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Original research article

Gaps between knowledge and practice in operating room environmental cleaning and disinfection: a cross-sectional study

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Abstract
Background: Environmental cleaning and disinfection in operating rooms are essential to prevent healthcare-associated infections. However, gaps between professional knowledge and actual practice may compromise patient safety.
Aims: To evaluate healthcare professionals' knowledge of surface cleaning and disinfection in operating rooms and its association with process effectiveness.
Methods: A cross-sectional study was conducted in two surgical centers of a university hospital in southeastern Brazil. Seventy-one professionals completed a structured questionnaire assessing knowledge. Process effectiveness was evaluated on 1,560 high-touch surfaces using visual inspection and fluorescent markers. Data were analyzed using descriptive and inferential statistics, chi-square tests, and item response theory.
Results: Nurses achieved the highest mean knowledge scores, while physicians showed lower performance. Significant differences were observed among professional categories, particularly regarding concurrent and terminal cleaning. Visual inspection indicated moderate conformity, whereas fluorescent markers revealed higher failure rates (63.5%). Surface type was strongly associated with cleaning outcomes ($p < 0.001$). Item response analysis demonstrated high discrimination for key conceptual items.
Conclusion: Relevant discrepancies were identified between knowledge and practice in operating room environmental cleaning.

Keywords: Disinfection; Health personnel; Infection control; Knowledge; Operating rooms

Introduction

Healthcare-associated infections (HAIs) remain a major challenge to safe healthcare due to their impact on patient safety and clinical outcomes (Tomazini et al., 2025). They are defined as infections identified 48 hours or more after hospital admission, not present or incubating at admission (Abalkhai and Marzouk, 2025). HAIs constitute a significant public health problem by increasing costs, length of stay, and antimicrobial resistance (WHO, 2025).

HAI prevalence varies globally, affecting about 7% of hospitalized patients in high-income countries, 8% in the European Union, and up to 15% in low- and middle-income countries (WHO, 2025). Prevention requires adherence to guidelines, particularly hand hygiene and effective surface cleaning and disinfection to reduce cross-transmission (Hajiyeva et al., 2025; Medeiros et al., 2022).

Operating rooms are particularly susceptible to cross-transmission due to invasive procedures, equipment complexity, and high staff circulation (Danski et al., 2023; Link, 2021). Environmental surface hygiene is therefore essential to interrupt transmission and is a key infection prevention strategy, often led by nursing teams, with proven cost-effectiveness (WHO, 2025).

Cleaning protocols include preparatory, concurrent, and terminal cleaning, and covering surfaces before and after procedures. However, surfaces may retain organic matter and residues, increasing contamination risk during surgical procedures (Brasil Agência Nacional de Vigilância Sanitária, 2010; Link, 2021).

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Despite its importance, evidence on environmental cleaning in operating rooms remains limited, as most studies focus on care units (Alvim et al., 2023; Bernardes et al., 2023; Macedo et al., 2024). This study aims to evaluate healthcare professionals' knowledge and the effectiveness of environmental cleaning processes, contributing to patient safety, team qualification, and the advancement of knowledge in this field.

Accordingly, this study aimed to evaluate the knowledge of professionals working in operating rooms regarding surface cleaning and disinfection and its correlation with process effectiveness, measured by visual inspection and a fluorescent marker.

Materials and methods

Design and study setting

This is a descriptive and analytical study with a quantitative approach, guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Cuschieri, 2019).

The study was conducted in two stages. First, healthcare professionals' knowledge was assessed using a structured instrument. Responses were analyzed according to predefined criteria. Subsequently, the second stage focused on analyzing the effectiveness of the surface cleaning and disinfection process.

The study was conducted in the operating rooms of two surgical centers at a university hospital located in southeastern Brazil. The sector is responsible for medium- and high-complexity procedures. The evaluated surgical centers had distinct profiles: the first has an outpatient character, performing an average of 292 procedures per month; the second performs elective and emergency surgeries, with approximately 250 procedures per month.

