


**ORIGINAL ARTICLE**

# The hand hygiene compliance of student nurses during clinical placements

Jorun Sætre Sundal RN, University College Teacher<sup>1</sup>  | Anne Grethe Aune RN, MHS, Assistant Professor<sup>1</sup> | Eline Storvig RN, MPH, Master of Public Health<sup>2</sup> | Jenny Kristin Aasland RN, MHS, Infection Control Nurse<sup>2</sup> | Kaja Linn Fjeldsæter MD, Regional Infection Control Physician at the Regional Health Authority of Central Norway<sup>2</sup> | Kirsti Torjuul PhD, RN, Associate Professor<sup>1</sup>

<sup>1</sup>Department of Public Health and Nursing, Faculty of Medicine and Health Sciences, Norwegian University of Science and Technology (NTNU), Trondheim, Norway

<sup>2</sup>Department of Infection Control, St. Olavs Hospital, Trondheim University Hospital, Trondheim, Norway

**Correspondence**

Jorun Sætre Sundal, Department of Public Health and Nursing, Faculty of Medicine and Health Sciences, Norwegian University of Science and Technology (NTNU), Trondheim, Norway.

Email: Jorun.s.sundal@ntnu.no

**Aims and objectives:** To observe student nurses' overall and moment-specific hand hygiene compliance during clinical placement.

**Background:** Hand hygiene is the single most important measure to prevent healthcare-associated infections. However, research has shown low compliance among healthcare workers. During clinical placements, student nurses perform various nursing tasks and procedures to a large number of patients, requiring extensive patient contact. It is crucial that they practice correct hand hygiene to prevent healthcare-associated infections.

**Design:** Open, standardised and nonparticipating observations.

**Methods:** Twenty-nine student nurses were observed three times for 20 ± 10 min during clinical placement in a Norwegian university hospital. To measure compliance, we used WHO's Hand Hygiene Observation tool, based on the model "My five moments for hand hygiene".

**Results:** Overall hand hygiene compliance in the student group was 83.5%. Highest moment-specific compliance was after touching patient surroundings, after touching patients and after body fluid exposure risk. Lowest moment-specific compliance was recorded before touching patients or patient surroundings, and before clean/aseptic procedures.

**Conclusions:** Nurse education needs to be improved both theoretically and during clinical placements in order to advance and sustain compliance among student nurses.

**Relevance to clinical practice:** Increasing healthcare workers' compliance with hand hygiene guidelines remains a challenge to the clinical community. In order to reduce healthcare-associated infections, it is important to educate student nurses to comply with the guidelines during clinical placements. Identifying student nurses' hand hygiene performance is the first step towards developing teaching methods to improve and sustain their overall and moment-specific compliance. As a measure to ensure student compliance during clinical placements, mentors should be aware of their influence on students' performance, act as hand hygiene ambassadors, encourage students to comply with established guidelines and provide regular feedback.

**KEYWORDS**

"My five moments", clinical placement, compliance, hand hygiene, infection control, observational study, student nurses

## 1 | INTRODUCTION

The prevalence rate of healthcare-associated infections (HAIs) in Norwegian hospitals was 4.5% in spring 2016, that means about one in every 20 hospitalised patients got a HAI (Norwegian Institute of Public Health, 2016). HAIs have major consequences on patient outcomes, including increased length of stay, morbidity and mortality, and the financial burden in society is considerable (WHO, 2009a, 2011). The hands of healthcare workers are the most common source of transmission of pathogenic microorganisms between patients, and from hospital surroundings to patients (Allegranzi & Pittet, 2009). Most hand hygiene opportunities occur during nurse–patient interactions (Han et al., 2017). Even though hand hygiene is the single most important measure to prevent HAIs and the spread of antibiotic resistant microorganisms (Allegranzi & Pittet, 2009; WHO, 2009b), international research indicates that hand hygiene rarely is correctly accomplished (Alsubaie et al., 2013, WHO, 2009a). Observational studies conducted in the UK (Randle, Arthur, & Vaughan, 2010; Randle, Firth, & Vaughan, 2013), Germany (Scheithauer & Lemmen, 2013), USA (Carter et al., 2016; Sunkesula et al., 2015), Italy (di Martino et al., 2011) and India (Chavali, Menon, & Shukla, 2014) have examined hand hygiene rates of healthcare workers in hospitals and found that compliance scores vary between 40%–78%.

