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The experiences of nurses' hand hygiene compliance in advanced recovery room care (ARRC): A descriptive phenomenological study

Abstract

Background: Hand hygiene is vital in preventing health care–associated infection, yet compliance rates remain suboptimal across different clinical settings. Limited research has focused on hand hygiene compliance within the Post Anaesthesia Care Unit (PACU). Hence, this study aimed to understand factors that hindered or promoted compliance within a specialised PACU unit, the advanced recovery room care (ARRC) unit in a major tertiary hospital.

Methods: A descriptive phenomenological design was employed, and data was collected using the purposive sampling method through in-depth, semi-structured interviews conducted with ten registered nurses working in a major tertiary hospital ARRC unit. The data was analysed using Giorgi's five-step phenomenological approach.

Results: Four major themes were identified in this study which encompassed the various challenges and opportunities faced by nurses in maintaining effective hand hygiene practices within the ARRC unit. The themes were: hand hygiene practice, education and compliance; leadership roles and functions; safety and compliance measures; and infrastructure and resources.

Conclusions: This study indicates that strong leadership, continuous education, improved infrastructure and regular audits are vital for reinforcing hand hygiene practices within the PACU unit. The findings emphasise an urgent need for continuous vigilance, innovation and improvements in leadership, training and infrastructure to ensure that infection control standards are maintained within PACU units.

Keywords: phenomenology, nurse, hand hygiene, compliance, advance recovery room care unit, post anaesthetic care unit

Introduction and background

Health care–associated infections are a persistent issue that lead to patient morbidity, increased length of hospital stays and higher healthcare expenses[1,2]. Hand hygiene is one effective intervention to prevent and reduce health care–associated infections, yet hand hygiene compliance remains suboptimal worldwide[3]. Despite comprehensive guidelines, such as the Australian 'National hand hygiene initiative' (NHHI) and the World Health Organization's 'Five moments for hand hygiene', compliance rates among healthcare workers remain below optimal levels[1,3].

Existing research[4–8] has identified multiple factors influencing hand hygiene compliance, categorised into individual, managerial and organisational barriers. At an individual level, nurses' compliance is influenced by personal attitudes, beliefs, intentions and behavioural habits, with a lack of awareness further contributing to non-adherence[4–7]. Managerial challenges include inadequate training, ineffective feedback, inadequate support and inconsistent monitoring, which weaken adherence to hand hygiene protocols[8]. Organisational barriers, such as heavy workloads and limited access to hand hygiene facilities, further impede compliance[6–8].

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Intervention strategies have focused on multimodal approaches integrating education, leadership engagement, training and effective evidence-based strategies, and have demonstrated effectiveness in improving compliance[9–11]. National initiatives, such as the NHHI, have reinforced adherence through standardised audits and feedback systems[1].

Recent studies have predominantly focused on multimodal interventions to improve hand hygiene practices. Although numerous studies[4–8] have identified barriers to and facilitators of hand hygiene practice in general hospital wards, there is limited research investigating compliance in the PACU setting[11,12].

The PACU is a high acuity, fast-paced environment where frequent patient contact and heavy workload create unique barriers to hand hygiene compliance compared to general wards. Additionally, healthcare professionals frequently perform invasive procedures, increasing the risk of cross-contamination. Unlike the stable workflows of general wards, the PACU's dynamic nature, high patient turnover and time-limited care encounters further challenge consistent adherence to hand hygiene practices[13]. Currently there is a dearth of knowledge and research studies focused on hand hygiene practices within the PACU units from an Australian context. Hence, it is crucial to identify inhibitors of hand hygiene compliance in the recovery area to better understand the issues with compliance and use research findings to guide future approaches to hand hygiene practices.

Hand hygiene compliance is routinely audited internally across all areas of the hospital. In a recent observational audit conducted within a specialised PACU unit, the advanced recovery room care (ARRC) unit, of a major South Australian tertiary hospital, revealed a decline in hand hygiene compliance among nurses. Between July 2022 and June 2023, compliance rates were 70.8 per cent, between April and June 2023 compliance rates were 61 per cent, falling further below the national benchmark of 80 per cent. This decline in compliance rates highlighted a significant gap in understanding impacting factors associated with hand hygiene adherence within the ARCC setting.

The contemporary literature highlights numerous studies which have examined barriers to and factors affecting hand hygiene practice in general hospital ward settings[4,6–8]. Currently, there is limited research investigating hand hygiene compliance in PACU settings. To address this research gap, this study employed a descriptive phenomenological approach to explore the lived experience of nurses' hand hygiene practices to deepen understanding of factors that hindered or promoted compliance within the specialised PACU setting of the ARRC unit.