Population and sample

The first stage, aimed at assessing the knowledge of healthcare professionals, involved nurses, physicians, and nursing technicians, using a non-probabilistic convenience sampling strategy, resulting in the participation of 71 professionals. To verify the adequacy of this group of participants, a sample power analysis was performed using G*Power software version 3.1.9.7. The χ^2 test family was adopted, with a two-tailed test, a variance ratio of 1.5, and a β/α ratio equal to 1. With these parameters, a statistical power of 0.84 was achieved, demonstrating that the sample size was sufficient to support the proposed analyses.

Inclusion criteria considered professionals with at least six months of experience in the sector. Those who performed exclusively administrative functions, as well as multiprofessional residents, were excluded.

A *post hoc* power analysis was performed for the second stage using G*Power. Considering the final sample of 1,560 surface assessments and the same statistical parameters described previously, the estimated statistical power was greater than 99%, indicating a very low probability of type II error. For this calculation, the χ^2 test family (variance: difference from a constant) was used, with two tails and the same parameters as previously described. The analysis indicated that a sample size of 1,560 surfaces was associated with a statistical power of approximately 1.0.

The selection of surfaces was based on direct and systematic observation in the sector, aiming to identify the most frequently handled contact points. The observational period was one month, with sessions conducted twice a week, totaling 32 hours of observation. Surfaces with greater exposure to touch were included, comprising: infusion pump, anesthesia cart, computer, electrocautery device, surgical light, door handle, Mayo table, support table, mouse, negatoscope, gas rail, ventilator, and electrical outlets.

Data collection

Data were collected between August and November 2025, across daytime and nighttime shifts, through weekly visits to surgical centers. In the first stage, a researcher-developed instrument based on prior literature was applied, derived from a narrative review on cleaning and disinfection practices in surgical environments (Assadian et al., 2021; Brasil Agência Nacional de Vigilância Sanitária, 2010; Link, 2021; Xie et al., 2024). Before data collection, evaluators received standardized training, and a pilot study with 30 observations was conducted to assess interobserver agreement using the Kappa coefficient (κ), with $\kappa \geq 0.60$ considered acceptable.

The instrument assessed sociodemographic and professional characteristics and 11 items on knowledge of cleaning and disinfection methods, including concepts of concurrent and terminal cleaning, essential steps, and appropriate use of personal protective equipment (PPE). It also covered recognition of recommendations, team responsibilities, standard precautions, and the scope of surfaces included. Items were multiple-choice, with one point per correct answer (total = 11). Knowledge was considered satisfactory at ≥75% (≥9 correct answers).

The instrument was administered in person at the workplace, at scheduled times, in a private setting. It was provided in printed format, with an average completion time of 15 minutes. Responses were checked immediately, with no losses or incomplete records. In the second stage, a structured protocol combining visual inspection and fluorescent marker verification was used to evaluate cleaning and disinfection effectiveness. Surfaces were assessed before disinfection (BD) and after disinfection (AD).

A 24-hour interval was established between BD and AD. At both time points, visible dirt (dust, residues, stains, secretions and/or liquids) and adhesive residue were assessed (Frota et al., 2020). Findings were recorded and classified as approved or failed.

For fluorescent marker evaluation, the OptiGlow® solution was applied to predefined points on selected surfaces. Verification occurred during AD, to identify cleaning failures, as the product adheres to surfaces, resists abrasion, and is removed when cleaning is properly performed. Ultraviolet light provided by the manufacturer was used to assess presence or removal of the marker (Frota et al., 2020).

The instrument used in this stage was developed by the researchers and underwent content validation with ten expert judges and 30 representatives of the target population, achieving a Content Validity Coefficient (CVC) >0.90 in both groups. It included variables related to the evaluation process, such as study setting (outpatient or elective and emergency procedures), type of surface, presence of visible dirt, and fluorescent marker results, classified as approved or failed.

Data analysis

Data were analyzed using Microsoft Excel for data organization and the Statistical Package for the Social Sciences (SPSS), version 21, for statistical procedures. Continuous variables (age, professional experience, time in the operating room, and weekly workload) were summarized using means, minimum and maximum values, and standard deviations. Categorical variables were expressed as absolute and relative frequencies.