Researchers have reported several work circumstances that affect hand hygiene compliance, such as type of hospital ward and the number and type of patients being cared for (Erasmus et al., 2010). Differences in compliance vary between professional groups and level of staff experience (Randle et al., 2010; Sunkesula et al., 2015). A heavy workload and time pressure also affect hand hygiene compliance, as well as the kind of clinical task performed, and whether it is perceived as dirty or clean (Alsubaie et al., 2013; Storvig, 2014). Compliance has also been reported to vary with time of day and time of year (Carter et al., 2016).

Individual motivation, knowledge and engagement in infection control influence the hand hygiene performance of healthcare providers (Joshi et al., 2012), as well as social factors such as organisational culture, and the practices of peers and senior staff (Berland, Bentsen, & Gundersen, 2009; Fuller et al., 2014). In addition, hand hygiene compliance is affected by the way work situations are organised, that is whether alcohol-based dispensers are available (Smiddy, O'connell, & Creedon, 2015), or pasted hand hygiene posters by washbasins are visible (Lau, Tang, Mak, & Leung, 2014).

Previous research has examined factors promoting and impeding hand hygiene compliance among different groups of healthcare

### What does this paper contribute to the wider global clinical community?

- Increasing healthcare workers' compliance with hand hygiene guidelines remains a challenge to the clinical community. In order to reduce healthcare-associated infections (HAIs) and increase patient safety, it is important to educate student nurses to comply during clinical placements.
- Identifying student nurses' hand hygiene performance is the first step towards developing teaching methods to improve and sustain their overall and moment-specific compliance. This study is one of very few observational studies to identify student nurses' hand hygiene compliance during clinical placements.
- As a measure to ensure students' compliance during clinical placements, mentors should be aware of their influence on students' performance, act as hand hygiene ambassadors and encourage students to comply with established guidelines, and provide regular feedback.

workers, and in various parts of healthcare. Many international or local campaigns have been launched to improve hand hygiene, but no substantial or lasting effects on compliance have so far been reported (di Martino et al., 2011; Scheithauer & Lemmen, 2013; Tromp et al., 2012).

Several teaching methods in hand hygiene and infection control have been researched to promote student nurses' compliance (Konicki & Miller, 2016; Mathai et al., 2010). Reime, Harris, Aksnes, and Mikkelsen (2008) compared lectures and an e-learning programme and found that students preferred variation in methods of learning hand hygiene and infection control. Ward (2011) found that students and mentors favoured interactive methods and small group learning. Mikkelsen, Reime, and Harris (2008) studied the effect of scenario-based simulation and found that student nurses became more aware of factors that facilitate or impede hand hygiene compliance in complex clinical situations when this method was applied.

In the literature reviewed, we found only one observational study of hand hygiene compliance among healthcare workers in Norway and the Nordic countries (Storvig, 2014). Furthermore, scarce international research has investigated student nurses' compliance during clinical placement. Most studies have focused on students' knowledge and attitudes towards hand hygiene and infection

control. While some studies have reported adequate hand hygiene knowledge and high self-reported compliance among student nurses (Darawad & Al-Hussami, 2013; Van De Mortel et al., 2012), others have found unsatisfactory results (Hernandez-Garcia & Cardoso, 2013; Nasirudeen et al., 2012; Salmon, Wang, Seetoh, Lee, & Fisher, 2013; Shinde & Mohite, 2014; Whitcomb, 2014). With the exception of the observational study by Whitcomb (2014), previous research has used questionnaires or interviews to investigate students' compliance (Nasirudeen et al., 2012; Shinde & Mohite, 2014; Van De Mortel et al., 2012). There may be great variations between student nurses' observed and self-reported compliance during clinical placements (Randle et al., 2010). Additionally, students tend to overestimate their personal compliance and express dissonance between what they say, what they know and what they do, according to Cole (2009).

