Improving hand hygiene compliance amongst second-year nursing students and staff by implementing a standardised aseptic hand wash protocol in hospitals in the Northern Cape Province, South Africa

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Background: Infection prevention and control is essential within the scope and practice of every nurse or health care practitioner. It is also mandatory for wound care practitioners to ensure safe practices to avoid infection and decrease the associated risks, which would impact wound healing. At Henrietta Stockdale Nursing College (HSNC) in Kimberley, Northern Cape Province (NCP), students for the diploma in nursing are trained on social hand washing, alcohol hand rubbing and aseptic hand washing during their first year; and surgical hand scrubbing during the second year. Throughout the years, it was found that students copied different hand washing practices from different hospitals where they were placed for clinical training, despite the specified aseptic hand washing skill/procedure that was taught at HSNC. This has led to poor compliance with the prescribed aseptic hand washing skill/procedure, which could lead to the introduction of infection in those hospitals. Clinical preceptors also realised that students were failing their second-year practical examination due to failure of aseptic hand washing skills.

Methods: This study was a clinical, observational, qualitative, action research performed from May to December 2021. After a preliminary meeting to identify barriers to the study, assessment of needs, training material was made available for preceptors and students were placed in three hospitals within the NCP for clinical assessment. A questionnaire and evaluation tool were used to assess students' and staff's knowledge on aseptic hand washing technique. Descriptive statistic was used to compile results.

Results: A total of 25 students and 17 hospital staff members participated in the aseptic hand hygiene study. The pre-test percentage score for the evaluation tool for the students was 52%, and the objective structured clinical assessment (OSCA) score was 96%. The pre-test percentage score for the evaluation tool for the staff was 24%, and the OSCA score was 100%.

Conclusion: Continued training and support should be offered to all clinical facilities to minimise the gap between knowledge and attitude related to hand hygiene practices. Infection control units need to be resuscitated to adhere to audit programmes in the clinical facilities and to provide ongoing support and education on hand hygiene practices to the clinical facilities.

Keywords: hand washing, aseptic hand washing, nurse education, infection prevention, infection control, wound infection

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Background

Infection prevention and control is essential within the scope and practice of every nurse or healthcare practitioner. It is also mandatory for wound care practitioners to ensure safe practices to avoid infection and decrease the associated risks, which would impact wound healing. The following are among the factors contributing to the development and spread of healthcare-associated infections: the infectious nature of any chronic or acute condition and diseases; the patient:nurse ratio; the hurried movement of staff; visitors; supplies and equipment around patient care areas; as well as the fact that modern scientific technology, diagnostic test and procedures often bypass normal patient defence mechanisms.[1]

Hands are the body part most often in contact with the clinical environment, staff members, patients/clients and visitors in the environment. Therefore, hands are the single most common method of transmission of microbes that cause cross-infection and healthcare-associated infection.[2,3] A pathogen like enteric norovirus is likely to spread in succession from an individual's infected hands to as many as seven separate body surfaces.[3,4]

Hand hygiene in the healthcare environment is an umbrella concept that includes: social hand washing, alcohol hand rubbing, aseptic hand washing and surgical hand scrubbing. This umbrella concept can lead to great confusion, related to its indication and adoption for situations where professionals are not experienced.[5,6] Hand hygiene is performed as indicated with the appropriate technique while using adequate quantities of the correct products to cover all skin surfaces for the right time duration.[7,8] Hand washing with soap and water is indicated with proven or suspected exposure to spore-forming pathogens such as *Clostridium difficile* or drug-resistant *Staphylococcus aureus*.[6]

Infection control practice aims to establish and maintain a safe environment for patients, visitors, and staff, providing the maximum level of protection within the framework of available resources.[7] To ensure patient-centred asepsis, healthcare staff should have knowledge of the following: the infectious process, the pathophysiology of the disease and isolation and aseptic technique.[7]