Methods

Aims and objectives

This study aimed to explore the lived experiences of nurses' compliance with hand hygiene to understand factors that hinder or promote compliance within the ARRC unit. A descriptive phenomenological approach was used to achieve three objectives:

1. to explore nurses' knowledge regarding hand hygiene compliance within the ARRC unit
2. to identify barriers influencing non-compliance with hand hygiene among nurses in the ARRC unit
3. to identify facilitators promoting compliance with hand hygiene among nurses in the ARRC unit.

Design

This study employed a descriptive phenomenology approach, guided by Husserl's methods[14–17] and Giorgi's five-step approach[18], to explore the essence of ARRC nurses' lived experiences in real clinical practice. The study aimed to contribute a deep understanding of the factors that influence ARRC nurses' lived experiences, knowledge and clinical practice in a recovery context. To ensure the authentic representation of participants' voices, the researcher adhered to Husserl's concept of bracketing through continuous self-reflection, setting aside biases, preconceptions and assumptions[14–17]. This descriptive phenomenological approach was well suited to this study, as it provides a deep understanding of the phenomena under investigation and shows a comprehensive insight that other approaches may not capture[14].

Participants and setting

This study was undertaken in the ARRC unit at a major tertiary hospital in South Australia. Purposive sampling was used to recruit ten nurse participants from the ARRC unit. The inclusion criteria included nurses who have experience with hand hygiene practices in the ARRC unit; were currently employed in the ARRC either as a recently graduated registered nurse, registered nurse, clinical nurse or nurse unit manager; and were able to provide informed consent for involvement in this study. Pre-registration nurses, enrolled nurses and allied healthcare workers were excluded from this study.

Recruitment strategy

Participants were recruited via an approved study flyer displayed in the ARRC workplace and tearoom. The principal researcher, an ARRC nurse, distributed 30 information packs within the work setting which included the study flyer, an introduction, a participant information sheet, a consent form and the contact details of the researcher. Additionally, the principal researcher distributed invitations to all the ARRC nurses via their formal work emails with copies of the information pack attached. Ten ARRC nurses were recruited and informed this study.

Data collection

This study employed semi-structured interviews to collect qualitative data on nurse's hand hygiene experiences in the ARRC unit of a major tertiary hospital in South Australia. Ten eligible participants were interviewed face-to-face by the principal researcher. The interviews were conducted in a private meeting room on the worksite and external to the operating room department, between February 2024 and March 2024, with each session lasting between 20 and 30 minutes. All interviews were audio recorded and guided by semi-structured, open-ended questions, providing participants with the opportunity to freely express their experiences. The audio recordings were later transcribed verbatim.

The principal researcher brought both experiential and personal knowledge of the specialty and the phenomenon of interest to the study. Given the principal researcher's familiarity with the participants and the department, careful steps were taken to bracket personal assumptions throughout the data collection and analysis process. A semi-structured interview guide was used to ensure consistent, neutral questioning across all participants, reducing the risk of biases. Participants were asked to elaborate on their answers and or provide illustrations, e.g. Can you tell ...? Additionally, the involvement of three researchers in the data analysis process served to enhance the confirmability of the findings and reduce the impact of the principal researcher's positionality and any biases.

Data analysis

The data was analysed following Giorgi's five-step approach[18]. First, the researcher read the entire transcripts to gain an overall understanding of the experience, followed by re-reading to identify distinct 'meaning units'. These units were generalised to encapsulate the broader essence of the experiences, leading to the development of a narrative structure that integrated essential meanings across all cases, highlighting commonalities in participants' experiences. During this process, similar codes were merged to form cohesive themes. Once these major themes were defined, the descriptive phenomenological approach continued to guide the in-depth exploration of the data. Finally, the researcher presented the emerging themes with detailed explanations, and supported by direct quotes from participants, ensuring that the findings were both credible and reflective of the participants' perspectives.

Rigor

This study employed five criteria to evaluate research trustworthiness: bracketing, credibility, transferability, dependability and confirmability[14,19]. Bracketing was achieved through continuous self-reflection by the researcher to suspend personal biases and maintain an accurate representation of participants' experiences. Credibility was accomplished through in-depth engagement with the data and member checking to confirm the accuracy of the findings. Transferability was ensured by employing purposive sampling to capture diverse participant experiences, thereby allowing findings to be applicable in other recovery contexts. Dependability was established by transcribing audio-recorded interview verbatim and documenting detailed data analysis to support the research findings. Confirmability was supported by the involvement of three researchers in the data analysis process, ensuring the findings were based on participants' perspectives without researcher biases.

Ethical consideration

This study was approved by the Human Research Ethics Committee (HREC) through Central Adelaide Local Health Network (CALHN) (No:18 870) and University of Adelaide (No: 38 619). Prior to commencing the interviews, the study was explained to participants and they were given an opportunity to ask questions and clarify any points. Following this, informed consent was individually obtained from all the participants. Participation in this research was voluntary, and participants could withdraw from this project at any stage without prejudice. Participants' information was de-identified by assigning unique study identifiers (e.g. Participant 1) to ensure privacy and anonymity. All personal information remained confidential, and the data obtained was used for analysis only within this research.