It is vital that student nurses comply with hand hygiene guidelines and infection control measures during clinical placements to safeguard patients and themselves against HAIs (Reime et al., 2008; Schuttpelz-Brauns, Obertacke, Kaden, & Hagl, 2015). Students have reported several gaps in hand hygiene by healthcare workers. Still, students' mentors and healthcare providers in the wards affect students' hand hygiene compliance (Barrett & Randle, 2008; Gould & Drey, 2013). Ward (2011) found that occasionally, student nurses did not comply with hand hygiene guidelines to fit in and be accepted by staff, or in fear of not passing their clinical placement. In contrast, the majority of student nurses interviewed by Hinkin and Cutter (2014) said they would challenge mentors' incorrect practice when appropriate and follow infection control advices learned in university.

Student nurses do a large amount of hands-on nursing tasks and procedures to a large number of patients during clinical placement. Still, we know little about student compliance during clinical placement. Identifying the prevalence of students' hand hygiene behaviour is the first step towards developing educational methods to improve and sustain hand hygiene compliance. With this in mind, the nursing department at a Norwegian university conducted this study in 2014, in cooperation with the department of infection control at one university hospital in Norway.

The main objective of this study was to observe student nurses' overall and moment-specific hand hygiene compliance during clinical placement. In addition, the study aimed at rising student nurses' awareness of hand hygiene, and suggesting educational strategies to increase and maintain students' hand hygiene compliance.

## 2 | METHODS

The design of this study was open, nonparticipating observations, using the standardised hand hygiene observational tool, developed and validated by WHO to investigate the hand hygiene compliance in healthcare providers. Direct observation is regarded as the current gold standard for determining compliance (Allegranzi et al., 2007; Sax et al., 2007; WHO, 2009b).

### 2.1 | Participants and setting

A nonprobability, convenience sample comprising 29 student nurses, two males and 27 females between 21–48 years of age, was observed during clinical placement. All second-year student nurses due to go into clinical placement in a Norwegian university hospital in spring 2014 were invited to participate. This hospital was chosen because it is located near the university and because of the likelihood of recruiting a satisfactory number of participants. The hospital also hosts student nurses on different wards most of the academic year.

At first, only 10 of 100 students volunteered to participate. To increase the number of participants and observed moments of hand hygiene, additional observations were conducted during autumn 2014. Students from the same class were invited to participate, now in the beginning of their third year of study, and 19 of 100 volunteered.

The second-year students were observed during their first clinical placement in a hospital, and the third-year students were undertaking their second clinical placement on hospital wards. Although clinical experience varied between the student groups, they had all passed the infection control module in their first year of study. The module consists of lectures, tests and practical training. Additionally, hand hygiene and infection control measures are integrated in the nursing curriculum and skills training throughout the degree programme. Likewise, students' knowledge and competence are included in nursing examinations and clinical placement assessments.

Because one and a half year had passed after the students had completed the infection control module, all participants were offered repetition lectures, including a film about the five moments for hand hygiene developed by WHO (2009c), about a fortnight prior to data collection.

### 2.2 | Data collection

The student nurses' hand hygiene compliance was observed using WHO's standardised and validated Hand Hygiene Observation tool, based on the model "My five moments for hand hygiene" (WHO, 2009b). In addition to time, place and duration of observation sessions, students' hand hygiene compliance was observed at the following five clinical moments, which describe situations where transmission of pathogens may occur (Sax et al., 2007). Students' hand hygiene (i.e. washing of hands with soap and water, or disinfection using alcohol-based hand rub) was examined at the following occasions:

- Moment 1. Before touching patients or patient surroundings
- Moment 2. Before clean/ aseptic procedures
- Moment 3. After body fluid exposure risk
- Moment 4. After touching patients
- Moment 5. After touching patient surroundings

To ensure reliable observations and data collection, the two observers (the first and second authors) conducted a pilot study at the university, guided by the third and fourth authors, who both

work at the hospital's department of infection control and are trained in using the observation tool.

All observations were conducted after at least 2 weeks during clinical placement to allow student nurses sufficient time to become familiar with ward routines and procedures. The observation sessions were agreed upon with each student and conducted with a few exceptions at daytime. All students were observed three times for  $20 \pm 10$  min, according to acknowledged standards. If a procedure lasted longer, the observation was terminated (WHO, 2009b). The observations were conducted in the following hospital wards: rheumatology, gastrointestinal, orthopaedic, heart and lung medicine, vascular and thoracic surgical, infection, neuroscience and an observational ward.