At Henrietta Stockdale Nursing College (HSNC) in Kimberley, Northern Cape Province (NCP), students for the diploma in nursing (general/

psychiatric/community and midwifery) are trained on social hand washing, alcohol hand rubbing and aseptic hand washing during their first year and surgical hand scrubbing during the second year. Students and clinical preceptors have been trained on the World Health Organization (WHO) five moments for hand hygiene:[6] i) before touching a patient; ii) before surgically clean or aseptic procedures; iii) after body fluid exposure or risk; iv) after touching a patient, and v) after touching a patients' surroundings. Second-year nursing students at HSNC are placed in three hospitals within the NCP for clinical training: Dr Harry Surtie Hospital, a regional hospital; Tshwaragano Hospital, a district hospital and Robert Mangaliso Sobukwe Hospital, a tertiary hospital. Throughout the years, it was found that students copied the different hand washing practices from these different hospitals despite the specified aseptic hand washing skill/procedure that was taught at HSNC. This has led to poor compliance with the prescribed aseptic hand washing skill/procedure, with hand washing areas frequently missed, as has been well reported.[9] This could lead to the introduction of infection in those hospitals.[10] Clinical preceptors also realised that students were failing their second-year practical examination due to failure of aseptic hand washing skills.

Aiming to correct the problem identified, the author proposed in this study to i) identify and compare the different hand washing policies and skills/procedures that were available for each one of the training hospitals; ii) identify barriers to compliance to the required aseptic hand washing skill/ procedure of the HSNC, and iii) standardise aseptic hand washing procedure/skill for all three hospitals to ensure a patient-centred aseptic environment. This was possible through the implementation of an effective training programme.

Methods

This study was a clinical, observational, qualitative, action research study performed as part of the selective application for the International Interdisciplinary Wound Care Course (IIWCC) 2021–2022. The HSNC managers approved it after the submission of the study proposal. The period of the study was from May to December 2021.

Identification of barriers

The author organised a preliminary meeting with the nursing service (NS) managers, infection prevention and control (IPC) managers and registered nurses (RN) of the three hospitals of the NCP: Dr Harry Surtie Hospital (HSH) in Upington, ZF Mgcawu District; Tshwaragano District Hospital (TDH) in Kuruman, John Taolo District, and Robert Mangaliso Sobukwe Hospital (RMSH) in Kimberley, Frances Baard District. The meeting was online via the Zoom platform. Assessment of available policies and skills/procedures for each one of the training hospitals regarding hand washing protocol and hand washing practices were discussed.

Planning and implementation

Three clinical preceptors (nurse educators) of the HSNC allocated to the three hospitals were identified. Infection control nurses were also identified to assist with assessing the facilities/hospitals. The proposed implementation plan was discussed and refined with the team. All training needs and available resources such as alcohol hand rubs, soap, paper towels, bins, basins, water, hand washing policies, hand washing posters, etc., were assessed and compiled per hospital. A team leader for each hospital was identified who had to communicate with the coordinator/author. A weekly report was submitted every Friday to the coordinator/author.

A pre-test assessment questionnaire was prepared for students and staff to answer 16 questions containing: two open answers; two yes/no questions; nine true/false questions; two to choose between always, most of the times, sometimes or never and one direct choice between techniques of hand washing (Table I). The same questionnaire was applied after the formative education/training sessions at the final

Table I: Hand hygiene questionnaire created by the author for the study

Question	Type of answer
1. How many patients do you assist per day during your nursing duties?	(open)
2. Do you know the hand hygiene policy/protocol of the facility/hospital?	(yes/no)
3. You always wash your hands/perform alcohol hand rub when you enter the ward.	(always/most of the times/sometimes/never)
4. You always wash your hands/perform alcohol hand rub when you leave the ward.	(always/most of the times/sometimes/never)
5. When do you perform aseptic hand washing?	(open)
6. Which method do you perform more for hand hygiene?	(social hand washing/alcohol hand rub/aseptic hand washing)
7. When washing your hands, use clean, running water; if available, use warm water.	(true/false)
8. Your hands should be dry before applying soap.	(true/false)
9. You should rub your soapy hands for at least 20 seconds.	(true/false)
10. Aseptic hand washing takes at least 60–120 seconds.	(true/false)
11. If soap/water is not available, an alcohol-based hand sanitiser can be used to clean your hands.	(true/false)
12. When using an alcohol-based hand sanitiser, it is important to rub the product on all surfaces of your hands and fingers until dry.	(true/false)
13. *Staphylococcus aureus* is commonly found on the skin and around the nose.	(true/false)
14. A nosocomial infection is an infection acquired while in hospital.	(true/false)
15. You wash your hands/use alcohol hand rub after removing gloves.	(true/false)
16. Have you ever performed a sterile procedure without performing aseptic hand washing?	(yes/no) + open (reason)

summative skill assessment test. This questionnaire was prepared to assess the knowledge of both students and staff on principles of hand hygiene in preparation for the assessment of the aseptic hand washing skill at the final examination. Briefing of second-year nursing students regarding the standardised wound care protocol was given by the nurse educators. Although students were trained on all these skills/procedures during their first year and the beginning of the second year, the briefing was necessary to refresh their knowledge. Some hospital staff members were reluctant to be assessed on hand hygiene practices, as they thought it would affect their contract employment. However, they did change their minds once they attended the information and training sessions.

