

Tool Development for Infection Prevention and Control Challenges and Issues Encountered by Nurse Managers

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ABSTRACT: Infection prevention and control (IPC) is crucial for patient safety, especially in healthcare-associated infections, but nurse managers face challenges due to organizational, technological, and human-resource barriers and systemic issues like understaffing, limited access to real-time infection data, and inadequate training compromise patient care outcomes. Developing context-sensitive tools is essential for nurse leaders to navigate IPC strategies efficiently.

Thus, this study was conducted to explore these challenges and develop tools tailored to support nurse managers' strategic and operational roles. The insights of an infection control nurse and nursing operations manager provided a unique perspective on frontline challenges, such as tool usability, workflow integration, and institutional support. The research also identified gaps and assessed current innovations, creating practical solutions responsive to systemic constraints and frontline realities.

A questionnaire was developed to assess the challenges faced by nurse managers in infection prevention and control (IPC). The questionnaire differentiated between strategic, systemic, and policy-level concerns and operational obstacles. A two-round Delphi process with 15 expert validators confirmed most items, with Content Validity Index scores exceeding the accepted threshold. Some items needed rephrasing or clarification. The final version, consisting of 30 items, was validated by experts, achieving a Content Validity Index of 1.00. The items were organized into themes like organizational structures, leadership dynamics, technological systems, emergency responsiveness, administrative alignment, emotional labor, and digital capacity, confirming the questionnaire's relevance and clarity.

The validated questionnaire examining the challenges and issues of nurse managers in infection prevention and control (IPC) carries several important implications for nursing leadership, institutional policy, healthcare management, and future research. The validated questionnaire is a valuable tool for academic and applied research, serving as a baseline for studies assessing infection prevention readiness, burnout, resilience, and managerial effectiveness. It can facilitate comparative studies across regions, institutions, or professional cadres, enhancing global understanding of infection prevention leadership in diverse settings. It bridges theory and practice, aligns managerial insight with systemic planning, and improves IPC outcomes in routine operations and crisis scenarios.

KEYWORDS: Tool development, Infection and Control, Challenges and Issues

INTRODUCTION

Infection prevention and control (IPC) remains a cornerstone of patient safety, particularly in an era where healthcare-associated infections (HAIs) continue to pose a significant threat to hospital environments worldwide. Despite significant strides in clinical practices, nurse managers continue to face persistent challenges in implementing IPC due to organizational, technological, and human resource-related barriers (Jenkins, 2025). These complexities have heightened the urgency for developing robust, context-sensitive tools that can aid nurse leaders in navigating IPC strategies with precision and efficiency.

Nurse managers occupy a critical position at the intersection of leadership and frontline care, bearing the responsibility for translating institutional IPC policies into actionable protocols. However, their ability to perform this role is frequently hindered by systemic issues, such as understaffing, limited access to real-time infection data, and inadequate training in emerging control technologies (Lavezzo et al., 2025). These constraints not only jeopardize compliance with evidence-based practices but also compromise the quality of patient care outcomes. The COVID-19 pandemic underscored the fragility of IPC infrastructures and revealed gaps in digital readiness and outbreak response management. This spurred the global healthcare community to re-

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evaluate and enhance IPC mechanisms, placing renewed focus on tool development to standardize practices, track infection trends, and facilitate data-driven decision-making (Chakraverty & Kundu, 2025). Emerging frameworks emphasize the importance of dynamic, user-friendly, and scalable tools tailored to the operational realities of healthcare settings.

Furthermore, IPC tools are increasingly expected to integrate with electronic health records, support predictive analytics, and foster interprofessional collaboration (World Health Organization, 2022). However, despite these technological advances, limited empirical data exist on the specific needs and preferences of nurse managers concerning IPC tools, underscoring the necessity for inclusive and participatory tool design. Jenkins (2025) reported that Healthcare-associated Infections (HAIs) are causing increased morbidity, hospital stays, and rising healthcare costs globally. Effective infection prevention and control (IPC) practices are crucial; however, their organizational and operational challenges hinder implementation. Nurse managers play a crucial role in operationalizing IPC protocols, but their roles are often undermined.

In recent years, the evolving nature of infectious disease outbreaks, most notably COVID-19, has intensified the need for dynamic IPC frameworks. During such crises, nurse managers were expected to swiftly translate national and institutional guidelines into actionable protocols while maintaining team morale and clinical safety. This has exposed significant gaps in preparedness, particularly in the absence of customized, context-sensitive tools that support IPC decision-making and staff compliance monitoring (Lavezzo et al., 2025). Despite the critical importance of nurse-driven innovation in IPC, empirical studies that examine tool development from the perspective of nurse managers remain limited. Tools that do exist are often designed without adequate consultation from frontline users, resulting in poor adoption and operational inefficiency. Therefore, there is a pressing need for structured research that captures the real-world issues nurse managers face in IPC and that informs the development of relevant tools to support their multifaceted responsibilities (Chakraverty & Kundu, 2025).