Following the observation sessions, the student nurses received feedback on the results as a part of their clinical placement counselling (Sax et al., 2009).

### 2.3 | Data analysis

Data were analysed using SPSS version 22. The observational data were ordered according to the five moments for hand hygiene and were managed as five separate variables with two values: compliance or noncompliance (WHO, 2009a,b). We calculated the overall and moment-specific hand hygiene compliance among the student nurses as a group. Results for individual students are not presented. Although each student was observed three times, these time points usually occurred within the same shift. Hence, we did not examine changes in students' compliance between the three time points. Due to the inequity in the number of second ( $n = 10$ )- and third-year students ( $n = 19$ ) participating, it was not possible to calculate the difference in performance between them.

### 2.4 | Ethical considerations

The student nurses gave their written consent to participate in the study. They were informed that participation was voluntary, and that they could withdraw their consent at any time. Anonymity and confidentiality regarding participation and publication were emphasised. They were also told that participating would affect neither their clinical studies nor their assessment on the ward.

The wards where the observations took place approved the study. The students themselves or their mentors obtained oral consent from patients involved in the study. No patients refused to participate.

The study was conducted according to Norwegian legal requirements and ethical guidelines for medical and health research (<https://www.etikkom.no/en/>). The regional ethical committee approved the study (Ref.nr: 2013/1207). Personal data that could identify participants were anonymised by allocation of a participant number. The observational records and consent forms were stored in accordance with recommendations from The Norwegian data protection authority (<https://www.datatilsynet.no/English/>).

## 3 | RESULTS

The total number of observed moments for hand hygiene was 478, and student nurses' overall compliance was measured to 83.5%. Noncompliance was observed in 16.5% of these moments (Table 1).

The most frequent moment for hand hygiene was before touching patients or patient surroundings (Moment 1), which was observed 150 times. The student nurses' compliance was 77% at this moment. This moment gave the lowest score. At 23% of these moments, the nursing students did not comply.

Moment 2 was observed 59 times. Before clean/aseptic procedures, the student nurses' hand hygiene compliance was 78%. Lack of compliance was observed at 22% of these moments. When carrying out clean procedures, the student nurses' compliance was somewhat lower, 73% compared to aseptic procedures 79.5%.

Moment 3 was observed 58 times, and the student nurses' compliance after body fluid exposure risk was 84.5%. Moment 4, after touching patients, was observed 106 times, and the hand hygiene compliance was 85%. At moment 5, after touching patient surroundings, the hand hygiene compliance was at its highest, measured at 93%. The number of observations for this moment was 105.

We carried out a Pearson's chi-square test to investigate the difference in students' compliance rate before and after patient contact and found that nursing students were less compliant before than after patient contact. The difference measured by Pearson chi-square test was statistically significant ( $p < .05$ ) (Table 2).

## 4 | DISCUSSION

The aim of this study was to observe student nurses' overall and moment-specific hand hygiene compliance during clinical placement. We found that nursing students' overall compliance was 83.5%,

**TABLE 1** Student nurses' overall and moment-specific hand hygiene compliance

Moments of hand hygiene	Number of observations	Compliance	Noncompliance
Moment 1: Before touching patients or patient surroundings	150 (31.4%)	116 (77%)	34 (23%)
Moment 2: Before clean/ aseptic procedures	59 (12.3%)	46 (78%)	13 (22%)
Moment 3: After body fluid exposure risk	58 (12.1%)	49 (84.5%)	9 (15.5%)
Moment 4: After touching patients	106 (22.2%)	90 (85%)	16 (15%)
Moment 5: After touching patient surroundings	105 (22%)	98 (93%)	7 (7%)
Total	478 (100%)	399 (83.5%)	79 (16.5%)

**TABLE 2** Hand hygiene compliance before and after patient contact

Moment-specific hand hygiene compliance	Moment 1 and 2 (Before)	Moment 3, 4 and 5 (After)	p-Value (Pearson chi-square)
Compliance	40.6% (n = 162)	59.4% (n = 237)	.002
Noncompliance	59.5% (n = 47)	40.5% (n = 32)	
Total	43.7% (n = 209)	56.3% (n = 269)	

which is a higher compliance rate than previously reported in studies of healthcare workers, irrespective of research method used, and before or after local or national hand hygiene campaigns or interventions (Berland et al., 2009; Chavali et al., 2014; Randle et al., 2010; Scheithauer & Lemmen, 2013; Sunkesula et al., 2015). The results in our study were also better than Whitcomb (2014), who reported that student nurses' compliance increased from 44%–65% following teaching in hand hygiene and infection control.

