions

MLV, MDW, MSB, MLM, MSD, MNL, and SAS conceptualised and designed this study, and SAN assisted with the data collection process and analysis. SAN supervised the project from start to finish. All authors read and confirmed the final version of the manuscript.

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Author biographies

Lefentse Vannesa Magale, Dumisani Wonderboy Mahlangu, Suzen Bokamoso Mokonyane, Letlotlo Malebo Makgatho, Sebuti Delta Mokoena, Ntsakiso Lungile Manganye, and Avuyile Sibonelo Shongwe are graduates of the Bachelor of Nursing programme at Sefako Makgatho Health Sciences University. They completed this research project in 2025 as part of the requirements for their undergraduate nursing qualification under the supervision of Dr Siyanda Alex Ngema. Their research interests include infection prevention and

control, patient safety, maternal health, healthcare quality improvement, and evidence-based nursing practice.

Dr Ngema SA is a lecturer, nephrology nurse specialist, and researcher at the Adelaide Tambo School of Nursing Science, Faculty of Science, Tshwane University of Technology. His research interests include Nephrology, Nursing, Midwifery, Quality Improvement and Management, Student-Centred Education and Training, NCDs & SDG No. 3 and 4.

REFERENCES

1. Al Kadi, A., & Salati, S. A. (2012). Hand hygiene practices among medical students. *Interdisciplinary Perspectives on Infectious Diseases*, 2012, Article 679129. <https://doi.org/10.1155/2012/679129>
2. Allegranzi, B., Bagheri Nejad, S., Combescure, C., Graafmans, W., Attar, H., Donaldson, L., & Pittet, D. (2011). Burden of endemic health-care-associated infection in developing countries: Systematic review and meta-analysis. *The Lancet*, 377(9761), 228-241. [https://doi.org/10.1016/S0140-6736\(10\)61458-4](https://doi.org/10.1016/S0140-6736(10)61458-4)
3. Ataiyero, Y., Dyson, J., & Graham, M. (2019). Barriers to hand hygiene practices among health care workers in sub-Saharan African countries: A narrative review. *American Journal of Infection Control*, 47(5), 565-573. <https://doi.org/10.1016/j.ajic.2018.09.014>
4. Bale, T. L., Ramukumba, T. S., & Mudau, L. S. (2021). Evaluation of compliance with the World Health Organization's five moments of hand hygiene: Cross-sectional observation of healthcare professionals. *Southern African Journal of Infectious Diseases*, 36(1), Article 255. <https://doi.org/10.4102/sajid.v36i1.255>
5. Bredin, D., O'Doherty, D., Hannigan, A., & Kingston, L. (2022). Hand hygiene compliance by direct observation in physicians and nurses: A systematic review and meta-analysis. *Journal of Hospital Infection*, 130, 20-33. <https://doi.org/10.1016/j.jhin.2022.08.013>
6. Centers for Disease Control and Prevention. (2024). Clean hands: About hand hygiene for patients in healthcare settings. <https://www.cdc.gov/clean-hands/about/hand-hygiene-for-healthcare.html>
7. Gon, G., de Barra, M., Dansero, L., Nash, S., & Campbell, O. M. R. (2020). Birth attendants' hand hygiene compliance in healthcare facilities in low- and middle-income countries: A systematic review. *BMC Health Services Research*, 20(1), 1116. <https://doi.org/10.1186/s12913-020-05944-4>
8. Goodwin, M. A., Stange, K. C., Zyzanski, S. J., Crabtree, B. F., Borawski, E. A., & Flocke, S. A. (2017). The Hawthorne effect in direct observation research with physicians and patients. *Journal of Evaluation in Clinical Practice*, 23(6), 1322-1328. <https://doi.org/10.1111/jep.12773>
9. Harun, M. G. D., Anwar, M. M. U., Sumon, S. A., Mohona, T. M., Hassan, M. Z., Rahman, A., Abdullah, S. A. H. M., Islam, M. S., Oakley, L. P., Malpiedi, P., & Kaydos-Daniels, S. C. (2023). Hand hygiene compliance and associated factors among healthcare workers in selected tertiary-care hospitals in Bangladesh. *Journal of Hospital Infection*, 139, 220-227. <https://doi.org/10.1016/j.jhin.2023.06.019>
10. McFee, R. B. (2009). Nosocomial or hospital-acquired infections: An overview. *Disease-a-Month*, 55(7), 422-438. <https://doi.org/10.1016/j.disamonth.2009.03.001>
11. McKechnie, L. E. F. (2008). Covert observation. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (pp. 133-134). SAGE Publications.
12. Nalule, Y., Buxton, H., Ir, P., Leang, S., Macintyre, A., Pors, P., Samol, C., & Dreifelbis, R. (2021). Hand hygiene during facility-based childbirth in Cambodia: A theory-driven, mixed-methods observational study. *BMC Pregnancy and Childbirth*, 21(1), 429. <https://doi.org/10.1186/s12884-021-03919-z>
13. Nance, L. N. (2022). Save lives and sanitize: Prevention of surgical site infections post-caesarean section through increased hand hygiene compliance (Doctoral dissertation).
14. Ngema, S. A., Ramukumba, T. S., Bale, T. L., & Zwane, L. S. (2024). WCN24-1071 hand hygiene compliance in the dialysis setting: a systematic review. *Kidney International Reports*, 9(4), S257.
15. Ngema, S. A., Bale, T. L., & Ramukumba, T. S. (2025). Impact of infection prevention and control quality improvements in haemodialysis facilities: a scoping review. *BMC nephrology*, 26(1), 527.
16. Ngema, S. A., Mahlangu, D. W., Mokonyane, S. B., Makgatho, L. M., Mokoena, S. D., Vannesa, M. L., ... & Shongwe, A. S. (2026). Hand hygiene intricacies in maternity departments in Sub-Saharan Africa: A scoping review. *Student's Journal of Health Research Africa*, 7(3), 7-7.
17. Ngema, S. A., Zwane, L. S., Bale, T. L., & Ramukumba, T. S. (2026). WCN26-9551. "I have never seen any doctor washing hands." Barriers to Hand Hygiene Compliance of Healthcare Staff in Haemodialysis Units of