The objectives, content and structure of the educational programme to be implemented were formulated with the preceptors and infection control nurses at the facilities. This was important in order to take into account local priorities and resources and to target all ward staff and students. The training packages contained not only educational content but also strategies for teaching-learning and for assessing practice performance. The stated objectives covered the three learning domains in Bloom's taxonomy, i.e., affective, psychomotor and cognitive, to facilitate the acquisition of knowledge, skills and the right attitude.[11] Together with the infection control nurses, the author ensured that all hospitals had functional wash basins, soap, water (hot/cold), paper towels, alcohol hand rub and hand washing protocols in the hospitals/wards where the students were allocated.

The educational training consisted of oral presentation, where the trainer presented the topic by a traditional lecture accompanied by one or several other methods (e.g. videos posted via social media group created for the study). Following the lecture, the author demonstrated how to perform social hand wash, alcohol hand rub and aseptic hand washing. Preceptors were assisted by the author while they also demonstrated the techniques to the students. Training was also done with the preceptors/educators regarding the assessment tool used for the final examination on aseptic hand washing (Table II).

Students were distributed into three groups and allocated a number for the group. Each group rotated in each one of the three hospitals. The

Table II: Evaluation tool for final OSCA test

Steps to be assessed	**Rating scale mark**				
	3	**2**	**1**	**0**	**N/A**
1. Wet hands under running water from fingertips to elbows and close taps with elbows					
2. Apply one squirt (3–5 ml) of hand wash to the palm of the hand					
3. Rub hands together to form lather – palm to palm					
Wash hands in the following sequence:					**C**
4. Palm to palm with fingers interlaced					
5. Right palm over left dorsum with interlaced fingers and vice versa					
6. Inter-lock fingers in order to rub knuckles and vice versa					
7. Rotational rubbing of the thumb in opposite palm					
8. Sweep past the anatomical snuff box and the dorsal part of the hand toward the fingertips and vice versa					
9. Rotational rubbing of fingertips in the palm of the hand and vice versa					
10. Wash with rotational movement from the fingertips to the wrist and vice versa					
11. Open the taps with elbows					
12. Rinse hands from the fingertips to the wrist and vice versa					
13. Close the tap with the elbows					
14. Remove one paper towel from dispenser					
15. Unfold paper towel with both hands					
16. Clasp the paper towel between the palms of the hands with fingers open to absorb most moisture					
17. Dry hand from top to bottom					
18. Discard paper towel and dry other hand in the same fashion					
					Total: /54

Evaluation tool used for the study, part of the skills assessment for students at HSNC.
C – Critical component
N/A – Not applicable
0 – Unsafe practitioner
1 – Ability to function as a safe practitioner, displaying average performance
2 – Ability to function with the expected level of training,
3 – Ability to function independently, displaying outstanding performance and exceed expectations
Criteria for competence:
> 60% – Competent
< 60% – Not yet competent

students were placed in the following units/wards for clinical experience and assessment: medical, surgical, paediatric and orthopaedic wards and the emergency unit. Students and staff were supported and evaluated during placement in the hospitals during their 3rd–4th week of placement from July to October 2021. The final assessment or summative assessment on aseptic hand washing was done during the scheduled objective structured clinical assessment (OSCA) practical examination in December 2021 at the HSNC simulation laboratory in Kimberley. The evaluation tool for this exam consisted of 18 hand washing steps that needed to be performed by the students within 10 minutes (Table II). The scoring rate ranged from 0 (unsafe practitioner) to 3 (outstanding performance). If the student were assessed to cause harm to the patient during any stage of the procedure due to unsafe or inappropriate interventions, the assessor would intervene, nullifying the procedure. The student would be requested to repeat the procedure at another time. The minimum score to pass was 60% obtained on this evaluation tool. Failure in any of the critical (C) steps (from number 4) would render the student to be considered for immediate failure. This evaluation tool was also applied during the formative assessment performed at the monthly placement of students as part of the training for the final exam from July to October 2021.