Findings

This study involved ten registered nurses (RNs) working within the ARRC unit. Participants had an average of three years of working experience in this setting, and their clinical experience ranged from two to 44 years. Their clinical background included diverse specialities, such as cardiac, surgical, intensive care, high dependency, coronary care, emergency, burns, spinal and nursing home care. This diversity in experience and specialisation provided differing perspectives and

Table 1: Themes and subthemes identified in the study

Themes	Subthemes
1. Hand hygiene practice, education and compliance	i. Hand hygiene experiences
	ii. Hand hygiene education and training
	iii. Hand hygiene practice compliance and conduct
4. Leadership roles and functions	i. Infection control lead (infection control link nurse and ward portfolio holder)
	ii. Team leader role
	iii. Nurse unit manager role in reinforcing hand hygiene
3. Safety and compliance measures	i. Management of patients with multi-resistant organisms (MROs)
	ii. Use of personal protective equipment (PPE)
4. Infrastructure and resources	i. Ward layout and infrastructure
	ii. ARRC clinical set up and resourcing
	iii. Advocating for infrastructure and resourcing improvements

insights into hand hygiene practices requirements within the ARRC unit.

Four major themes, each with two or three subthemes (see Table 1), were identified in this study:

1. hand hygiene practice, education and compliance
2. leadership roles and functions
3. safety and compliance measures
4. infrastructure and resources.

Theme 1: Hand hygiene practice, education and compliance

Hand hygiene practice, education and compliance are crucial for infection control and patient safety in all healthcare settings. Three subthemes were identified within this major theme: hand hygiene experiences, hand hygiene education and training, and hand hygiene practice compliance and conduct.

Hand hygiene experiences

Many participants reported feeling comfortable with their hand hygiene experiences. They followed the 'Five moments for hand hygiene' protocol and integrated hand hygiene into their daily routines. Participants expressed positive perspectives regarding hand hygiene practice and compliance experiences in the ARRC unit with confidence in the overall staff performance.

> I think we are following the direction and standards really well in ARRC … I observed a lot of my colleagues and myself performing hand hygiene according to the standard … I'm quite confident with the hand hygiene performance in ARRC.
>
> Participant 5

Conversely, other participants witnessed poor hand hygiene practices by doctors, which hindered hand hygiene practice and patient care.

> I don't think the visiting medical staff are good, because you see them touching patients or not washing their hands … or not wearing gloves to look at wounds …
>
> Participant 9

Despite this general confidence, several barriers to consistent hand hygiene were identified such as interactions with multiple patients, staff-to-patient ratios, emergencies and heavy workloads. One participant highlighted the difficulty in maintaining consistent hand hygiene when interacting with more than one patient in ARRCs where patients were managed in bays as opposed to individual rooms.

> Here [in the ARRC] we have more bays … I don't find it's as easy for people to remember going to a patient or to use the hand gel between patients … I don't find people are adhering to it [hand hygiene] as strictly.
>
> Participant 7

Staff-to-patient ratios played a significant role in hand hygiene compliance, with participants noting that a 1:1 ratio made it easier to adhere to proper hygiene, while an increase in patient load led to lapses in compliance.

> If we have … someone on the metaraminol … at that time we get 1:1. It's not bad when we get 1:1, we can wash hand[s] and follow hand hygiene in between. But when we have, like two patients, it's a bit hard.
>
> Participant 4

Participants identified emergency situations as a significant barrier to performing the full steps of hand hygiene.

> Barriers also could be in the time of … [a medical] … emergency, people are rushing doing things, so that … people are not performing the full steps [of hand hygiene].
>
> Participant 5

Heavy workloads were reported as a key factor affecting adherence to hand hygiene protocols such as when the unit became too busy and there was a need to move between many patients or to assist other staff.

> You just get pulled sometimes from one patient to the next … we're always quite busy and often hand hygiene can just get missed.
>
> Participant 8

> If the patient load is heavy … it's hard to do hand hygiene.
>
> Participant 4

While participants were positive about hand hygiene experiences, it was found that staffing levels, emergencies and heavy workloads were barriers to consistent hand hygiene practice.

Hand hygiene education and training

Nurses in the ARRC reinforced their hand hygiene competency through mandatory, annual online education provided by Hand Hygiene Australia. This online theoretical education ensured staff were up to date with the latest knowledge and protocols. As one participant shared:

> I think because the course [online education] … they have very good description on how you can facilitate good hand hygiene … you just need to follow the video to wash your hands … In the education section, they give you very good explanations about how to wash your hands and how to … make sure your hands are clean.
>
> Participant 3

While online education was valued, participants emphasised the need for further practical training to reinforce their theoretical knowledge. As one participant explained:

> In my seven years' work experience, I've only twice done [a] hand hygiene practical session … That practice session is really good, that reminds you to do a proper hand hygiene. So, I think it's better if we do the practical session. It would be better for the staff.
>
> Participant 4

Other participants reported the use of UV lights to visualise germs as a practical and impactful training tool.

