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Gender dynamics in hand hygiene practices: A survey in a specialized dermatological Scientific Institute for Research, Hospitalization and Health Care

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Parole chiave: Infezioni correlate all'assistenza (ICA); igiene delle mani; operatori sanitari; dinamiche di genere; prevenzione delle infezioni

Abstract

Background. *A high adherence to hand hygiene procedures is regarded as cost-effective for preventing healthcare-associated infections. How important it is perceived by healthcare workers may determine the level of adherence to recommendations. This survey aimed at investigating perceptions, practices, and gender dynamics surrounding hand hygiene among healthcare professionals.*

Study design. *This study followed a cross-sectional design, involving a questionnaire administered only once to each participant.*

Methods. *The study was set in a dermatological Scientific Institute for Research, Hospitalization and Healthcare (SIRHHC) in Italy. An internet-based survey was made available to every SIRHHC's healthcare worker for two months of 2024. Surveyed population consisted of healthcare professionals involved in patient care within the SIRHHC, including physicians, nurses, and other healthcare staff. The questionnaire was based on the World Health Organization Hand Hygiene Self-Assessment Framework 2010 and involved both open-ended questions and Likert-scale items. Descriptive statistics and qualitative analyses were used to identify themes and quotes related to hand hygiene. To examine the relationship between the percentage of inpatients who will suffer from a healthcare-associated infection and predictor variables, a generalized linear model was fit. Tests were conducted to assess the robustness of results.*

Results. *Answers from 172 respondents, predominantly nurses (66.86%) and female workers (69.6%), were analyzed. Training emerged as a critical determinant of awareness, with participants reporting higher perceived compliance (86.98%) than general compliance rates (77.52%). However, workload pressures and perceived effort required for adherence (rated 5.70/7) were identified as barriers to consistent practice. Institutional support for hand hygiene, reflected in training initiatives and leadership prioritization (rated 3.87/4), was strong, yet patient involvement remained underutilized (rated 4.55/7). While gender differences in beliefs about*

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healthcare-associated infections (HCAIs) were not statistically significant, the high representation of women highlighted their pivotal role in infection prevention and the potential for leadership in hygiene promotion.
Conclusions. *This study provides actionable insights into improving hand hygiene practices and fostering a culture of safety within healthcare settings.*

Introduction

Health care-associated infections (HCAIs), or nosocomial infections, are a notorious and serious public health threat, consisting of infections contracted by patients admitted for unrelated health issues while receiving or after having received health care in a healthcare facility (1).

Established by the European Center for Disease Control in 2008, the HAI-Network project aims at monitoring HCAIs in these four settings through a standardized methodology and a shared protocol, to estimate the impact of HCAIs and antimicrobial use and to allow comparison of data collected in different European countries. Since 2011, the ECDC has conducted both point prevalence surveys for acute care hospital HCAIs and ICU HCAIs, and epidemiological surveillance reports for long-term care facilities HCAIs and surgical site infections.

Closely related to the challenge of HCAIs is the parallel, exponential increase of the antimicrobial resistance (AMR) phenomenon, which occurs when microorganisms (i.e., bacteria, viruses, fungi and parasites) mutate over time to become resistant to the action of medicines, making infections more difficult to treat and increasing the risk of disease spread, severe illness and death (2). Regarding AMR, the strongest determinants were higher prevalence of antimicrobial usage, the praxis of modifying the antimicrobial after it has been prescribed, the percentage of single-bed rooms (i.e., an indicator of isolation capacity), availability of alcohol hand-rub dispensers at the point of care, and the number of infection prevention and control nurses in the staff (3).

The latest point prevalence survey on HCAIs in acute care hospital conducted in 2022-2023 shows an estimated total of 4.3 million (95% CI: 3.1–5.8 million) patients with at least one HCAI per year; the estimated HCAI prevalence for Italy was 8.2% (95% CI 5.8%–11.2%), which translates to around 429 272 patients with HCAIs per year (4) (95% CI 303 917–582 238).