Performance on the knowledge instrument was calculated as the percentage of correct answers and categorized. Associations were tested using the chi-square test of independence, with professional category as the dependent variable. Effect size was estimated using Cramer's V, interpreted as small (>0.10), moderate (>0.30), and large (>0.50) (Ialongo, 2016). Differences between visual inspection at BD and AD were assessed using McNemar's test. A significance level of 5% ($p < 0.05$) was adopted for all inferential analyses.

Item Response Theory (IRT) was applied using the two-parameter logistic (2PL) model to evaluate response patterns according to participants' knowledge levels, allowing more precise interpretation beyond total scores. Data were processed in R using the mirt package for parameter estimation.

The model assumed a single latent trait (knowledge of cleaning and disinfection) and estimated item discrimination (a) and difficulty (b). Discrimination reflects the ability to differentiate respondents by knowledge level, while difficulty indicates the level required for a 50% probability of a correct response (De Ayala, 2022).

Discrimination was interpreted as: none (0), low (0.01–0.4), moderate (0.4–1.0), high (1.0–2.1), and very high (>2.1). Difficulty ranged from −3 to +3 (De Ayala, 2022). Factor loadings (F1) and communalities (h^2) were also examined to assess item–factor association and explained variance. Loadings <0.30 indicated weak association. Communalities were classified as low (<0.20), moderate (0.20–0.50), and high (>0.50). Item characteristic curves and the test information curve were used to assess model precision across the knowledge scale (De Ayala, 2022).

Ethical aspects

This study was approved by the Research Ethics Committee, under approval no. 7,648,523. All participants read and signed the Informed Consent Form.

Results

Regarding the sociodemographic profile, participants' ages ranged from 22 to 62 years, with a mean of 39.1 (±10.9) years. The sample comprised nurses (27; 38.0%), nursing technicians (24; 33.8%), and physicians (20; 28.2%). Overall, the sample was predominantly female (49; 69.0%). Professional experience ranged from 1 to 39 years, with a mean of 14.3 (±9.9) years. Time working in the current sector ranged from 1 to 36 years, with a mean of 6.4 (±6.8) years.

When assessing whether professionals were aware of institutional protocols for surface cleaning and disinfection, most participants reported being familiar with them (54; 76.1%), while 17 (23.9%) stated they were not. Regarding training on the topic, the largest group consisted of those who had never received training (25; 35.2%), followed by those who did not recall having received it (16; 22.5%). Among those who reported having undergone training, the most frequently reported period was more than six months prior (19; 26.8%), followed by those trained within the last six months (11; 15.5%). With respect to compliance with cleaning and disinfection steps in the work environment, most participants reported performing them frequently (33; 46.5%), followed by those who reported always performing them (24; 33.8%), and those who stated they did not perform them (14; 19.7%).

Regarding the knowledge assessment instrument, mean scores varied according to professional category. Nurses had the highest mean number of correct answers (M = 9.38; SD = 1.44), followed by nursing technicians (M = 8.70; SD = 1.75), while physicians showed the lowest performance (M = 8.10; SD = 1.48). Considering all professionals evaluated, the overall mean score was 8.76 points (±1.63).

Knowledge of the concept of concurrent cleaning showed the strongest association with professional category ($p < 0.001$; Cramer's V = 0.61). Other significant differences were observed for knowledge of cleaning and disinfection methods, the timing of cleaning procedures, and concepts related to operative and terminal cleaning ($p < 0.05$). These associations were of moderate magnitude (Table 1).

Item analysis made it possible to identify different performance patterns among participants regarding cleaning and disinfection practices. The model showed good convergence stability (Log-Lik = −345.394; Max-Change = 0.00010), and the explained variance was approximately 41.7%, indicating that the general knowledge factor accounted for a substantial portion of response behavior.

The results for factor loadings and communalities indicated that most items showed moderate to high associations with the knowledge factor. Items such as "during terminal cleaning, the use of PPE, such as gloves, masks, and gowns, is mandatory, even in noncritical areas, to prevent cross-contamination" (F1 = 0.866; h^2 = 0.751); "do you know what concurrent cleaning is?" (F1 = −0.983; h^2 = 0.967); and "do you know what terminal cleaning is?" (F1 = −0.976; h^2 = 0.952) demonstrated a strong relationship with the construct assessed.