> I really like this [practical tool], it's so vivid. It was really shocking when the light shines on my fingers, it's just … I can see the germs in your fingernails.
>
> Participant 5

Other participants reported a lack of in-service sessions on hand hygiene in the ARRC unit compared to their previous working place.

> In the surgical ward, there is in-service, so we can attend there. But in here [the ARRC], there is no in-service about that.
>
> Participant 2

The same participant suggested regular in-service sessions to reinforce hand hygiene practices.

> Like you can create some in-service education every three months … gathering people and doing the proper hand hygiene … asking about the question … So that [can] actually bring us to keep reminding it.
>
> Participant 2

The study participants also recommended tailoring education specific to the ARRC with a focus on shared spaces to improve compliance.

> I think we could probably come up with something specific for shared area … So still do that … [online] training, but a little extra that we could do.
>
> Participant 10

Participants emphasised the importance of consistent reminders to reinforce infection control practices via education and training. Using verbal prompts to maintain adherence was also recommended.

> Just a reminder … please remember to wash your hands properly and sanitise … wear your gloves and change your gloves too.
>
> Participant 9

Additionally, visual cues like posters and stickers with a preference for concise messages were considered effective.

> Wash your hands or hand hygiene. Short phrases will be more beneficial than long sentences.
>
> Participant 5

These findings indicate the role of both verbal and visual reinforcement, in addition to training, in promoting consistent hygiene practices in the ARRC unit.

Hand hygiene practice compliance and conduct

Hand hygiene practice compliance and conduct are deeply embedded into healthcare professionals' daily routines, influenced by formal training and individual responsibility.

Participants emphasised personal responsibility in maintaining hand hygiene.

> It's our responsibility to wash [our] hands … we have to make sure that we wash hands in between two patients
>
> Participant 4

However, personal attitudes were cited as barriers, with another participant noting:

> It's really very personal, because maybe people are lazy to wash their hands.
>
> Participant 3

Lapses in practice were observed, particularly before patient interactions.

> ARRC staff, in general, get quite slack at … using it [hand gel] before patients, but I always see people washing their hands afterwards.
>
> Participant 10

This inconsistency suggested a shift in workplace culture could further improve compliance.

> Maybe we need to change the culture … making them accountable …
>
> Participant 8

While ARRC nurses expressed confidence in following protocols to perform hand hygiene, barriers such as heavy workload, emergency situations and personal attitudes challenge consistent compliance. Hence, ongoing tailored education and a culture of accountability are vital to maintaining and improving hand hygiene practice.

Theme 2: Leadership roles and functions

Leadership roles and functions are vital in promoting and maintaining hand hygiene standards within the ARRC unit. Three sub-themes were identified within this major theme: infection control lead (infection control link nurse and ward portfolio holder), team leader role, and nurse unit manager (NUM) role in reinforcing hand hygiene.

Infection control lead (infection control link nurse and ward portfolio holder)

Infection control link nurses and ward portfolio holders serve as the primary points of contact for infection prevention in the ARRC. They function as educators, auditors and enforcers of hand hygiene protocols to ensure the best practices are followed.

Participants were aware of the infection control link nurse's role in maintaining accountability through regular audits.

> They [the infection control link nurse] check if people did do good infection control and hand hygiene [practice]. And then if you don't do the good hand hygiene, they will get a low mark for that month.
>
> Participant 3

Another participant highlighted the educational role of the infection control link nurse.

> The infectious disease prevention nurses check the hand washing. They teach us if we're doing [it correctly or] missing steps.
>
> Participant 6

In relation to the influence the infection control link nurses have on nurses' hand hygiene behaviour, one participant said:

> When we see the auditor down here [in the ARRC] … people are immediately doing what they should do all the time
>
> Participant 8

Similarly, other participants highlighted the feedback from these audits served as a motivator for improvement.

> They [the infection control link nurse] give us feedback on whether we've been good or bad in our hand hygiene. So that prompts us if we've scored badly.
>
> Participant 1

Participants also suggested increasing the frequency of audits to further boost staff compliance rates.

> More audits will be good … If people know someone's watching you, they can do more properly … I hated someone watching us… but still like this [audit] is good too.
>
> Participant 2

However, infection control link nurses sometimes faced challenges in fully observing hand hygiene practice due to the department layout and set up of each hand hygiene station.

> They [the infection control link nurse] stand outside and audit whether we've done it [hand hygiene]. But … a lot of times we go behind the curtain and pump wash our hands from the end of the bed. They don't see that.
>
> Participant 10

Participants also recognised the role of the ward portfolio holder in promoting hand hygiene education.