The results of the evaluation tool applied before and after the educational programme was implemented were compiled, and descriptive statistical analysis was performed.

Results

From the preliminary meeting, it was found that no written hand washing protocols and policies were available in the three hospitals. The last review date for those was in 2017 in all three hospitals. No in-service hand washing training and/or auditing was performed for the past five years. The reasons proposed by the managers were as follows: i) the COVID-19 pandemic and confusion created regarding hand hygiene, between the use of alcohol hand rub x aseptic hand washing; ii) the fact that nursing staff employed at those hospitals were originated from different provinces, with different hand hygiene practices.

The following challenges were identified for corrective action: i) poor maintenance plans to fix hand washing basins/taps/hot water supply in TDH; ii) challenges with the availability of warm water in the hospitals; iii) out of stock items like paper towels to dry hands (hands were dried with bed sheets); iv) constant water cuts and interruptions at RMSH and TDH leading to poor compliance of hand hygiene; v) inconsistent alcohol hand rubbing practices at hospitals; vi) outdated hand hygiene policies/protocols in hospitals; vii) insufficient hand hygiene posters available to promote hand hygiene, and viii) no training records and audit reports on hospital regarding hand hygiene practices.

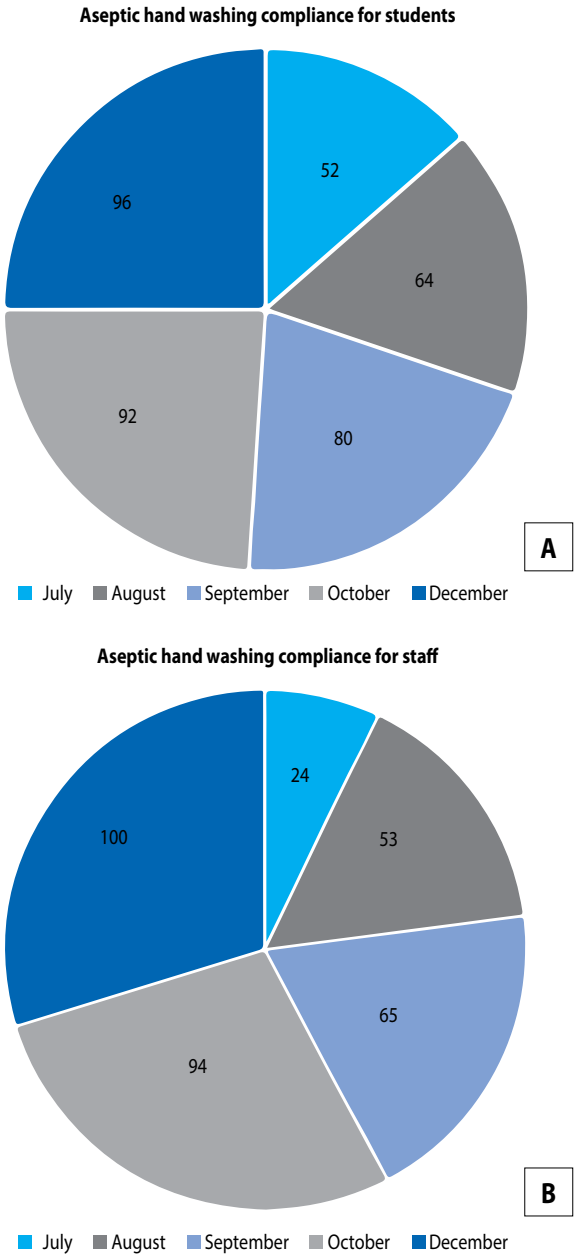

Figure 1: Distribution of aseptic hand washing compliance of students (1A) and staff (1B)

A total of 25 students and 17 hospital staff members participated in the aseptic hand hygiene study. The pre-test percentage score for the evaluation tool for the students was 52%, and the OSCA score was 96%. The pre-test percentage score for the evaluation tool for the staff was 24%, and the OSCA score was 100% (Table III and Figure 1A and 1B).

Aseptic hand hygiene practices improved as indicated in Table III and Figure 1.

