

Healthcare workers' attitudes toward hand hygiene practices: Results of a multicentre qualitative study in Quebec

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ABSTRACT

Background: Hand hygiene (HH) is one of the most effective practices to reduce healthcare-associated infection (HAI) transmission, though compliance remains inadequate among hospital personnel. The aim of this study was to explore perceived barriers and enablers of HH compliance in hospital care and healthcare workers' (HCW) HAI risk and severity perceptions.

Methods: Qualitative study using semi-structured interviews and observations. Interview recordings were transcribed verbatim and supplemented with transcribed observations and field notes. Data was aggregated and coded thematically using a qualitative data analysis software.

Results: 65 interviews and 18 observations with HCWs were conducted in nine hospital centres in Quebec, Canada. Data analysis revealed several factors that may influence HCWs' compliance with HH recommendations. These included clinical environment factors (e.g., lack of sinks), organizational factors (e.g., inadequate staffing, demanding workloads), and communication factors (e.g., dissemination of infection prevention and control [IPAC] information, feedback, and interpersonal professional relationships). At the individual level, knowledge of IPAC and HAI risk perceptions were associated with the adoption of HH.

Conclusion: Understanding the determinants of HH adoption is crucial for improving current practices and reducing HAI rates in hospital care. Our findings suggest that environmental strategies (e.g., additional sinks and HH stations) and organizational and communication strategies (e.g., continuing education and training sessions, support from hospital management, positive feedback) could help raise HCWs' awareness of HAI prevention and adoption of HH guidelines.

KEYWORDS

Hand hygiene; infection control practice; healthcare provider; perception; belief; behaviours

INTRODUCTION

Healthcare-associated infections (HAI) continue to threaten patient safety in healthcare facilities. Approximately 80,000 to 90,000 patients suffer from a HAI in Quebec, Canada annually [1-3]. *Clostridium difficile* infections (CDI) and antibiotic-resistant infections such as methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant enterococci are among the most common. These HAIs significantly increase economic costs for healthcare systems as well as patient mortality and morbidity rates [4, 5].

Hand hygiene (HH) is one of the most effective infection prevention and control (IPAC) practices for preventing HAI transmission [6-8]. The importance of adhering to HH guidelines has been studied extensively, yet compliance remains low among healthcare workers (HCWs) [7, 8]. A study by Kingston et al. (2017) surveyed nurses' HH attitudes and practices between 2007 and 2015 [9]. The authors found that self-reported alcohol-based hand rub (ABHR) was suboptimal, as fewer nurses reported

compliance with ABHR in 2015 compared to 2007 (42% and 55%, respectively) [9]. The World Health Organization estimates that on average, HCWs wash their hands less than half the time they should [10].

Many quantitative research studies have examined the barriers to HH compliance, but few have resulted in the implementation of effective interventions [11-13]. Several qualitative studies have also been conducted on this topic. Smiddy et al. (2015) conducted a systematic review of 11 qualitative studies on HCWs' compliance with HH [14]. The authors' thematic analysis identified two broad categories of factors that influenced adherence to HH guidelines: motivational factors (i.e., social influences, acuity of patient care, self-protection, and use of cues) and perceptions of the work environment (i.e., resources, knowledge, information, and organizational culture). Chatfield et al. (2017) also reviewed 36 qualitative studies on HH among HCWs worldwide in a meta summary using the GRADE-

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CERQual process of quality assessment [15]. Findings from the study showed that although adequate HH training was available, content and reach could be improved. Furthermore, though management support evidenced through provision of human and hygiene resources was deemed necessary, it was often lacking. The authors also identified that HCWs' subjective risk assessment also influenced HH behaviours.

Both reviews highlight the strengths of qualitative research. Understanding the factors that influence HCWs' compliance with HH guidelines involves exploring their complex social behaviours within context-specific conditions [11]. Conditions that influence adherence to HH guidelines need to be assessed at a local level to inform the development of interventions that are appropriate to the setting, context, and subgroups of a given working environment [16]. Qualitative research can provide an in-depth understanding of HCWs' perceptions and practices within their local context and help fill existing knowledge gaps in a comprehensive way.