> We have the portfolio holder to put up the education for us to read, so we can read and know about the updates.
>
> Participant 5

However, concerns were raised regarding portfolio holders' lack of active engagement in fulfilling their responsibilities.

> When I worked in ARRC, no one [was] actually doing the role of hand hygiene practice.
>
> Participant 2

Participants suggested that the ward portfolio holders be more proactively involved, such as increasing communication and providing clear feedback on audit results to raise awareness of compliance.

> Maybe somebody could be emailing us the results rather than them just being put up in a poster … or letting people know the audits how we've done and explain … let's try and better that next month.
>
> Participant 1

Team leader role

Team leaders in ARRC units play a vital role in reinforcing hand hygiene standards by actively reminding, checking and encouraging nursing staff within policies.

Participants emphasised the importance of regular checks and policy enforcement.

> For the best practice, before the huddle, we can just mention about the hand hygiene every day, five moments [for hand hygiene] and the TL [team leader] just quick check … like no nails … look for extra rings and any jewellery. Just quickly remind each other … because we are not supposed to use anything below elbow. Only from the one single wedding ring they're allowed.
>
> Participant 6

Additionally, participants highlighted the importance of teamwork in promoting hand hygiene. Team leaders, along with support from other staff, ensure hand hygiene is maintained during busy periods.

> Like work in a team and you probably have more time to pay attention to this hand hygiene. With patients care, we have a float nurse helping as well. So, we have more time to facilitate the hand hygiene practice.
>
> Participant 3

Nurse unit manager (NUM) role in reinforcing hand hygiene

The NUM played an important role in reinforcing hand hygiene practice within the ARRC setting. Participants emphasised the role of the NUM as providing regular updates and increasing staff awareness of hand hygiene practice.

> I think the manager can give us some education, not just give us some education but explain the importance of hand hygiene in our unit to prevent infection.
>
> Participant 3

Leadership roles, at various levels from infection control leads to team leaders and NUMs, are crucial for ensuring hand hygiene practices are effectively implemented within the ARRC unit. Regular audits, proactive engagement and fostering a culture of accountability are essential strategies for promoting hand hygiene practice.

Theme 3: Safety and compliance measures

Safety and compliance measures were also reported as having an impact on hand hygiene compliance. Two sub-themes were identified: management of patients with multi-resistant organisms (MROs) and the use of personal protective equipment (PPE).

Management of patients with multi-resistant organisms (MROs)

Caring for patients with MROs presents challenges to maintaining hand hygiene.

Participants reported inconsistencies in adherence to protocols by healthcare staff. One participant mentioned:

> Even the doctors, when they enter the infectious room, I always remind them. Some doctors don't care about it … Between the infectious patient and MROs, they're not wearing the gowns and gloves properly. They're not doing their hand hygiene properly.
>
> Participant 2

Additionally, participants reported challenges to maintaining hand hygiene practice when caring for patients with MROs due to the time it takes.

> When you're looking after two MRSA [methicillin-resistant *Staphylococcus aureus*] patients, you have to wash [your] hands whenever you touch the patient … their surroundings. It's like constant washing of the hands. It can get very difficult to do hand washing every time.
>
> Participant 4

Use of personal protective equipment (PPE)

Participants recognised the importance of PPE as a safety compliance measure. However, misuse of PPE by staff was reported as a concern within the ARRC unit.

> Just because you have gloves on, you can't do everything with that same pair of gloves … If they didn't have the gloves on, maybe they would wash their hands more often.
>
> Participant 9

Also, barriers like allergies and sensitivities to hand hygiene products were identified as factors affecting staff compliance. One participant disclosed:

> Barriers could exist when someone is a bit sensitive to the alcohol gel or allergic to certain chemicals that we use for hand hygiene.
>
> Participant 5

Safety and compliance measures are vital in maintaining infection control standards in the ARRC. Although there are protocols in place, there are inconsistencies in adherence to hand hygiene. Hence, improved training, frequent reminders and addressing barriers are crucial

strategies to strengthening safety and compliance practices.

Theme 4: Infrastructure and resources

Within the ARRC unit, infrastructure and resources were identified as significant barriers to maintaining proper hand hygiene. Three sub-themes were identified: ward layout and infrastructure, ARRC clinical set up and resourcing, and advocating for infrastructure and resourcing improvements.

Ward layout and infrastructure

The physical ward infrastructure, layout and resources available in the ARRC unit significantly affect nurses' ability to maintain consistent hand hygiene. Participants appreciated that the ARRC unit is generally well-equipped with hand hygiene facilities to maintain hand hygiene practice. As explained by one participant:

> We have three sinks for ten beds … it's really easy to reach to the sink … We have alcohol gel at the nurse station … the tearoom and the doctor seats … the patient's bed.
>
> Participant 5

However, participants also reported poor access to sinks, PPE and hand hygiene products, particularly gel.