The student nurses' moment-specific hand hygiene compliance was different across the five moments, with the highest compliance rate *after* touching patients or patient surroundings, and after body fluid exposure risk, and lowest *before* clean/ aseptic procedures, and touching patients or patient surroundings. These results correspond with findings in observational studies of healthcare workers (Allegranzi & Pittet, 2009; Alsubaie et al., 2013; Randle et al., 2013; Scheithauer & Lemmen, 2013). That only 77% of the students cleaned their hands before touching patients or patient surroundings, is a concern, due to the risk of cross-contamination between patients.

Student nurses' hand hygiene compliance was relatively low before clean/ aseptic procedures. This result is in line with observations of healthcare workers (Chavali et al., 2014; Sunkesula et al., 2015). Students' failure to comply before clean/aseptic procedures is worrying, as the risk of transmitting microbes into the bloodstream and tissues when handling artificial openings (catheter, operation wounds, tubes and so on) increases. This in turn may give rise to some of the most severe types of HAIs (WHO, 2009b).

Our results suggest that the nursing education programme in addition to focusing on overall compliance should adopt a moment-specific approach to hand hygiene. This may require different teaching and training strategies targeting specific causes of noncompliance (Chassin, 2015; Lau et al., 2014). Which moment that requires special emphasis may vary between individual students, clinical placements and different parts of the nursing programme.

Student nurses learn to practice hand hygiene simultaneously with nursing skills, procedures and assignments during clinical placements. The hand hygiene culture on the ward, modelled by mentors and team members influences students' compliance, both positively and negatively (Barrett & Randle, 2008; Erasmus et al., 2010; Nasirudeen et al., 2012; Salmon et al., 2013; Van De Mortel et al., 2012). Berland et al. (2009) found that nurses underlined the importance of being good role models, but often observed incorrect hand hygiene among colleagues. Nurses interviewed by Førlund and Iversen (2006) described a ward culture that allowed noncompliance, and that it was uncommon to remind colleagues to perform hand hygiene when

they failed to comply. By tacitly allowing noncompliance, the hand hygiene culture remains the same. If students experience that mentors are not acting in accordance with hand hygiene guidelines, it may be difficult for them to comply. Most researchers have reported that students tend to modify their hand hygiene according to the routines they observe on the wards, in a desire to be accepted as a part of the team (Barrett & Randle, 2008; Gould & Drey, 2013; Scheithauer & Lemmen, 2013). In contrast, Hinkin and Cutter (2014) found that over half of the nursing students said they would ignore incorrect hand hygiene by their mentors' and follow the infection control advices learned in university.

Although student nurses in our study achieved relatively high compliance scores, some of them neglected hand hygiene in high-risk situations, failing to protect patients and themselves against HAIs. While hand hygiene performance is regarded as a basic procedure, the hand hygiene context is not, as numerous factors influence compliance in busy, complex and dynamic work circumstances (Carter et al., 2016; Erasmus et al., 2010; Randle et al., 2013). Chassin (2015) identified 41 different causes of noncompliance in eight hospitals in the United States. Being busy, high workload, frequent interruptions and acute situations have been reported causes of low compliance rate among nurses (Alsubaie et al., 2013; Carter et al., 2016). Storvig (2014) found that nurses' hand hygiene compliance while handling central venous catheters, decreased if something unexpected occurred during the procedure. Students trying to learn in unfamiliar territory may find themselves enmeshed in a complex web of competing priorities (Levett-Jones, Lathlean, Higgins, & McMillan, 2009). Thus, it may not be realistic to expect complete compliance at any given time, among neither healthcare workers nor student nurses (Milligan, 2007). As it seems like absolute compliance cannot be taken for granted, it may be difficult to reach an agreement on what should be a satisfactory compliance rate in order to prevent HAIs. Although hand hygiene compliance among students and healthcare workers remains at low levels, nursing education still has a duty to continue to teach and expect high compliance rates among student nurses.