Hand hygiene is promoted worldwide as a convenient and powerful practice for preventing healthcare-associated infections in general (5). Hand hygiene seems to nearly maximize its effect in preventing HCAIs when the hand hygiene compliance rate among the hospital healthcare workers is around 70% (6). Nevertheless, according to the World Health Organization (WHO) first-ever research agenda on hand hygiene in healthcare, the average compliance rate on hand hygiene practices is still inadequate worldwide, stalled at 40% without any specific interventions; moreover, low- and high-income countries show persistent disparities even between the lowest average compliance rates, with 2% for the former and 20% for the latter (7). Healthcare workers' perceptions on hand hygiene importance and acceptance of hand hygiene practices and recommendations are a crucial component in HCAIs prevention (8). Research indicates that female healthcare professionals often demonstrate higher adherence to protocols and heightened vigilance in infection prevention than their male counterparts (9). These gender-based differences can shape individual practices and team dynamics, influencing overall compliance with safety standards. Recognizing female healthcare workers as potential leaders in hygiene promotion is essential; their commitment to best practices can inspire peers and strengthen a culture of safety within healthcare settings. This study aims to examine these behaviours to inform targeted interventions that leverage female leadership for improved infection control.

Methods

Study Design

An internet-based survey was conducted to assess the perceptions and practices of hand hygiene among healthcare professionals, focusing on gender dynamics and the workplace environment in a dermatological Scientific Institute for Research, Hospitalization and Healthcare (SIRHHC) in Italy.

Recruitment

Healthcare professionals involved in patient care within the dermatological SIRHHC were contacted via company email and invited to complete the survey. The target population included physicians, nurses, and other healthcare staff from various departments, aiming to gather comprehensive insights into their hand hygiene practices and attitudes. The sample size was determined by means of data saturation, ensuring diverse representation of the healthcare workforce.

Questionnaire

The adopted questionnaire was the "WHO Hand Hygiene Self-Assessment Framework 2010", validated by the World Health Organisation (WHO). It included both open-ended questions and Likert-scale items designed to explore attitudes, knowledge, and practices related to hand hygiene. The questionnaire encompassed sections addressing participants' demographics, attitudes towards hand hygiene, perceived barriers, and the influence of gender dynamics in practice. The questionnaire was drafted in Italian and distributed using an online survey platform, ensuring ease of access for all participants. The questionnaire as administered is available upon reasonable request to the corresponding author. The submitted survey can be found in English in the supplementary materials.

Data Collection

The survey was available from January to February 2024. The invitation to participate was distributed via the hospital's internal mailing list addressed to "all employees." The email was sent by the Hospital information technology department, ensuring broad dissemination across all staff members. Biweekly reminders to encourage completion of the survey were subsequently sent by the secretariat of the Healthcare Management office. Participants were asked to share the survey link with colleagues, facilitating snowball recruitment. Institutional Research Ethics Board approval was not required under Italian legislation, but informed consent was obtained from all participants prior to commencing the questionnaire. Participation was voluntary, with the option to opt out at any time, and no incentives were provided for completion. Data collection was conducted anonymously.

Data Analysis

Data saturation, a commonly used approach in qualitative research, was employed to estimate the sample size. Saturation was assessed to ensure that additional data collection did not yield new insights. Responses were manually entered into an electronic spreadsheet, with verification for accuracy performed by multiple investigators. Descriptive statistics were used to summarize participant demographics and practices, employing frequencies and standard deviations. Additionally, qualitative analysis was conducted on open-ended responses using summative thematic analysis to identify key themes and quotes related to hand hygiene practices in the clinical setting.

Furthermore, to examine the relationship between the percentage of inpatients who will suffer from a healthcare-associated infections and predictor variables, a generalized linear model was fit specifying a gamma distribution and an identity link function. The model included the categorical variables occupation, gender, and training course participation, with robust standard errors to account for potential heteroscedasticity. Following model estimation, a link test was conducted to assess the adequacy of the model specification. Deviance and Pearson residuals were predicted to evaluate model fit further. Residual plots were generated by plotting deviance residuals and Pearson residuals against the outcome variable to visually assess the goodness of fit and check for patterns indicating model misspecification.

Study approval

Following a consultation with the Data Protection Officer (DPO) of the institution, it was concluded that, based on the nature and objectives of this study, involvement of the Ethics Committee was not deemed necessary. The study was reviewed and approved by the authors' institutional review board.

Results

The survey was distributed to approximately 600 recipients, corresponding to the total number of employees at the facility involved in the study. Results encompassed 172 respondents, including 49 men and 120 women. Three healthcare workers chose not to disclose their gender. Regarding the professional category, the respondents were primarily nurses (66.86%), followed by medical doctors (12.79%), with others comprising non-healthcare workers (4.65%), other healthcare professionals (2.92%), auxiliary staff (6.98%), and healthcare technicians (5.81%). Of the 172 participants, 159 reported

Table 1 - Demographic background of the healthcare workers respondents.