The purpose of this qualitative study was to explore HCWs' knowledge, attitudes, and practices toward HH [9, 17]. More specifically, our study examined the perceived barriers and enablers influencing HH adoption and explored HCWs' HAI risk perceptions. Previous qualitative studies on HH adherence have been conducted in Canada [7, 18-22]; however, most of these involved individual or group interviews or were conducted over five years ago. Furthermore, few have been conducted in the province of Quebec.

METHODS

This multicentre qualitative study employed an exploratory descriptive research design. Individual semi-structured interviews and observations were conducted over a period of two years, from May 2015 to May 2017, in nine hospitals in Quebec, Canada. The study was part of a larger research project with co-investigators from select hospital centres involved in the clinical development of a diagnostic test. The aims of the larger project were to develop, evaluate, and above all deliver to the healthcare system of Quebec novel rapid molecular diagnostic tests for the prevention, control, and treatment of CDIs and bacterial multidrug-resistant infections. One of the project's objectives was to evaluate the acceptability of the technology among end users and the usefulness of the results for real-time surveillance. Interviews on HH were conducted in this context [23].

Participants

Of the nine participating hospitals, four were in Montreal and five were in Quebec City. All were university-affiliated centres. Seven centres were francophone and two were anglophone. The number of admissions ranged from 12,948 to 36,730 per year. Bed capacity ranged from 256 to 1,053. HH observance rates, measured through regular audits [24, 25], were under 60% for the year 2015-2016 for all participating centres. Informants were contacted by email and invited to participate in this study. The snowballing technique was used to identify other participants. The sampling was done purposively to include HCWs of varying levels of experience and with different professional backgrounds, including infection control professionals. All participants were employees at one of the nine

participating sites. Participants included front-line nurses, nurse managers, physicians specializing in infectious diseases, infection prevention and control nurses (IPCN), and IPCN managers.

Data collection

This study was conducted on a voluntary basis. No incentives were given for participation. Individual in-person interviews were scheduled according to participants' availability and convenience and took place on-site in a private room. To conduct interviews and observations with front-line nurses, we first asked their clinical managers for their authorization. The interview guide included questions on HH, IPAC, HAIs, and risk perceptions and was tailored to participants' professions and adjusted throughout the data collection process as new themes emerged. Open-ended questions and dialogue were prioritized during interviews; however, conversations remained centred on the main topics and follow-up questions were asked when necessary. Interviews were conducted in either French or English by a senior researcher trained in social and cultural anthropology and a junior research assistant training in qualitative methods and public health. Interviews lasted approximately 30 to 45 minutes. All interviews were audio recorded and supplemented with field notes describing non-verbal responses, the interview context, and information given off the record. Participants were recruited until data saturation was achieved. During data collection, weekly team meetings were held to discuss preliminary findings and hypotheses and to review the interview guide.

To complement data collected during interviews, observations were conducted at each of the sites by both the senior researcher and junior research assistant. The observations consisted of following either a participating nurse, physician, or an IPCN for a period of four to eight hours. Observations were scheduled during weekdays according to participants' availability. HCWs' daily work routines were observed, including HAI and cohort management, nurse-patient interactions, sample collecting methods, environmental challenges, and workflow. Observations also took place at IPCN meetings and IPAC training sessions. The observations were conducted in order to provide a more contextual and detailed understanding of the participants' environments, workflow, and settings. Handwritten field notes were taken during observations, then transcribed. To avoid disrupting participants' work routines during observations, the research team interacted with participants only when certain situations or exchanges needed to be clarified.

All collected data was kept anonymous and was stored in a secure database to ensure participant confidentiality.