To improve and maintain students' compliance, our results imply that hand hygiene education should be emphasised during clinical placements, which entails increased cooperation between the university, healthcare institutions and mentors. This cooperation may include setting joint hand hygiene targets, implementing interventions and monitoring compliance. Regular monitoring of hand hygiene compliance among students and healthcare workers, including timely feedback, may improve the performance of both students and their role models in clinical placement.

Because students hold a position different from nursing staff, the clinical placements have traditionally paid relatively less attention to student hand hygiene practices (Barrett & Randle, 2008; Jeong & Kim, 2016). This perception of nursing students ought to be changed, so that students are accepted as part of the team in prevention and control of HAIs (Jeong & Kim, 2016). According to Barrett and Randle (2008), nursing students' hand hygiene compliance is also better when they perceive themselves as part of the team rather than in a negative relationship with the team.

#### 4.1 | Limitations

Our study has several limitations. Due to the small number of volunteering participants and the nonprobability composition of the sample limited statistical calculations have been made. The observations were conducted among students from only one nursing school and one hospital. Thus, the results cannot be generalised, but may indicate educational strategies to increase and maintain students' hand hygiene compliance during clinical placements.

Most likely, the Hawthorne effect influenced the results, that is that students modified their hand hygiene behaviour in response to their awareness of being observed (Cole, 2009; Haessler, 2014). Additionally, participants received supplementary lectures and practice in the five moments prior to data collection, which may have affected the results. The students who volunteered to participate may also have been those with particular interest in hand hygiene.

The observations were limited to three times for  $20 \pm 10$  min on the same shift. The study does not reflect students' hand hygiene compliance in the remaining time of their clinical placement. Our study was restricted to measuring students' overall and moment-specific compliance and we did not register the quality, duration and techniques in hand hygiene. This is a limitation of the WHO hand hygiene observation tool. To develop teaching methods to improve nursing students' hand hygiene, additional studies of factors that facilitate or impede students' hand hygiene behaviour during clinical placements are needed.

## 5 | CONCLUSION

The results suggest that nurse education in hand hygiene still needs improvements both theoretically and during clinical placement. Particularly, lecturing and clinical training should emphasise those moments where compliance is poor. Above all, hand hygiene before clean/ aseptic procedures should be highlighted to reduce the high risk of HAIs. Improving students' compliance during clinical placements requires collaboration between the university and hospital staff. Observational studies should be carried out, looking at students' hand hygiene compliance at various wards and times throughout their education. We also need qualitative studies of students' experiences of factors that facilitate or inhibit hand hygiene compliance in clinical placements, to develop educational methods targeted towards these factors.

## 6 | RELEVANCE TO CLINICAL PRACTICE

Increasing healthcare workers' compliance with hand hygiene guidelines remains a challenge to the clinical community. In order to reduce HAIs and increase patient safety, it is important to educate student nurses to comply during clinical placements.

This study is one of very few observational studies of student nurses' hand hygiene compliance during clinical placements. Identifying students' hand hygiene performance is the first step towards developing teaching methods to improve and sustain their overall and moment-specific compliance. As a measure to ensure compliance, students' mentors should be aware of their influence on students' performance, act as hand hygiene ambassadors and encourage students to comply with established guidelines.

The students said that receiving feedback on their hand hygiene performance made them more attentive and vigilant. We suggest regular use of performance feedback as a suitable method to improve and maintain students' compliance. In addition, simulation and clinical training should focus on empowering students' confidence and capacity to practice according to approved guidelines. Training may also include learning to give and receive reminder statements about hand hygiene to fellow students, mentors and healthcare providers on the wards. In this manner, students may contribute to reducing HAIs, improving hand hygiene compliance and patient safety.

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#### CONTRIBUTIONS

Study design: JSS, AGA, ES, JKA, KLF, KT; Data collection: JSS, AGA; Data analysis: JSS, AGA, ES, JKA, KLF, KT; Manuscript preparation: JSS, AGA, ES, JKA, KLF, KT.

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