Table III: Distribution of percentage score for the evaluation tool amongst students and staff from July 2021 (first assessment) to October 2021 (before final assessment) and final OSCA exam result (December 2021)

	Month *n* (%)				
	July	August	September	October	OSCA
Students (*n* = 25)	13 (52)	16 (64)	20 (80)	23 (92)	24 (96)
Staff (*n* = 17)	4 (24)	9 (53)	11 (65)	16 (94)	17 (100)

Discussion

No statistics on hand washing audits or training from any of the three hospitals to be used for comparison were available at the start of this study. The impact of the COVID-19 pandemic and shortage of staff were reasons offered by all three health establishments. However, hand washing was one of the strategies, together with social distancing and the use of facial masks, to prevent the spread of the coronavirus.[12] Despite the pandemic in South Africa that is still present though, with fewer cases, hand washing should have been made a priority for the healthcare practitioners to restrict the propagation of COVID-19 and other infectious diseases and protect the healthcare workers against this rapidly spreading virus.

It was important for the team to ensure that all role players' staff and students knew what was expected from them. Resources were allocated to ensure that the shortage of resources did not affect the set programme negatively. The overarching goal of this programme was to ensure that students and staff applied a standard aseptic hand washing procedure to minimise wound infection. Confusion regarding aseptic hand washing and alcohol hand rubbing was addressed and resolved.

Due to resource constraints, the use of a fluorescent dye as proposed by Goel and Chandrashekar was not available for this study.[9] It would have helped evaluate the hand washing technique and probably would have had a strong impact on this study, allowing a visual demonstration of the effectiveness of hand hygiene during the course of this study.

In this study, the results obtained after the initial tests were applied showed an increase in compliance with aseptic hand washing. This was possible after implementing educational strategies during the course of this study. Teaching-learning strategies should aim at continuing and progressive education to address the different objectives and preferably include a variety of teaching-learning methods, including those that facilitate reflective thinking.[11] Guideline summaries, leaflets, brochures or information sheets were made available to the students and hospital staff. Hygiene posters were made available in every ward and notice boards of the three hospitals.

The choice of appropriate learning methods to convey different aspects and a tight alignment between these ensured that the programme catered to the needs of each student/staff member and helped build competence.[10,13] The students were asked to find the information needed to solve a problem (= aseptic hand washing) and thus learned from the information gathered, constituting a problem-solving approach in education.[11,14] Besides, the students were stimulated to evaluate their personal experience in practical situations (= aseptic hand washing) and learn from this experiential learning.[11] Debriefing sessions were done with students and staff at the end of each month of placement. These experiences can significantly modify behaviour and achieve compliance to hand hygiene. Participatory decision-making is another important factor in enabling attitude change and addressing the culture of resistance to change in healthcare facilities.[14]

The analysis of the evaluation tool before and after implementation of educational tools demonstrated an increase in the knowledge of the hand washing skills amongst the students and staff. Sustained changes in hand hygiene practices is one component of the programme than can improve hand hygiene in healthcare settings. Educational programmes must be adapted to local needs and resources and must be primarily focused on "why", "when", and "how" and behavioural change. Guidelines and tools for most aspects of an educational programme to improve hand hygiene in healthcare facilities have been developed by WHO and the National Department of Health.[6,12] Infection control departments in hospitals need to ensure ongoing training and auditing of hand hygiene practices. Regarding educational interventions in improving hand hygiene in health care, facilities should be encouraged to document their experiences, including details on all aspects of the intervention and its evaluation.

While appreciating the critical role of a formal education programme in achieving better adherence to hand hygiene protocols, it is also important to emphasise that educational programmes alone are not sufficient to guarantee improvement. Interventions to strengthen the facility infrastructure and supplies and address cognitive, behavioural and administrative aspects are fundamental to improving hand hygiene in healthcare settings.

As a simultaneous achievement of this study, the task team involved reviewed all hand hygiene policies for the three hospitals, which are now standardised. The aseptic hand washing protocol was adopted for all three hospitals.

Conclusion

This study was limited to three hospitals, which is a fraction of the Nursing College placement facilities. This training programme should be rolled out to all facilities. Continued training and support should be offered to all clinical facilities to minimise the gap between knowledge and attitude related to hand hygiene practices. Infection control units need to be resuscitated to adhere to audit programmes in the clinical facilities and to provide ongoing support and education on hand hygiene practices to the clinical facilities.

Supplementary video link

https://youtu.be/xRfCkU_F5q0

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Conflict of interest

The author declares no conflict of interest.

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Ethical approval

Consent was given by the students and staff to participate in this study. The Henrietta Stockdale Nursing College Principal authorised the protocol and final submission. The study was accepted and approved by the IIWCC to conclude the 2021–2022 course.

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