Data analysis

Data collection, interview transcriptions, and analysis occurred concurrently to monitor the progress of themes emerging from individual interviews. Using an inductive approach, transcripts and observational data were reviewed several times by members of the research team to identify emerging themes and subthemes [26]. Data was aggregated and coded thematically using NVivo 10 qualitative analysis software. A two-phased approach of ethnographic analysis was used: analysis and interpretation [27].

Data was coded using a constant-comparative and concept-development approach of emerging themes [26, 28]. Data analysis was performed for each individual hospital site to allow a better comparison between the different work environments. This involved data coding, in which the qualitative data was organized into patterns, categories, and basic descriptive units. Data interpretation was performed by the senior researcher in collaboration with the research team and involved attributing meaning and significance to the collected data by explaining patterns and identifying relationships among descriptive dimensions. Data obtained from all participants and sites were compared to generate and test interpretations of existing relationships between HCWs' work environments, their risk perceptions of HAIs, and their HH practices. The research team identified key verbatim quotations and observations that were most representative of the research findings and best illustrated the prevalence of the final themes and sub-themes. Quotations were edited for clarity and brevity and were labelled with participants' professions.

Ethical considerations

This study was approved by each site's research ethics board. Written informed consent was obtained from all study participants. Prior to data collection, participants were reminded that the contents of their interviews and observations would remain confidential and that no identifying information would be shared with their peers or senior management teams.

RESULTS

65 interviews and 18 observations were completed for this study. Participants' average years of work experience was 7.60 years (range: 0.6 to 30 years) with a median of five years. Participants' characteristics are provided in Table 1.

Data analysis revealed several factors that may influence HCWs' adherence to HH recommendations in hospital care, with several shared perceptions across all sites. No significant differences were found between Montreal and Quebec City participants, nor between French- and English-speaking participants. Observations helped supplement findings from the individual interviews. No major discrepancies between participants' discourses (interviews) and practices (observations) were identified. Barriers as well as intervention and implementation strategies to enhance HH adoption are presented in Tables 2 and 3.

Barriers

HCWs' attitudes and perceptions of HH

The importance of proper HH was acknowledged and accepted by all, though participants across all sites reported that HH was not consistently prioritized in practice. Nurses described physicians as non-compliant with HH recommendations. Conversely, IPCNs and other nurse participants claimed that HH resistance was not exclusive to physicians, as they described non-compliance to be present among hospital personnel, visitors, and patients. They also reported concerns regarding night teams and float nurses. These groups were harder to reach, which hindered IPAC communication, and were generally less compliant with guidelines

and difficult to supervise. Similarly, IPAC nurses described being more vigilant with staff returning from vacation, as they tended to be less compliant with HH.

At the individual level, lack of HH and IPAC knowledge and low HAI risk perceptions were identified as barriers to HH adoption. Interviewed IPAC nurses, nurse managers, and physicians reported that the invisibility of infectious agents did not favour HH among hospital staff, nor did it reinforce the legitimacy of certain IPAC practices. HCWs' lack of knowledge and awareness of HAI severity also discredited the importance of certain HH practices. Some nurses believed that gloves replaced proper handwashing. Others perceived patients to be at higher risk of contracting HAIs than themselves. They also reported feeling confident in their abilities to properly apply IPAC measures, though very few expressed the need to protect their own health and safety during patient care.

Contextual and organizational barriers

Generally, each participating centre's infection control team reported implementing IPAC measures adapted to their own clinical setting, with a strong emphasis on HH. HH was described as a key practice that HCWs needed to implement to successfully achieve an "IPAC culture" change within their hospital. Nurses and nurse managers reported that hospital management's support and commitment to IPAC helped reinforce the legitimacy of IPAC practices, including HH.

However, HH performance was perceived as an additional task that hindered workflow for many HCWs. Contextual barriers to HH included heavy workloads and inadequate staffing. Nurses

TABLE 1: Sample characteristics (N = 65).