> When you're leaving the patient's room … you would like to gel your hands as soon as you leave that patient's area … the main barrier for hand hygiene is the accessibility to the hand gel itself.
>
> Participant 1

> I do find hand gel difficult to find; it's not always full or it's not always at the end of the bed … I quite often use one [hand gel] on my WOW [workstation on wheels / computer], but there's not always hand gel on the WOW.
>
> Participant 7

The layout of the ARRC unit and the placement of equipment further hindered access to hand hygiene facilities and PPE, as did clutter. These were seen as significant barriers to maintaining effective hygiene practices.

> … just being able to access the gloves because they're at the back of the bed. And they're not actually easy to get to.
>
> Participant 9

> The environment that we're working in, the shared bays … the clutter, restricted access to PPE … you don't have immediate access to hand hygiene just at your fingertips.
>
> Participant 8

ARRC clinical set up and resourcing

Participants identified several aspects of the ARRC unit's clinical setup and resourcing that complicated adherence to hand hygiene protocols, such as the open floor plan, ill-defined barriers and limited space.

> The setup of the clinical environment … I feel like here [the ARRC] we're constantly sidestepping around patients, which wastes a significant amount of time.
>
> Participant 8

> There's no definite barrier … it's just curtains … before you walk into a patient's area, there's no definite wall or door … you have to keep that in your brain that you're moving into their [area].
>
> Participant 10

This lack of defined zones makes it easy for staff to overlook the need for hand hygiene when moving between patients. The same participant suggested redefining patient zones in shared spaces.

> We can come up with something that just defines what we need to do within our area … a lot of nurses go in and talk to the patients and walk out. And they don't do any hand hygiene because they're not seeing it [wall or door] as doing anything with the patient … because there's not that barrier.
>
> Participant 10

In addition, the absence of sinks between patient areas was identified by participants as a major concern.

> We don't have a sink between the patients. We could have four patients … we had to come out of the unit [to wash our hands].
>
> Participant 6

To address this, one participant suggested relocating sinks closer to patient areas.

> If the sink would be closer to the [patient] bay area …Then it would be more effective.
>
> Participant 4

Participants highlighted inconsistent restocking of hand hygiene products and PPE by the patient service assistant (PSA) and orderlies as a barrier to maintaining hand hygiene. Inconsistent restocking led to shortage of essential items.

> On the trolleys … [there's] usually hand gel there … on the WOWs, there is some, but it's not always restocked. Particularly overnight as well.
>
> Participant 7

> We don't have our own orderlies, so some of the [orderlies] are very good … and then other days … by the end of the late shift, like nothing's left.
>
> Participant 9

Another participant emphasised the need for orderlies to ensure hand gel is available at each bedside.

> I think the orderlies, they need to make sure that every bed has the gel at the bottom of the bed.
>
> Participant 10

Advocating for infrastructure and resourcing improvements

Participants provided several suggestions about advocating for infrastructure and resourcing improvements to improve hand hygiene compliance in the ARRC unit. Key recommendations included improving the placement of hand gel stations, providing gentler hand hygiene products and making structural adjustments to the unit.

> If we could have [hand gel] at the end of every bed, that would be good … the ones [hand gel] on the back of the bed, on the wall … they're really not in a good space for us to use.
>
> Participant 10

> That's a cream especially for people with dry hands … because some people are allergic to that alcohol gel.
>
> Participant 6

In terms of broader infrastructure improvements, participants stressed the need for single patient rooms and appropriately located PPE storage to better support infection control.

> I think the biggest way to overcome the obstacles would be … to try and move to a new wing, where we've got single rooms for all of our patients and we've got the PPE cupboards in the correct position and single rooms … but we can only dream.
>
> Participant 8

Discussion

This study offered an in-depth exploration of the factors influencing nurses' hand hygiene compliance within the ARRC unit, using a descriptive phenomenological approach to capture the essence of participants' lived experiences. The analysis revealed a complex interplay of influences across four major themes: hand hygiene practice, education and compliance; leadership roles and functions; safety and compliance measures; and infrastructure and resources. These themes provide a comprehensive view of the challenges and opportunities faced by nurses in maintaining effective hand hygiene practices in the ARRC unit.

Most studies in the reviewed literature examined hand hygiene compliance in various healthcare ward settings and only limited research has been conducted in perioperative recovery and anaesthetics environments. Three studies[11,12,20] were conducted in post anaesthesia recovery units (PARUs) outside Australia, specifically, in Sweden, Brazil and the United States of America. They focused on evaluating the effectiveness of hand hygiene interventions aimed at improving compliance rates. These studies primarily employed quantitative approaches to measure outcomes following targeted interventions. In contrast, our study is the first to explore hand hygiene experiences from the perspective of healthcare professionals within a PARU setting in Australia. Rather than focusing on intervention outcomes, the current study identifies factors that impact adherence to hand hygiene protocols within the recovery care context, where compliance has been declining.