Characteristic		No. (%)
Sex		
	Male	48 (28.6)
	Female	120 (69.6)
	Unreported	3 (1.8)
Occupation		
	Nurse	115 (66.9)
	Doctor/Physician	22 (12.8)
	Healthcare support worker	12 (7.0)
	Healthcare technician	10 (5.8)
	Administration	8 (4.7)
	Other healthcare professional	5 (2.9)
Specialty		
	Dermatology	40 (23.3)
	Multidisciplinary Surgery	27 (15.7)
	Oncology	22 (12.8)
	General Medicine	21 (12.2)
	Laboratory	15 (8.7)
	Healthcare Management	12 (7.0)
	Radiology	8 (4.7)
	Administration	7 (4.1)
	Allergology	6 (3.5)
	Home Care (ADI)	5 (2.9)
	Cardiology	3 (1.7)
	Emergency	3 (1.7)
	Gastroenterology and Digestive Endoscopy	2 (1.2)
	Hospital Pharmacy	1 (0.6)
Setting		
	Regular Admission	74 (43.0)
	Outpatient Clinics	29 (16.9)
	Medical Services/Research	28 (16.3)
	Administrative	17 (9.9)
	Day Hospital (DH)	16 (9.3)
	Home Care (ADI)	5 (2.9)
	Day Surgery (DS)	3 (1.7)

having participated in hand hygiene training, and all confirmed the availability of alcohol-based hand rubs in their departments. The respondents were distributed across various healthcare settings, including regular admissions (74), outpatient clinics (29), medical services/research (28), administrative areas (17), and day hospitals (16). The demographic background of HCW respondents is detailed in Table 1.

The rate of HCAIs estimated by Health Workers among patients was 13.06%, with a median of 6.3%, and the perceived impact of these infections on patient outcomes was rated at 2.9 out of 4. Hand hygiene effectiveness in preventing HCAIs was rated at 3.84 out of 4, and its importance as a safety priority by institutional leadership was scored at 3.87 out of 4. Respondents believed that hand hygiene was performed correctly in 77.52% of recommended situations, while their personal compliance rate was reported at 86.98%. Support from healthcare leaders was rated at 6.84 out of 7, with alcohol-based products available in all care points (6.66/7), posters displayed in all care areas (6.47/7), and comprehensive training