Participant Characteristics	N (%)
Gender	
Male	13 (20)
Female	52 (80)
Profession	
Nurse ^{a, b}	53 (82)
Physicians ^c	12 (18)
Role in hospital	
Front-line care providers (nurses and physicians)	28 (43)
Nurse managers	13 (20)
Infection prevention and control staff and managers	24 (37)
Experience (years)	
0 to 5	34 (52)
6 to 10	17 (26)
10 or more	14 (22)
Language	
French	52 (80)
English	13 (20)
City	
Quebec City	44 (68)
Montreal	21 (32)
Legend	
^a Includes nurse educators and nurse manager assistants.	
^b Includes nurse managers and directors.	
^c Includes only infection control specialists.	

TABLE 2: Barriers to hand hygiene adoption.

HCWs' attitudes and perceptions of HH	Verbatim ¹ /Observation
Differences across health professions	NM: "[...] there are more doctors who have been observed compared to the rest of the team, so it lowers our [hand hygiene audit] results, because they [doctors] don't do it all the time."
Lack of knowledge of and education on HH	IN: "We discovered last year that some nurses, to go faster, were washing their gloves in between patients instead of changing them. And they saw no problem with that."
Invisibility of pathogens leading to lack of legitimacy of some IPAC practices	IN: "We can't see the bugs. It's an invisible contamination. It's like an imaginary problem [...]. It [hand hygiene] is not integrated in the culture. It's not automatic."
Low risk perceptions: wearing gloves	NM: "Even if you have a pair of gloves on, you are not completely protected. There is always something that will remain afterwards."
Self-protection not prioritized during patient care	NM: "Employees need to understand that handwashing is to protect patients, but it's also to protect themselves. You wash your hands to protect yourself."
Contextual and organizational barriers	
Heavy workload	IM: "When you increase the workload of staff, you have non-compliance with everything really, from environmental cleaning to handwashing."
Inadequate staffing and high patient-nurse ratio	IN: "[...] when we didn't have enough resources, like nurses working and caring for many patients at the same time. Well hand hygiene showed lower audit results. Like it went down from 70% to 50%."
Budgetary restrictions and lack of time	N: "Putting on your protective equipment, reserving your material, disinfecting all your tools when you exit a patient's room. It all requires a lot of time. And time, well nurses don't have a lot of that."
Supply issues	N: "[...] it's management, they're the ones who oversee the change. I think it's because the new gloves cost less. So, we're not the ones to decide [...] like gloves, care material and gloves, they never ask us our opinion, it just happens."
Environmental barriers	
Limited space on hospital floors	OB: There is insufficient space on the floor to install more sinks. HCWs do not have close access to sinks to wash their hands.
Lack of sinks and/or bad positioning of sinks on hospital units	MD: "[...] we absolutely have to wash hands with water and use soap like in the good old days. Hospitals are not equipped with sinks. So often, the sink is 15 to 20 feet away. The health provider has to go all the way there, wash their hands, come back, so there is a big loss of time and it's not efficient."
Communication barriers	
Hierarchical working relationships and HCW resistance	IM: "One of the problems we've had, is that yes, we'll be quick to criticize a porter or a nurse who didn't wash their hands. But when it's a doctor or something, well we won't say anything because we don't want them to answer us rudely."
Youth, maturity, and relational proximity	NM: "[...] our teams are young and all around the same age [...] when I need to say something to someone about hand hygiene, I'll do it within the hour if I see them and it'll be professional. But what taints everything is that they talk amongst themselves. They're family, they're friends."
Negative perceptions of infection control team	OB: Some nurses ignored the IPAC nurse when she reminded them to wash their hands. They pretended that she wasn't there and did not answer her when she spoke to them.
¹ Legend IN: IPCN nurse; IM: IPCN manager; MD: physician; N: nurse; NM: nurse manager; OB: observation	

reported frequently working overtime to compensate for the shortage of staff, which in turn may compromise the quality of care and lead to professional burnout.