On the other hand, some items showed low communality, such as "cleaning and disinfection in the operating room should be performed before each scheduled surgery, using clean cloths and disinfectant products on horizontal surfaces" (h^2 = 0.068), suggesting lower alignment with the general knowledge factor. This finding indicates that the content may have been interpreted more subjectively, or that it involves institutional and procedural aspects not yet uniformly understood by respondents.

Interpretation of discrimination parameters showed that the items "terminal cleaning should include removal of organic material, application of detergent, rinsing, disinfection with products regulated by Anvisa, and drying of surfaces" (a = 1.507); "during terminal cleaning, the use of PPE, such as gloves, masks, and gowns, is mandatory, even in noncritical areas, to prevent cross-contamination" (a = 2.953); "surface cleaning and disinfection in the operating room should be performed before each scheduled surgery, using clean cloths and disinfectant products on horizontal surfaces" (a = 1.127); and "operative cleaning during the surgical procedure should be performed only by the nurse, without the participation of the circulating staff" (a = 1.679) showed a high capacity to differentiate distinct levels of knowledge among participants and were considered sensitive and informative items.

With regard to item difficulty, a wide variation was observed, with values reflecting both more accessible content and more complex topics. Questions related to concurrent cleaning (b = 5.872) and terminal cleaning (b = 9.754) showed high levels of difficulty, indicating that they required more in-depth knowledge, possibly related to differentiation between types of procedures and specific technical criteria. In contrast, the items "after each surgery, only terminal cleaning should be performed, dispensing with concurrent cleaning" (b = −1.972) and "terminal cleaning in the operating room should include

Table 1. Healthcare professionals' knowledge of the cleaning and disinfection process in the operating room (n = 71)

Variables	Professional category – n (%)			p-value*	Cramer's V
	Nursing technician	Nurse	Physician		
1. Do you know the methods of cleaning and disinfection?					
Yes	21 (87.5)	26 (96.3)	12 (60.0)	<0.001	0.399
No	3 (12.5)	1 (3.7)	8 (40.0)		
2. When should surface cleaning and disinfection be performed in the operating room?					
a) When there is contamination	1 (4.2)	0 (0.0)	2 (10.0)	0.109	0.109
b) Between each procedure	17 (70.8)	16 (59.3)	16 (80.0)		
c) In case of visible dirt	6 (25.0)	11 (40.7)	2 (10.0)		
3. Do you know what concurrent cleaning is?					
Yes	22 (91.7)	24 (88.9)	6 (30.0)	<0.001	0.612
No	2 (8.3)	3 (11.1)	14 (70.0)		
4. Do you know what terminal cleaning is?					
Yes	22 (91.7)	26 (96.3)	15 (75.0)	0.063	0.279
No	2 (8.3)	1 (3.7)	5 (25.0)		
5. Terminal cleaning should include removal of organic material, application of detergent, rinsing, disinfection with regulated products, and drying of surfaces.					
True	23 (92.0)	22 (81.5)	20 (100.0)	0.104	0.253
False	2 (8.0)	5 (18.5)	0 (0.0)		
6. During terminal cleaning, the use of PPE, such as gloves, masks, and gowns, is mandatory, even in noncritical areas, to prevent cross-contamination.					
True	23 (95.8)	22 (81.5)	20 (100.0)	0.051	0.29
False	1 (4.2)	5 (18.5)	0 (0.0)		
7. Surface cleaning and disinfection in the operating room should be performed before each scheduled surgery, using clean cloths and disinfectant products on horizontal surfaces.					
True	22 (91.7)	18 (66.7)	17 (89.5)	0.041	0.302
False	2 (8.3)	9 (33.3)	2 (10.5)		
8. Operative cleaning during the surgical procedure should be performed only by the nurse, without the participation of the circulating staff.					
True	3 (12.5)	0 (0.0)	6 (30.0)	0.009	0.363
False	21 (87.5)	27 (100.0)	14 (70.0)		
9. After each surgery, only terminal cleaning should be performed, dispensing with concurrent cleaning.					
True	1 (4.2)	2 (7.4)	7 (35.0)	0.006	0.379
False	23 (95.8)	25 (92.6)	13 (65.0)		
10. In the cleaning process, all surgical materials should be considered potentially contaminated, adopting standard precautions at all stages.					
True	21 (87.5)	23 (85.2)	14 (70.0)	0.279	0.191
False	3 (12.5)	4 (14.8)	6 (30.0)		
11. Terminal cleaning in the operating room should include only floors and walls, excluding equipment not related to the surgical site.					
True	4 (16.7)	2 (7.4)	5 (25.0)	0.252	0.197
False	20 (83.3)	25 (92.6)	15 (75.0)		

Note: * Chi-square test

only floors and walls, excluding equipment not related to the surgical site" (b = −2.005) showed low difficulty.