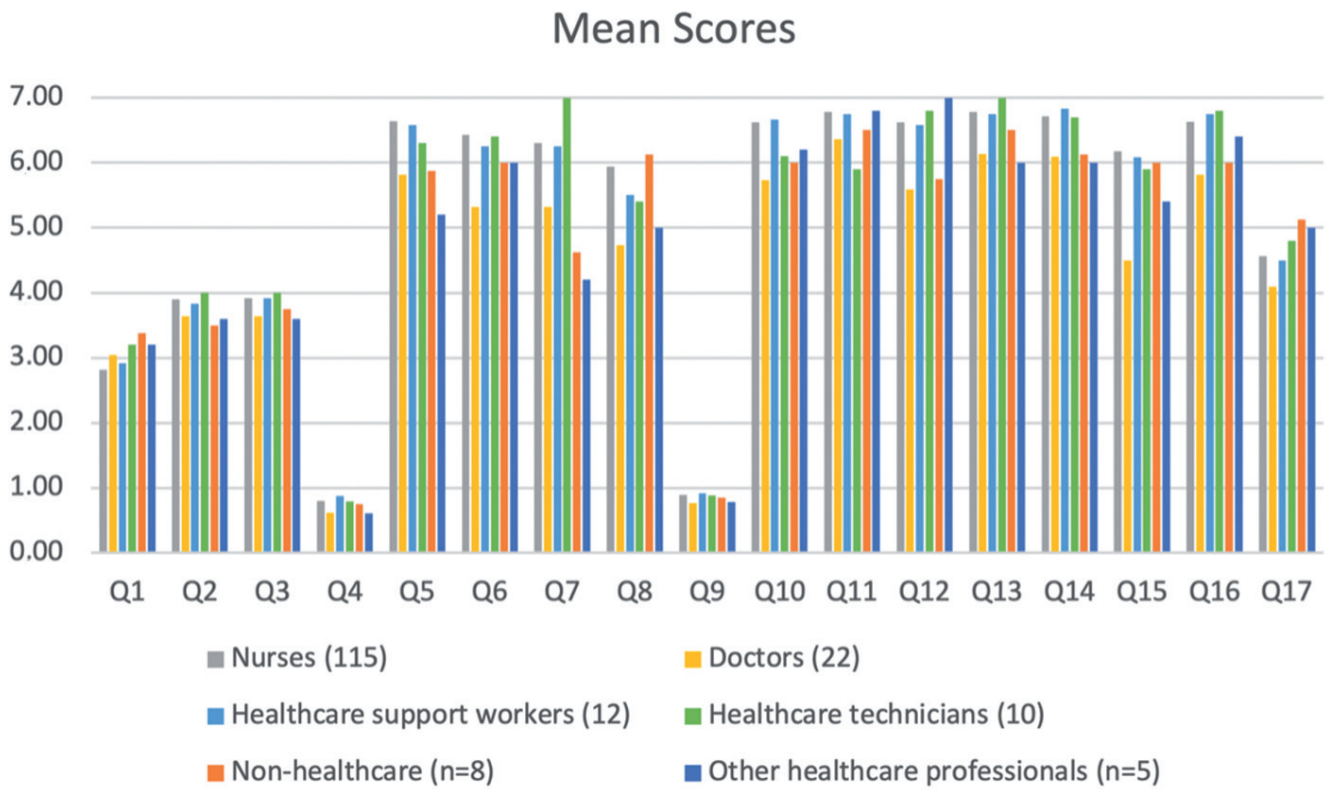

Figure 1 - Average scores assigned by different professional categories.

provided for all staff (6.67/7). Instructions for proper hand hygiene were rated at 6.59 out of 7, while regular feedback on adherence was rated at 5.91 out of 7. The respondents rated themselves as good examples to colleagues at 6.51 out of 7. Patient involvement in reminding healthcare workers about hand hygiene was rated at 4.55 out of 7, and the perceived effort required for maintaining good hand hygiene was rated at 5.70 out of 7. The average scores assigned by the different professional categories are illustrated in Figure 1. The full list of questions and their corresponding identification codes is provided in the supplementary materials.

Findings show that doctors expect about 9% fewer patients to experience HCAIs compared to nurses ($p < 0.001$). Similarly, Healthcare Support Workers also predict significantly fewer HCAIs, with a coefficient of -7.69 ($p < 0.001$) (see Figure 2). On the other hand, pharmacists believe a significantly higher percentage of inpatients will suffer from HCAIs, with a coefficient of 7.28 ($p < 0.001$). Healthcare technicians also expect a higher percentage of HCAIs compared to nurses ($\beta = 14.75$), though this association is borderline significant ($p = 0.055$). For biologists, the expectation is lower compared to nurses ($\beta = -3.72$), but this result is only marginally significant ($p = 0.052$). Physicians' beliefs do not significantly differ from nurses ($\beta = 2.07$, $p = 0.522$).

Gender does not seem to play a significant role in health professionals' beliefs about HCAIs. Both men ($\beta = -3.38$, $p = 0.121$) and those who did not declare their gender ($\beta = -4.52$, $p = 0.122$) predict fewer HCAIs compared to women, but these associations are not statistically significant.

Participation in training courses is associated with significantly higher beliefs about the percentage of inpatients suffering from HCAIs ($\beta = 7.89$, $p = 0.001$). Physicians who attended the course predicted nearly 8% more HCAIs than those who did not attend.

Discussion and Conclusions

The survey results provide a comprehensive overview of hand hygiene practices and perceptions among healthcare professionals across various roles