Environmental barriers

Environmental barriers included features of hospitals' physical layout and structure that challenged or restricted participants' HH performance. Frequently reported barriers included limited space, the absence of single-patient rooms, and the lack of sinks and HH stations. Furthermore, the lack of single-patient rooms was reported to be problematic, as restricted space on care units and inadequate isolation facilities compromised the application of IPAC measures. However, sites equipped with numerous single-patient rooms reported having frequent HAI outbreaks, which could be explained by staff's poor compliance with HH in between patients.

Communication barriers

Communication posed a major challenge for IPAC teams. The increased number of HCWs in hospitals and high employee turnover rates made the dissemination of IPAC and HH recommendations more challenging. Other communication barriers included hierarchical working relationships (i.e., between physicians and nurses), which impeded communication relating to IPAC; silo mentality, where IPAC information was segregated among HCWs belonging to the same care unit or profession; and concerns about critical feedback, where HCWs who had developed friendships with some of their peers were uncomfortable reminding colleagues to comply with HH guidelines. Communication and adherence to IPAC measures were also hindered by HCWs' negative perceptions of IPAC teams, as some perceived them to be the "police."

TABLE 3: Intervention and implementation strategies for hand hygiene adoption.

Organizational strategies	Verbatim¹/Observation
Dissemination of IPAC and HH guidelines using existing roles	N: "The infection control team will address the nurses directly, but [...] I, myself, or the nurse managers will act as sort of the intermediary to spread the word to all the staff."
Implementation of a new role: infection control agents, with the goal of promoting IPAC and HH guidelines	IM: "We have infection control agents on each unit. They have a day of infection control and prevention training [...] those working on units refer to those agents. It's infection prevention promotion, it's our transmission belt for communicating."
Implementing HH games on hospital units	MD: "That [certification program] will help develop infection control and prevention culture."
Communication strategies	
Implementing positive deviance (feedback, positive leaders)	IM: "Positive deviance is a lot of things [...] when you see someone doing something well, it's important to point them out to their peers because others will want that positive reinforcement as well."
Posting posters, handouts, reminders	IN: "Campaigning, we have posters. Each unit has them to motivate their team and remind the staff to wash their hands." OB: Posters are placed in strategic locations to be visible to all. Locations included elevators, cafeteria, walls of care units, IPAC offices, and even bathrooms.
Audits and publicizing HH audit results	IM: "So now our hand hygiene compliance results will become public [...] so everybody is going to be accountable." OB: Hand hygiene audit results are clearly displayed at entrance of care unit. They are visible to visitors, patients, and cleaning staff.
Implementing online training sessions and e-learning	IM: "There are also videos, e-learning videos is what we call them, online sessions where they can learn [...] for instance on hand hygiene."
Support from hospital management to increase nurses' adherence to IPAC practices	IM: "Implementing these measures has significantly decreased the pressure put on the infection control team. It's supported by management so there's nothing better than that."
Positive working relationship with infection control team	N: "It's not long before the infection control team is advised. They are always advised as soon as something happens."
Environmental strategies	
Increased access to single-patient rooms	IN: "[...] it's a government recommendation that all new rooms created in the healthcare system be private to prevent infection transmission."
Installation of additional sinks, soap dispensers, and HH stations	N: "We replaced the hand sanitizers so that they were more accessible, more visually present, to remind the staff that: 'OK, you need to wash your hands.' OB: Extra sinks are installed outside patient rooms. Visible "Stop" signs are placed near soap dispensers to remind visitors and staff to wash their hands.
¹ Legend IN: IPCN nurse; IM: IPCN manager; MD: physician; N: nurse; NM: nurse manager; OB: observation	

Intervention and implementation strategies to enhance HH adherence

Findings from this study have shown that IPAC teams have implemented different strategies to efficiently disseminate IPAC information in hospitals and change HCWs' practices. As shown in Figure 1, the interventions and strategies that have been implemented in participating hospital centres were in direct response to the barriers that have been identified.