Hand hygiene practices, education and compliance emerged as a key area of focus for participants. Participants generally expressed confidence in the 'Five moments for hand hygiene' protocol, which aligns with existing literature that emphasises the importance of structured protocols in preventing healthcare–associated infections[21]. However, our study found practical challenges to maintaining compliance with protocols, particularly related to heavy workloads, staff-to-patient ratios and emergency situations, where the urgency of patient care often resulted in hand hygiene not being prioritised.

The proximity of patients in shared spaces further hindered hand hygiene, as nurses struggled to remember or perform hand hygiene between patient interactions, especially in emergency situations. These findings are consistent with previous research documenting the difficulties healthcare workers face in adhering to hand hygiene protocols under time constraints[8,22]. The findings suggest that it is necessary for management to address emergencies, balancing workloads and enhancing hand hygiene adherence. The gap between theoretical knowledge and practical application within the ARRC unit was evident, highlighting the need for more adaptable and context-sensitive strategies to improve hand hygiene practices.

Education was identified as crucial for reinforcing hand hygiene protocols. While participants appreciated the annual online training provided by Hand Hygiene Australia, they expressed the need for more frequent, hands-on, in-service training with a focus on the ARCC setting. Practical tools such as UV light demonstrations, were particularly reported as effective in illustrating the importance of thorough hand hygiene and identifying areas often missed during routine handwashing.

This finding aligns with the literature, which indicates the necessity of ongoing theoretical and practical education to improve compliance with hand hygiene protocols[23]. However, our study identified a notable gap in regular, in-service training that is specific for the ARRC setting. Participants emphasised the need for education that is not only comprehensive but also tailored to the specific challenges of their working environment, such as managing shared spaces and heavy workloads.

In addition to training, participants highlighted the importance of regular reminders in promoting consistent hand hygiene. Visual cues like posters and stickers were seen as effective in encouraging adherence to hand hygiene protocols. This aligns with previous research demonstrating the positive impact of reminder systems on hand hygiene compliance[24].

Leadership roles and functions are essential for shaping hand hygiene behaviours. Participants highlighted that regular audits conducted by infection control nurses were viewed as effective. However, they suggested that more frequent and interactive audits, coupled with real-time feedback, could further enhance compliance. This aligns with existing literature suggesting that regular audits and visible feedback can improve compliance with hand hygiene protocols[25,26].

Team leaders are vital in reinforcing hand hygiene policies. By reminding staff at the start of shifts and checking for compliance, they can help ensure consistent hand hygiene practices and accountability among the team. A supportive team environment, where colleagues actively remind and encourage each other, played a crucial role in maintaining high standards of hand hygiene. This finding suggests that fostering a culture of mutual support and accountability within healthcare teams could be an effective strategy for improving hand hygiene practices.

Participants in this study also emphasised the role of the NUM in addressing resource needs and raising awareness of hand hygiene among staff within the ARRC unit. Leadership's active role in promoting accountability, whether through direct reminders or by supporting the team, was seen as a critical factor in maintaining hand hygiene adherence. These findings support existing literature which suggests that strong leadership is important for sustaining hand hygiene adherence[27]. However, the study also revealed that lapses in leadership oversight, such as the lack of visible follow-up on audit results,

weakened efforts to foster a culture of continuous improvement[27].

The ARRC unit deals with a number of patients requiring management of MROs with the need for staff to use relevant PPE to maintain infection control standards and patient safety. Our study identified inconsistent adherence to hand hygiene practices when patients with MROs were cared for in the ARRC. Participants reported that both doctors and nurses occasionally failed to follow proper hand hygiene protocols, particularly when using gowns and gloves, thus increasing the risk of infection transmission. The time-consuming nature of hand hygiene steps between patient interactions was reported as a factor contributing to non-compliance, particularly during busy periods. This emphasises the importance of regular audits and feedback mechanisms to reinforce adherence even under demanding conditions.

The use of PPE was acknowledged as an essential component of infection control. Participants indicated that the misuse of PPE was prevalent in ARRC unit. Some staff mistakenly believed that wearing gloves alone sufficed, resulting in cross-contamination caused by inadequate hand hygiene. Previous studies[28,29] have similarly identified these concerns, with insufficient evidence linking glove use to improved adherence to hand hygiene protocols. This highlights the need for ongoing education and training on the correct use of PPE, coupled with clear guidelines and leadership intervention to ensure compliance.

The infrastructure and resources of the ARRC unit, encompassing the ward layout and infrastructure, ARRC clinical setup and resourcing, and advocating for infrastructural improvements, significantly influenced adherence to hand hygiene practices. The physical layout of the ARRC unit, despite the unit being generally well-equipped with hand hygiene stations and sinks, was reported as suboptimal due to the placement of these facilities. These findings suggest a clear need for facility design that prioritises ease of access and strategic placement. Similarly, previous research suggests that inadequate infrastructure influences hand hygiene practice[30].