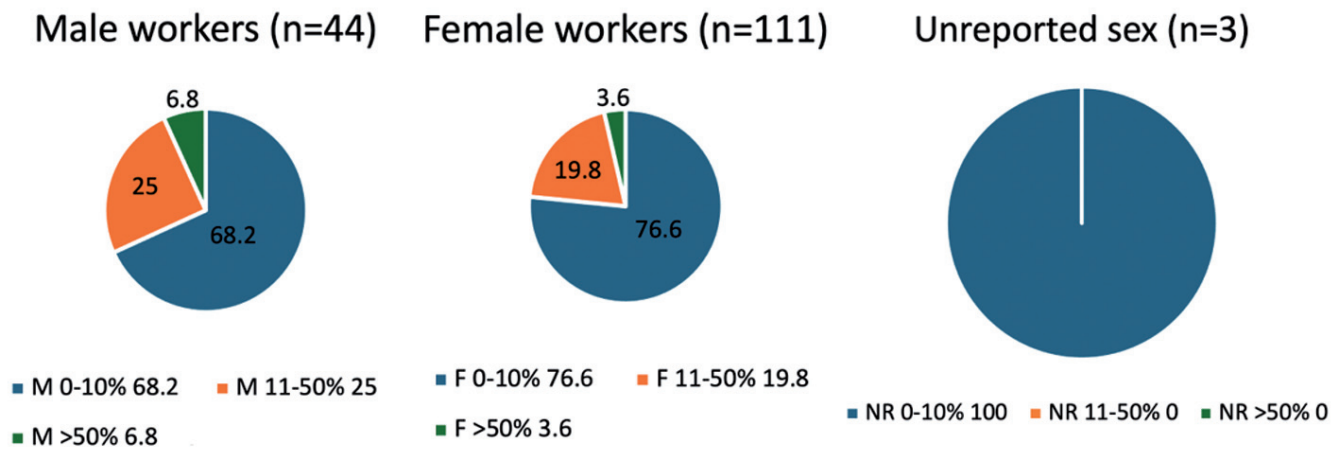

Figure 2 - Esteemed average percentage of hospitalized patients who will suffer from a healthcare-associated infection, percentage of responders per interval per sex.

and settings. The findings reveal critical insights into demographic, occupational, and institutional factors influencing hand hygiene practices adherence and their effectiveness in preventing HCAIs.

Firstly, the data highlights a predominantly female respondent group. This result reflects the composition of the workforce, as approximately 70% of the employees at the facility are female. In the physicians' group of respondents, gender does not seem to significantly influence beliefs about HCAIs. Although men and individuals who did not declare their gender predicted fewer HCAIs compared to women, the lack of statistical significance in these differences (men: $\beta = -3.38$, $p = 0.121$; non-declared: $\beta = -4.52$, $p = 0.122$) indicates that female physicians' perspectives on HCAIs may not be adequately represented or may require deeper exploration. Literature reports that female physicians demonstrate higher scores on empathy assessments, utilize more inclusive language, and employ less technical jargon in patient communications. Apparently, they are also more likely to adhere to clinical guidelines, provide preventive care, and engage in counselling compared to their male counterparts (10,11).

Secondly, the respondents were mainly nurses: this demographic reflects the significant role of nursing staff in direct patient care and infection control practices, including hand hygiene. Nurses are widely recognized for their heightened awareness of HCAIs (12), which is often attributed to several key factors. Their commitment to safety emphasizes prioritizing personal protective equipment (PPE) and safety measures (13). Adherence to standard precautions, essential measures for managing infections, is also a critical practice that especially younger nurses strictly follow (14). While physicians often focus more on the practical aspects of patient care, nurses are notably sensitive to comprehensive patient management (15). The "whole person" orientation of nurses emphasizes prevention and continuity of care (16). This includes their continuous vigilance in infection control, as they maintain awareness of infection risks in all interactions, including minor ones like touching bed sheets (17). This expertise enables them to navigate and address complex infection-related challenges effectively. Additionally, empathy and care are crucial aspects of nursing, as they address patients' emotional and physical needs, fostering trust and open communication about health practices (18).

Lastly, the efficacy of training reflects on results obtained on the question regarding the perceived prevalence of HCAIs, reported at a mean value of 13.06%, with a median of 6.3%, in line with ECDC prevalence studies (19). The impact of HCAIs on patient outcomes was rated at 2.9 out of 4, reflecting a discreet awareness of the profound consequences these infections can have, aligning with existing national literature (20). A notably high percentage of respondents reported having undergone formal training in hand hygiene, coupled with universal availability of alcohol-based hand rubs.

The joint reading of these results allows for some main implications.

Our study indicates no significant differences

between genders in sensitivity to patient safety issues. However, given the high representation of women in healthcare professions, it is essential to further strengthen their leadership roles. Moreover, the absence of gender differences demonstrates that, when stratifying, gender does not function as a confounding factor.

Women constitute approximately 70-90% of the healthcare workforce in various roles, particularly in patient-facing positions (21). Despite the challenges that women often face in the workplace, such as systemic gender bias (22) and lack of supportive policies (23), the COVID-19 pandemic has shed light on the effectiveness of female leading in the infections spreading context (9). Enhancing their empowerment could facilitate more effective management and control of healthcare-associated infections. Understanding the nuances of women's beliefs about HCAIs is crucial, especially since they represent a sizeable portion of the healthcare workforce. Their perspectives may inform practices and policies aimed at reducing infection rates.