Organizational strategies

At the organizational level, IPAC teams benefited from the support of nurse managers, assistant nurse managers, or nurse educators to facilitate the implementation of HH guidelines. In some participating centres, nurses who wished to promote IPAC practices on their respective units could volunteer to receive additional training to become "IPAC agents." Finally, interviewed IPAC nurses and physicians reported that support from hospital

management was crucial to promote staff's adherence to HH and reinforce the legitimacy of IPAC.

Nevertheless, HCWs' negative perceptions of infection control teams in some hospitals could have negatively impacted these efforts. Some nurses described IPAC nurses as the bearers of bad news and criticism, whereas some IPAC nurse participants reported feeling unwelcome and misunderstood by hospital personnel. HCWs' acceptance of IPCNs is important, as it may strengthen their commitment to IPAC.

Communication strategies

Communication strategies included distributing handouts and reminders year-round, especially during the week of the Canadian Patient Safety Institute's National Hand Hygiene Day in May. Other strategies included publicizing HH audit results in care units, implementing online IPAC training sessions (e-learning), having frequent information sessions for hospital

FIGURE 1: Barriers and strategies to enhance HH adherence.

Context & organization	Environment	Communication
Barriers: <ul style="list-style-type: none"> - Heavy workload - Inadequate staffing 	Barriers: <ul style="list-style-type: none"> - Limited space - Lack of single patient rooms - Lack of sinks and HH stations 	Barriers: <ul style="list-style-type: none"> - Increased number of HCWs - Employee turnover rates - Hierarchical working relationship - Silo mentality - Concerns about critical feedback - Negative perceptions of IPC teams
Strategies: <ul style="list-style-type: none"> - Managerial support - Hospital management support - Training IPC agents 	Strategies: <ul style="list-style-type: none"> - Additional sinks & HH stations - More single-patient rooms - Floor space reorganization 	Strategies: <ul style="list-style-type: none"> - Handouts & reminders - HH audit reports publication - Training sessions - Frequent & short meetings - Positive feedback - Use of UV light

personnel, and handwashing under ultraviolet lights¹ to reveal bacteria and enhance HAI awareness. One strategy relied on HCWs to act as role models and “IPAC educators” by disseminating IPAC information, increasing HAI awareness, and promoting the adoption of IPAC measures. Lastly, some respondents mentioned using a “positive deviance” approach [6, 18], where positive feedback was given to those who adhered to HH guidelines, viewing them as “positive leaders,” as opposed to giving critical feedback to non-compliant HCWs. However, issues in providing critical feedback to non-compliant colleagues were also reported by participants.

Environmental strategies

Finally, in newer hospitals, environmental strategies included the installation of additional sinks and HH stations and an increased number of single-patient rooms. In older hospital centres, participants described reorganizing floor space and modifying certain IPAC measures to better fit their actual clinical environment and maximize space.

DISCUSSION

Though HH is a priori a simple task to perform and incorporate into clinical practice, adherence to HH guidelines among HCWs remains low. Some qualitative studies have explored HCWs’ perceptions of HH and HAIs in Quebec hospital care [29], though few have been multicentre studies [30, 31]. Previous quantitative studies conducted in Quebec have shown that HCW adherence to IPAC practices is sub-optimal but have often failed to identify reasons why [32-34].

Though most nurses recognized the importance of proper HH in preventing HAI transmission [16, 19, 35], patients’ needs and fast-paced environments made it difficult for nurses to strictly adhere to HH guidelines and prioritize them

in practice. Previous research has noted the importance of organizational-level support and leadership to facilitate the implementation of HAI prevention initiatives and encourage an IPAC cultural change within health establishments. Furthermore, adequate nurse staffing levels have been associated with lower rates of patient mortality and morbidity and lower rates of HAIs [36, 37]. Similar to previous studies, environmental barriers consisted of poor physical structure and lack of resources, such as poor placement or absence of sinks and handwashing stations [18, 36, 38, 39]. While single-patient rooms may facilitate patient management [40], our findings and other studies indicate that on their own they are unable to reduce HAI transmission [41-43].