The ARRC unit's clinical setup, characterised by a lack of solid barriers like doors or walls, presented unique challenges to hand hygiene access and adherence. The absence of defined patient zones, and curtains instead of solid barriers, required staff to mentally redefine patient zones to maintain hand hygiene standards, especially in shared spaces. This finding is consistent with previous research that identified poor ward design as a barrier to effective hand hygiene practice[8,31]. To address this issue, there is an urgent need for more definitive environmental cues to reinforce the importance of hand hygiene in the ARRC setting. Additionally, tailored education that teaches staff to adjust to these unique conditions, is crucial for improving compliance.

The inconsistent availability of essential hand hygiene products and PPE was another concern in the ARRC unit. Participants frequently reported shortages of these supplies, particularly during night shifts or busy periods, directly affecting their ability to maintain proper hand hygiene. This issue reflects a broader systematic gap in inventory management and resource allocation within the unit. A previous study[32], also identified a similar concern about the lack of equipment being a barrier to hand hygiene practice. The need for a more reliable system for replenishing these resources in healthcare supply chains is vital to ensure these resources are consistently available to infection control efforts.

To overcome these challenges, participants recommended several infrastructure and resource improvements to enhance hand hygiene compliance. A key recommendation was the need for better placement of hand gel stations at each bedside, ensuring staff could easily sanitise their hands after interacting with each patient. This suggestion aligns with another study that highlighted the importance of convenient access to hand hygiene resources[30]. In addition, participants emphasised the importance of providing gentler hand hygiene products to prevent skin irritation from frequent sanitising. This suggestion is consistent with existing research that recommends skin friendly products to improve hand hygiene practice[30].

In terms of broader infrastructure improvements, some participants advocated for a complete redesign of the unit, proposing a move toward single-patient rooms and better placement of PPE storage. This recommendation aligns with other research, which has identified that improper ward design is a significant barrier to effective hand hygiene practice[8,30].

Strengths and limitations

This study's strengths lie in its detailed exploration of hand hygiene practices within a specific ARCC setting, providing insights that are directly applicable to similar environments. The use of a qualitative descriptive, phenomenological approach allowed for an in-depth understanding of participants' lived experiences, offering an important view of the factors influencing hand hygiene practices for nurses working within this setting. However, the study's findings are limited by its focus on a single ARRC unit setting within one healthcare facility, which may restrict the use of the results in other healthcare settings with different floor plans, layouts, resources and operational challenges. In addition, the sample size was relatively small, which may not fully capture the diversity of experiences and perceptions across a wider population of healthcare professionals.

Implications for practice

The findings have significant implications for both practice and policy in healthcare settings. First, there is an urgent need for tailored, frequent and practical training that goes beyond annual online modules. In-service training sessions that focus on real-world challenges, such as managing shared spaces and heavy workloads, would help bridge the gap between theoretical knowledge and practical application.

Additionally, leadership engagement is critical for ensuring sustained compliance. Infection control nurses, team leaders and NUMs should take an active role in conducting frequent audits, providing immediate feedback and fostering a culture of accountability among staff. Leaders must also ensure that audit results are visible, accessible and followed up with actionable plans for improvement.

Infrastructure improvements are vital to facilitate hand hygiene practices. The strategic placement of hand hygiene stations, sinks and PPE should be prioritised to ensure they are easily accessible during patient care. Furthermore, the regular restocking of resources such as hand hygiene gel and gloves must be systematically managed to prevent shortages, especially during busy period or overnight shifts.

Lastly, fostering a culture of accountability is necessary for improving hand hygiene compliance. This includes both individual responsibility and teamwork, where staff members hold each other accountable for following hand hygiene protocols. Leadership plays a key role in cultivating this culture by consistently reminding and supporting staff to adhere to protocols.

Conclusions and recommendations for future research

This study highlights the multifaceted challenges of maintaining effective hand hygiene practices within the ARRC unit, revealing how personal behaviours, environmental factors, leadership roles and infrastructure can either facilitate or hinder compliance. Barriers such as heavy workload, inadequate infrastructure and inconsistent leadership support, hinder adherence to infection control protocols. Addressing these barriers requires a comprehensive approach, including enhanced education, leadership engagement and infrastructure improvements. Future research could expand on these findings by exploring hand hygiene practices in a broader range of post-anaesthetic care settings and different healthcare facilities.

Ongoing, practical training tailored to the specific challenges of ARRC settings, coupled with strong leadership support and regular audits, is essential for improving hand hygiene compliance. Infrastructure improvements, such as better placement of hand hygiene stations and more accessible resources, are critical for reducing barriers to effective practice. The findings of this study suggest that addressing these issues can improve hand hygiene compliance, reduce the risk of infection and enhance patient safety. Also, continuous improvement in training, leadership and infrastructure are important to maintain infection control standards across healthcare environments.

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