Regarding the professional figures of nurses, Italy is currently facing a significant shortage of healthcare workers, exacerbated by the COVID-19 pandemic. Estimates suggest that the country is short by approximately 73,000 health professionals, especially nurses, which has led to increased pressure on the existing workforce and a reliance on inexperienced new graduates and retired personnel to fill gaps. Political interventions should face the actual crisis, which might reflect on patient safety as well (24); according to a 2016 Italian study (25), the burden of healthcare-associated infections nationwide is estimated at 702.53 DALYs (95% UI 575.22-844.66) per 100,000 general population.

Hand hygiene is highly rated for its effectiveness in preventing HCAIs, reflecting strong awareness among healthcare professionals of the critical role that proper hand hygiene plays in infection control. A humongous amount of literature strengthens this statement, influencing transmission both in nosocomial and community settings (6,26-30); also, evidence shows that firsthand clinical skills training significantly enhanced healthcare providers' skills and confidence, with direct interaction with instructors and peers creating a more effective learning environment (31). Additionally, the WHO underscores the significance of continuous training on healthcare-associated infections for healthcare professionals, designating it as a central focus of World Hand Hygiene Day 2024 (32).

The institution where the survey was administered implements mandatory training for staff upon hiring and offers an annual hand hygiene course for all employees. This course incorporates both theoretical instruction and practical demonstrations to ensure comprehensive understanding and application of hand hygiene practices. The high score (3.87 out of 4) attributed to the institutional prioritization of hand hygiene suggests that healthcare leadership recognizes and supports these practices as key patient safety initiatives. Earlier research indicates that enhancing patient safety by boosting hand hygiene compliance is more effective with a demonstrative approach. This method involves clear instructions supported by role modelling, which seems to lead to better compliance rates (33). A notable finding is the discrepancy between the perceived general compliance rate (77.52%) and the higher self-reported personal compliance rate (86.98%). Additionally, the perceived effort required for maintaining proper hand hygiene, rated at 5.70 out of 7, suggests that despite the infrastructure and educational support available, practical challenges and workload pressures may still impact consistent adherence. A previous study (34) found that hand hygiene compliance remained stable up to 30 opportunities per hour, but decreased significantly beyond this threshold, particularly among physicians and during isolation precautions, indicating that high workload can limit adherence to hygiene protocols. The findings suggest targeted interventions and adequate staffing during high workload periods may improve compliance, especially for critical procedures and among physicians.

The results demonstrate that greater efforts can be made to convey the message that HCAIs represents the most frequent adverse event during care delivery (35), underscoring the importance of stringent infection control measures, including effective hand hygiene. Finally, the relatively lower rating for patient involvement in encouraging hand hygiene (4.55/7) suggests an underutilized area that could potentially enhance adherence and accountability.

The small dimension of the healthcare facility where the study was conducted, counting around 170 beds, and the rather small number of respondents, might have biased the results; nevertheless, the methodology followed was validated and supported by scientific evidence. Another caveat is the low survey response rate (29%). It may be partly explained by the request to complete the survey during working hours. Nevertheless, the rigorous analytical approach adopted, supports the internal validity and relevance of the results. The survey has been redistributed in

2025, and the data collection phase is ongoing. Future research should explore the long-term efficacy of educational strategies and examine the direct impact of hand hygiene practices on patient outcomes across various healthcare settings. Further exploration into gender-specific factors influencing adherence and the effectiveness of different training methodologies could refine strategies to enhance compliance and reduce HCAIs.

The survey results reflect a well-established infrastructure and strong cultural emphasis on hand hygiene in healthcare settings. Nevertheless, there are areas for improvement, particularly in bridging the gap between perceived and actual compliance, enhancing patient involvement, and addressing the practical challenges healthcare workers face. Future initiatives should focus on reinforcing accurate compliance monitoring, fostering a more inclusive approach that engages patients, and addressing barriers to maintaining optimal hand hygiene practices. This study provides a foundation for future initiatives aimed at promoting evidence-based practices and fostering a culture of patient safety within healthcare facilities, particularly in specialized dermatological hospitals.

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Riassunto

Dinamiche di genere nell'igiene delle mani: una survey in un Istituto di Ricovero e Cura a Carattere Scientifico dermatologico

Premessa. Un'elevata aderenza alle procedure di igiene delle mani è considerata costo efficace per la prevenzione delle infezioni correlate all'assistenza. L'importanza dell'igiene delle mani percepita dagli operatori sanitari può determinare il livello di adesione alle raccomandazioni. Questa indagine mirava a indagare le percezioni, le pratiche e le dinamiche di genere relative all'igiene delle mani tra gli operatori sanitari.

Disegno dello studio. Lo studio ha seguito un disegno trasversale, con un questionario somministrato una sola volta a ciascun partecipante.