In this study as in others, HCWs’ “lack of knowledge and education” of HH guidelines was reported to be a significant barrier at the individual level [35, 36]. As HCWs’ poor levels of hospital hygiene knowledge were a reoccurring theme across sites, this could indicate that current educational initiatives are not conducive to learning. IPAC training tailored to HCWs’ respective professions may help address this issue. However, according to one study, low HH compliance is not necessarily linked to HAI knowledge, but rather to HCWs not incorporating this knowledge into their daily practice, which could be due to low motivation and HAI awareness, heavy workloads, and facilities’ physical structures [38]. Though IPAC education remains an important component of improving HH adherence, training aimed at improving HCWs’ preventive beliefs and HAI risk perceptions should also be considered [8].

Nurses interviewed in this study claimed that physicians did not comply with HH recommendations, which has been cited in previous research [14, 15]. However, our findings indicate that low adherence to HH was not solely a physicians’ problem, as it was reported to also be present among various

¹ The ultraviolet light is used to test HCWs’ handwashing technique and enhance their awareness of infection transmission. Though bacteria are invisible to the naked eye, the “glow” of the ultraviolet light reveals any bacteria left on the hands following handwashing.

groups of HCWs and visitors. As described by Shah et al. (2015), encouraging adherence to IPAC practices can be challenging in multidisciplinary teams where perceptions of clinical practice may vary and where HCWs are more likely to adhere to the norms of their respective professions [16].

In this context, IPAC teams relied on different strategies to enhance HCWs' adherence to HH. Our findings have highlighted that organizational climate or "pro-IPAC culture," HCWs' commitment to IPAC through different communication strategies, IPAC leadership initiatives, as well as knowledge and self-efficacy appeared to be highly influential success factors. Our findings also showed that barriers to HH adherence were complex and context-specific, and successful IPAC interventions were tailored to HCWs' context.

Though there is no "one size fits all" IPAC strategy, findings from our study suggest that continuous education, HCW cohesion and communication, organizational IPAC support, accessibility of materials, and improving facilities' physical layouts may help improve HH compliance in hospital care. Prioritizing HCW communication at all levels may improve cohesion and promote a workplace where feedback is welcomed and encouraged, which has previously been linked to higher HH compliance rates [11]. A systematic review of HH clinical trials conducted by Kingston et al. (2016) also concluded that multimodal approaches to HH intervention strategies can improve HH adherence among HCWs [6].

Our study had some limitations. Participation was voluntary and HCWs who were unavailable or declined to participate may therefore have characteristics and opinions that differ from those recruited. Furthermore, there was an under-representation of men and front-line nurses in our final sample. Recruiting front-line nurses was challenging, as they often had heavy workloads and needed the authorization of their clinical managers in order to participate in our study. Though data saturation was achieved, our findings could not adequately represent the views of all front-line nurses. Moreover, participants may have enhanced their responses to interview questions to provide socially desirable answers. We tried to control this by conducting observations and interviews with multiple participants from the same health facility, which allowed us to observe HCWs' behaviours and helped us identify any missing information from participant interviews. In addition, we used different methodological techniques that were intended to enrich validity: purposeful sampling using diversification criteria, grounded theory, and double coding [28]. Finally, only primary results have been developed in this manuscript to respect the journal's guidelines regarding article length.

To conclude, understanding the determinants of HH adoption is crucial in developing and implementing sustainable HH guidelines in hospitals. Strategies that consider HCWs' local contexts and opinions may increase IPAC awareness, improve cohesion among professions, and promote a safer working environment. Our findings provide valuable insight into the factors that may influence HCWs' compliance with HH in Quebec hospital care. We have identified key barriers at the organizational, environmental, and individual levels,

which include inadequate staffing, demanding workloads, lack of sinks and HH stations, lack of knowledge, and reduced HAI risk perceptions. Our findings also indicate that communication strategies are often prioritized in hospitals to overcome these barriers. Further research is needed to verify whether the representations identified in this study are present among all HCWs working within Quebec hospital centres and elsewhere in Canada.

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