The test information curve showed greater precision for θ values between 0 and 2, corresponding to individuals with moderate to high levels of knowledge (Chart 1).

For visual inspection and fluorescence-based analysis, 1,560 surface samples were evaluated. Table 2 shows that the fluorescence method had the highest rejection rate (63.5%). Visual inspection after the cleaning and disinfection process showed a lower frequency of rejection (35.4%) compared with the previous stage (41.3%). In stage 2 of visual inspection, the anesthesia cart (12.0%) and the computer (11.4%) showed the highest rejection rates, whereas in the fluorescence analysis, the electrocautery device (11.2%), infusion pump (10.6%), as well as the anesthesia cart, mouse, and negatoscope, all showed the same frequency (10%).

The analysis showed that type of surgical centre, whether for outpatient surgeries or elective and emergency procedures, was not significantly associated with the results obtained by visual inspection or by the fluorescence method ($p > 0.05$). However, the type of surface evaluated showed a strong and statistically significant association with all outcomes ($p < 0.001$), accompanied by a large effect size (Table 3).

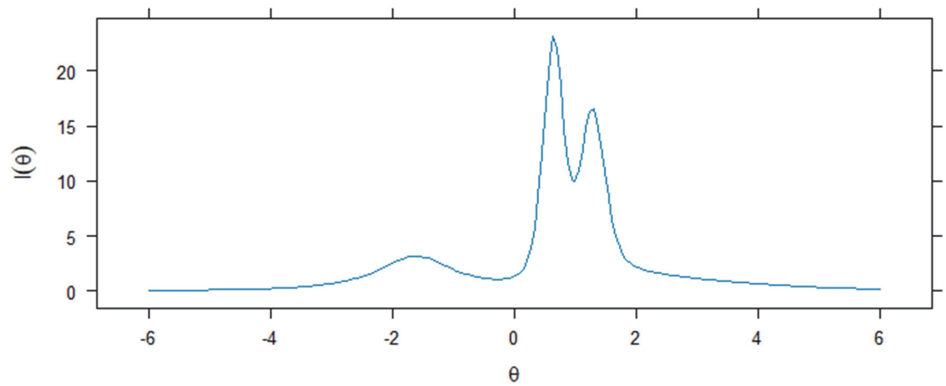

Chart 1. Test information curve for knowledge regarding the surface cleaning process in the operating room

Table 2. Types of surfaces and results of cleaning and disinfection evaluation methods (*n* = 1,560)

Surfaces	Visual inspection BD		Visual inspection AD		Fluorescence	
	Failed *n* (%)	Approved *n* (%)	Failed *n* (%)	Approved *n* (%)	Failed *n* (%)	Approved *n* (%)
Infusion pump	15 (7.0)	25 (8.2)	11 (6.0)	29 (8.6)	35 (10.6)	05 (2.6)
Anesthesia cart	24 (11.2)	16 (5.2)	22 (12.0)	18 (5.4)	33 (10.0)	07 (3.7)
Computer	18 (8.4)	22 (7.2)	21 (11.4)	19 (5.7)	28 (8.5)	12 (6.3)
Electrocautery device	22 (10.2)	18 (5.9)	18 (9.8)	22 (6.5)	37 (11.2)	03 (1.6)
Surgical light	12 (5.6)	28 (9.2)	17 (9.2)	23 (6.8)	32 (9.7)	08 (4.2)
Door handle	01 (0.5)	39 (12.8)	02 (1.1)	38 (11.3)	02 (0.6)	38 (20.0)
Mayo table	12 (5.6)	28 (9.2)	08 (4.3)	32 (9.5)	03 (0.9)	37 (19.5)
Support table	09 (4.2)	31 (10.2)	07 (3.8)	33 (9.8)	03 (0.9)	37 (19.5)
Mouse	25 (11.6)	15 (4.9)	18 (9.8)	22 (6.5)	33 (10.0)	07 (3.7)
Negatoscope	20 (9.3)	20 (6.6)	14 (7.6)	26 (7.3)	33 (10.0)	07 (3.7)
Gas rail	23 (10.7)	17 (5.6)	12 (6.5)	28 (8.3)	30 (9.1)	10 (5.3)
Ventilator	10 (4.7)	30 (9.8)	13 (7.1)	27 (8.0)	30 (9.1)	10 (5.3)
Electrical outlet	24 (11.2)	16 (5.2)	21 (11.4)	19 (5.7)	31 (9.4)	09 (4.7)
Total	215 (41.3)	305 (58.7)	184 (35.4)	336 (64.6)	330 (63.5)	190 (36.5)