Metodi. Lo studio è stato condotto in un Istituto di Ricovero e Cura a Carattere Scientifico (IRCCS) dermatologico in Italia. Un questionario è stato reso disponibile a tutti gli operatori sanitari dell'IRCCS per due mesi del 2024. La popolazione intervistata era composta da operatori sanitari coinvolti nell'assistenza ai pazienti all'interno dell'IRCCS, tra cui medici, infermieri e altro personale sanitario. Il questionario prevedeva sia domande aperte che item su scala Likert. Sono state utilizzate statistiche descrittive e analisi qualitative per identificare temi e citazioni relative all'igiene delle mani. Per esaminare la relazione tra la percentuale di pazienti ricoverati che soffriranno di infezioni nosocomiali e le variabili predittive, è stato applicato un modello lineare generalizzato. Sono stati condotti test per valutare la solidità dei risultati.

Risultati. Sono state analizzate le risposte di 172 intervistati, in prevalenza infermieri (66,86%) e lavoratrici di genere femminile (69,6%). La formazione è emersa come un fattore critico di consapevolezza, con i partecipanti che hanno riferito una maggiore aderenza percepita (86.98%) rispetto ai tassi di aderenza generale (77,52%). Tuttavia, la pressione del carico di lavoro e la percezione dello sforzo richiesto per l'aderenza (valutata 5,70/7) sono stati identificati come ostacoli alla costanza nelle procedure. Il supporto dell'istituzione nei confronti dell'igiene delle mani, che si riflette nelle iniziative di formazione e nelle prioritizzazione della leadership (voto 3,87/4), era forte, ma il coinvolgimento dei pazienti era ritenuto basso (voto 4,55/7). Sebbene le differenze di genere nelle convinzioni sulle infezioni correlate all'assistenza non siano risultate statisticamente significative, l'alta rappresentanza di donne ha evidenziato il loro ruolo centrale nella prevenzione delle infezioni e il potenziale di leadership nella promozione dell'igiene.

Conclusioni. Questo studio fornisce informazioni utili per migliorare le pratiche di igiene delle mani e promuovere una cultura della sicurezza all'interno delle strutture sanitarie.

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SUPPLEMENTARY MATERIAL

QUESTIONNAIRE ADMINISTERED TO PARTECIPANTS

Hand hygiene

This survey aims to explore knowledge, attitudes, and concerns regarding hand hygiene among healthcare professionals. The goal is to identify risky behaviors and evaluate necessary corrective actions to improve hand hygiene practices in healthcare settings. Completing the questionnaire takes approximately 10 minutes. Participation in this study is completely voluntary. All collected information will be anonymized and analyzed in aggregate form.

The data collected in this questionnaire will remain completely anonymous. No personal information will be requested, and no data that could identify participants will be gathered. All information will be handled with strict confidentiality. No data will be shared with third parties outside the research team and will be securely stored. Participants have the right to withdraw at any time without penalty. They may also request the deletion of their data from the study, even after completing the questionnaire.

By clicking "Next," you declare that:

- You have carefully read the study explanations.
- You have been informed of the purpose and objectives of the study.
- You understand that there are no risks associated with participation.
- You have been assured of the confidentiality of the information provided.
- You are aware that you can stop completing the questionnaire at any time.
- You freely and voluntarily consent to participate by completing this anonymous questionnaire.
- You understand that your personal data will be used exclusively for continuous improvement and scientific research purposes, in compliance with applicable regulations.
- You are 18 years or older.
- You know you can contact the research team at g.altamura@idi.it for any questions or additional information.

The asterisk "*" marks a question that must be answered.

Hand hygiene

We kindly invite you to complete the following questions. Your input is essential to us and will help maintain excellence in our services. Thank you for your cooperation.

1. Service/Ward*: _____
2. Unit*: _____
3. Gender*
   Tick only one option.
   - ◯ Female
   - ◯ Male
   - ◯ Non-binary
   - ◯ Prefer not to disclose
4. Profession*
   Tick only one option.