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18. Pittet, D., Hugonnet, S., Harbarth, S., Mourouga, P., Sauvan, V., Touveneau, S., & Perneger, T. V. (2000). Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. *The Lancet*, 356(9238), 1307-1312. [https://doi.org/10.1016/S0140-6736\(00\)02814-2](https://doi.org/10.1016/S0140-6736(00)02814-2)
 19. Umuhoza, A. G., Kamugisha, J. B., Nashwan, A. J., & Soko, G. T. (2023). Assessment of knowledge and practices of hand hygiene among health workers in Rwanda. *International Journal of Africa Nursing Sciences*, 19, 100585. <https://doi.org/10.1016/j.ijans.2023.100585>
 20. World Health Organization. (2009a). Hand hygiene monitoring tools. <https://www.who.int/teams/integrated-health-services/infection-prevention-control/hand-hygiene/monitoring-tools>
 21. World Health Organization. (2009b). WHO guidelines on hand hygiene in health care. <https://www.who.int/publications/i/item/9789241597906>
 22. World Health Organization. (2011). Report on the burden of endemic health care-associated infection worldwide. <https://apps.who.int/iris/handle/10665/80135>
 23. World Health Organization. (2016). Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. <https://www.who.int/publications/i/item/9789241549929>
 24. World Health Organization. (2022). Global report on infection prevention and control. <https://www.who.int/publications/i/item/9789240051164>
 25. World Health Organization. (2025). Infection prevention and control. <https://www.who.int/teams/integrated-health-services/infection-prevention-control/hand-hygiene>
 26. Yawson, A. E., & Hesse, A. A. J. (2013). Hand hygiene practices and resources in a teaching hospital in Ghana. *Journal of Infection in Developing Countries*, 7(4), 338-347. <https://doi.org/10.3855/jidc.2422>

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