Table 3. Association analysis of outcomes with study setting and type of surface

Outcomes	Study setting		Type of surface	
	p-value*	Cramer's V	*p*-value*	Cramer's V
Visual inspection BD	0.093	–0.136	<0.001	0.625
Visual inspection AD	0.089	0.140	<0.001	0.630
Fluorescence	0.063	0.135	<0.001	0.624

Note: * Chi-square test

Discussion

Although most professionals reported familiarity with institutional cleaning and disinfection protocols, many had not received recent training, indicating gaps in continuing education. Training is recognized as essential to improve practices, but its effectiveness depends on alignment with structural and organizational conditions (Oliveira et al., 2020; Xie et al., 2024). Limited participation in ongoing training and insufficient emphasis on infection control in operating rooms reinforce the need for institutional investment in professional development (Abu Rahmah et al., 2025; Ahmed et al., 2023; Turati and Pinto, 2023).

These findings are particularly relevant in the operating room context, where infection prevention depends on coordinated multiprofessional actions involving nursing staff, physicians, and support teams. In this study, physicians were included because their adherence to aseptic practices, environmental precautions, and institutional infection prevention measures directly influences surgical safety and the prevention of HAI (Abu Rahmah et al., 2025; Turati and Pinto, 2023).

Differences in knowledge among professional categories highlight inconsistencies in understanding key aspects of cleaning and disinfection. While nursing staff demonstrated better performance, gaps among physicians suggest the need for broader conceptual alignment within the multiprofessional team. The weaker performance observed among physicians may be associated with lower exposure to environmental hygiene training, reduced participation in cleaning-related processes, and professional cultures historically more focused on technical and procedural aspects of care than on environmental infection prevention measures. In addition, physicians may perceive environmental cleaning responsibilities as primarily related to nursing or support staff, contributing to lower engagement with institutional cleaning and disinfection protocols. Knowledge alone is insufficient to ensure effective practice without standardized processes and adequate working conditions (Abu Rahmah et al., 2025; Humphreys et al., 2023).

The operating room remains a critical environment for microorganism transmission due to intense circulation of people, equipment, and materials. In this context, environmental hygiene is a central strategy for interrupting transmission chains and ensuring procedural safety, requiring continuous training and refinement of practices. Effective infection prevention in this setting also requires shared accountability among all professional categories, particularly physicians, whose compliance with institutional protocols may influence team behavior and safety culture within surgical environments (Gonçalves et al., 2025; Medeiros et al., 2022).

Misunderstandings regarding roles and cleaning routines indicate fragmentation in team responsibilities and persistence of practices not fully aligned with evidence. This lack of standardization contributes to inconsistent practices and highlights the importance of interdisciplinary strategies to strengthen collaboration and protocol adherence (Ahmed et al., 2023; Brasil Agência Nacional de Vigilância Sanitária, 2010; Humphreys et al., 2023). These findings reinforce the importance of clarifying professional responsibilities and promoting multiprofessional educational interventions capable of integrating infection prevention practices into the routine activities of all healthcare workers involved in perioperative care (Anvisa, 2010; Humphreys et al., 2023).

Variation in performance across knowledge items suggests greater familiarity with routine practices and limitations in more complex or conceptual aspects. This pattern indicates the need to review institutional criteria, operational routines, and communication processes to reduce ambiguities and support a more integrated approach to care (Abu Rahmah et al., 2025; Commission for Hospital Hygiene and Infection Prevention (KRINKO), 2024; Xie et al., 2024).