- ◯ Nurse
- ◯ Physician
- ◯ Technician
- ◯ Support/Health Care Assistant
- ◯ Therapist
- ◯ Other: _____

5. Discipline*
   Tick only one option.
   - ◯ General medicine
   - ◯ Medical specialty
   - ◯ General surgery
   - ◯ Surgical specialty
   - ◯ Radiology
   - ◯ Geriatrics
   - ◯ Outpatient practice/Day hospital
   - ◯ Laboratory
   - ◯ Other: _____

Hand hygiene in your unit

6. Have you attended a hand hygiene training course?*
   Tick only one option.
   - ◯ Yes
   - ◯ No

7. Is an alcohol-based hand rub available in your unit?*
   Tick only one option.
   - ◯ Yes
   - ◯ No

8. What is the average percentage of hospitalized patients who experience healthcare-associated infections?* _____

9. In general, what is the impact of healthcare-associated infections on patient outcomes?*
   Tick only one option.
   - o (four-point Likert scale: from Very low to Very high)

10. How is the effectiveness of hand hygiene in preventing healthcare-associated infections?*
    Tick only one option.
    - o (four-point Likert scale: from Very low to Very high)

11. How important is hand hygiene among the patient safety goals of your facility?*
    Tick only one option.
    - o (four-point Likert scale: Not important to Very important)

12. In your opinion, what is the average percentage of moments in which hand hygiene is recommended healthcare workers in your hospital actually perform hand hygiene either with alcohol-based hand rub or soap and water (between 0% and 100%)?*

. Healthcare workers receiving feedback on their compliance with hand hygiene practices.*
Tick only one option.
- (seven-point Likert scale: Not effective effort to Very effective)

. You properly performing hand hygiene (being a good example for your colleagues).*
Tick only one option.
- (seven-point Likert scale: Not effective effort to Very effective)

. Patients are invited to remind healthcare staff about hand hygiene.*
Tick only one option.
- (seven-point Likert scale: Not effective effort to Very effective)

16. How do you consider the effort required to perform good hand hygiene during care activities?*
Tick only one option.
- (seven-point Likert scale: Minimum effort to Maximum effort)

17. What is the average percentage of moments in which hand hygiene is recommended you perform hand hygiene either with alcohol-based hand rub or soap and water (between 0% and 100%)?* _____

For all the next questions, rate the effectiveness of the following actions in permanently improving hand hygiene in your facility:
(Do not answer based on what you regularly do but on what you think is most useful to do.)

18. "Leader" professionals in your facility openly supporting hand hygiene.*
Tick only one option.
- (seven-point Likert scale: Not effective effort to Very effective)

19. Alcohol-based hand rub available in all care areas.*
Tick only one option.
- (seven-point Likert scale: Not effective effort to Very effective)

20. Display of hand hygiene posters in all care areas.*
Tick only one option.
- (seven-point Likert scale: Not effective effort to Very effective)

21. Every healthcare worker is trained on hand hygiene.*
Tick only one option.
- (seven-point Likert scale: Not effective effort to Very effective)

22. Simple and clear instructions on hand hygiene are available for every healthcare worker.*
Tick only one option.
- (seven-point Likert scale: Not effective effort to Very effective)

LIST OF QUESTIONS WITH IDENTIFICATION CODES AS IN FIG 1 OF THE ARTICLE

The following is the list of questions presented to respondents, translated in English, whose results are shown in Figure 1 of the article, along with their corresponding identification codes. The whole questionnaire translated in English is reported in Supplement B of this document. The questionnaire

Q1	In general, what is the impact of healthcare-associated infections on patient outcomes?
Q2	How is the effectiveness of hand hygiene in preventing healthcare-associated infections?
Q3	How important is hand hygiene among the patient safety goals of your facility?
Q4	In your opinion, what is the average percentage of moments in which hand hygiene is recommended healthcare workers in your hospital actually perform hand hygiene either with alcohol-based hand rub or soap and water (between 0% and 100%)?
Q5	How important is it to the director of your Unit/ward that you perform proper hand hygiene?
Q6	How important is it to your colleagues that you perform proper hand hygiene?
Q7	How important is it to patients that you perform proper hand hygiene?
Q8	How do you consider the effort required to perform good hand hygiene during care activities?
Q9	What is the average percentage of moments in which hand hygiene is recommended you perform hand hygiene either with alcohol-based hand rub or soap and water (between 0% and 100%)?
Q10	"Leader" professionals in your facility openly supporting hand hygiene.
Q11	Alcohol-based hand rub available in all care areas.
Q12	Display of hand hygiene posters in all care areas.
Q13	Every healthcare worker is trained on hand hygiene.
Q14	Simple and clear instructions on hand hygiene are available for every healthcare worker.
Q15	Healthcare workers receiving feedback on their compliance with hand hygiene practices.
Q16	You properly performing hand hygiene (being a good example for your colleagues).
Q17	Patients are invited to remind healthcare staff about hand hygiene.