The evaluation of environmental cleaning revealed deficiencies across different surfaces, indicating that practices may not be consistently effective. These findings suggest the persistence of routine-based actions without sufficient critical or theoretical support and reinforce the central role of environmental hygiene in HAI prevention (Dewangan and Gaikwad, 2020; Humphreys et al., 2023; Parry et al., 2022).

Limitations of visual inspection highlight the need for more robust evaluation strategies. When used alone, this method is subjective and may not accurately reflect cleaning quality. Its combination with objective methods, such as fluorescent markers, improves the detection of failures and the reliability of assessments (Frota et al., 2020).

The strong association between surface type and cleaning outcomes underscores the importance of combined assessment methods. Fluorescent markers demonstrated greater sensitivity in identifying failures, supporting their use as a complementary strategy for more accurate evaluation of environmental hygiene.

Finally, the adoption of stricter evaluation criteria, in which any detectable residue indicates failure, allows identification of minimal deficiencies and provides a more precise assessment of cleaning effectiveness in the operating room.

Study limitations

This study has limitations inherent to its cross-sectional design, which may restrict the generalizability of the results. The investigation was conducted in only two surgical centers within the same institution, reducing contextual variability. The number of participants, although supported by power analysis, remains limited. In the surface evaluation stage, selection based on direct observation may have introduced bias. Nevertheless, the combined use of visual inspection and fluorescence increased analytical sensitivity and strengthened the interpretation of the findings.

Contributions of the study to the field of nursing

The study offers relevant contributions to clinical practice by integrating, in an unprecedented manner, the simultaneous assessment of professionals' knowledge and the effectiveness of the cleaning and disinfection process in the operating room. This dual approach makes it possible to identify not only conceptual gaps, but also operational failures directly related to care, constituting a methodological differential compared with studies that analyze only one of these aspects. The findings provide objective support for improving protocols, training programs, and cleaning monitoring strategies, fostering safer practices aligned with infection prevention guidelines.

Conclusion

The study demonstrated that professionals' knowledge of cleaning and disinfection in the operating room shows important variation among professional categories, with better performance among nurses and lower results among physicians. Analysis using IRT showed that items related to fundamental concepts of the topic have high discriminatory capacity, reinforcing the need to strengthen conceptual understanding within the multiprofessional team. Evaluation of practice revealed that, although visual inspection indicated moderate levels of compliance, the fluorescent method identified higher rates of failure, evidencing low effectiveness of the process. These findings point to discrepancies between knowledge and practice, indicating that both knowledge gaps and operational inconsistencies need to be addressed in an integrated manner.

From an implementation perspective, healthcare institutions should prioritize periodic multiprofessional training, establish standardized cleaning and disinfection protocols, adopt objective monitoring methods such as fluorescent markers, and strengthen auditing and feedback strategies aimed at improving adherence to infection prevention practices across all professional categories.

Author contributions

Ragazzi TAL: Conceptualisation; Investigation; Methodology; Project administration; Validation; Visualisation; Writing – original draft; Writing – review & editing. *Varoto AA:* Conceptualisation; Validation; Visualisation; Writing – original draft; Writing – review & editing. *de Sousa AFL:* Validation; Visualisation; Writing – original draft; Writing – review & editing. *Ribeiro L:* Validation; Visualisation; Writing – original draft; Writing – review & editing. *Carbogim FC:* Validation; Visualisation; Writing – original draft; Writing – review & editing. *Garcia PG:* Validation; Visualisation; Writing – original draft; Writing – review & editing. *de Oliveira AC:* Validation; Visualisation; Writing – original draft; Writing – review & editing. *Alvim ALS:* Conceptualisation; Data curation; Formal analysis; Investigation; Methodology; Project administration; Resources; Software; Validation; Visualisation; Writing – original draft; Writing – review & editing.

Ethical permissions

This study was approved by the Research Ethics Committee at the Federal University of Juiz de Fora, under approval number 7,648,523. All participants provided written informed consent.

Conflict of interest

The authors have no conflict of interest to declare.

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