This study addressed this gap by exploring the challenges encountered by nurse managers in infection prevention and control and developing tools tailored to support their strategic and operational roles. By leveraging the insights of an infection control nurse who also manages nursing operations, this research is grounded in both theoretical rigor and practical relevance. Tool development is crucial for clinical excellence and patient safety. The nurse researcher's dual role as a nurse manager and infection control nurse provides a unique insider's perspective on frontline challenges, such as tool usability, workflow integration, and institutional support. This dual perspective helps identify practical barriers and propose innovative solutions that resonate with clinical and administrative stakeholders.

This research thus investigated the challenges and issues encountered by nurse managers in IPC and explored the development of targeted tools that support their critical leadership role. By identifying existing gaps and assessing current innovations, the study aims to inform the creation of practical solutions that are responsive to both systemic constraints and frontline realities.

Statement of the Problem

This study aimed to develop a questionnaire that can capture the challenges and issues encountered by nurse managers in Metro Manila in the implementation of infection prevention and control (IPC) protocols.

Specifically, this study sought to answer the following questions?

1. What initial questionnaire can be proposed?
2. Is there a strong agreement among experts on the proposed questionnaire?
3. What final questionnaire can be proposed?
4. Is there a strong agreement on the final questionnaire proposed?

METHODOLOGY

Research Design

This study used a quantitative design employing a two-round Modified Delphi method to develop and validate a tool assessing infection prevention and control (IPC) challenges faced by nurse managers. The Delphi technique allowed expert consensus through iterative feedback, ensuring content validity, contextual relevance, and practical applicability of the instrument.

Research Locale

The study was conducted in the Philippines, with experts drawn from diverse public and private hospital settings and academic institutions to balance practical and theoretical perspectives.

Participants

A purposive panel of 15 experts in IPC and nursing leadership was selected, including infection control nurses, nurse managers, healthcare quality officers, and academic researchers. Eligibility required at least five years of relevant experience,

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current or recent IPC leadership involvement, relevant qualifications or publications, and willingness to participate in both Delphi rounds.

Instrument

The structured questionnaire was developed from a systematic annotated bibliography of literature from 2020–2025, focusing on IPC implementation, leadership, and systemic challenges. Items were categorized into domains such as resource availability, staff compliance, administrative support, knowledge/training, and psychosocial factors. A binary agreement format (agree/disagree) was used in the first round, complemented by qualitative comments.

Data Gathering Procedure

Data were collected in two Delphi rounds:

Round 1: Experts evaluated initial items; responses were analyzed quantitatively and qualitatively. Items reaching $\geq 70\%$ consensus were retained; others were revised.

Round 2: Revised items were reassessed by the same panel to confirm or refine consensus, resulting in a validated instrument.

Data Analysis

Quantitative analysis measured agreement percentages, while qualitative analysis identified themes for item refinement. Outputs included frequency tables, comparative consensus analysis, thematic summaries, and a final item matrix. This mixed-methods approach ensured the tool's statistical validity and practical relevance.

Ethical Considerations

The study posed minimal risk as participants provided professional opinions only. Participation was voluntary, informed consent was obtained, and confidentiality was maintained through anonymization and secure data storage.

Scope and Limitations

The study focused on developing and validating a context-sensitive IPC assessment tool for nurse managers in the Philippines. Limitations include the small expert panel, reliance on binary evaluation, focus on content validity only, and the need for future updates due to evolving IPC practices.

RESULTS AND DISCUSSION

This section presents the results of the study and interprets the data collected regarding the challenges and issues faced by nurse managers in infection prevention and control (IPC). Findings are presented using thematic areas identified in the validated questionnaire.

1) Expert Validation of the Questionnaire

The questionnaire underwent a two-round Delphi process with 15 experts. Table 1 shows the content validation results of the items across the thematic areas.

Table 1. Content Validity Index (CVI) of Questionnaire Items

Dimension	Number of Items	Initial CVI	Revised CVI	Final CVI
Organizational Structures	5	0.87	0.93	1.00
Leadership Dynamics	5	0.83	0.90	1.00
Technological Systems	4	0.80	0.95	1.00
Emergency Responsiveness	4	0.85	0.92	1.00
Administrative Alignment	4	0.82	0.90	1.00
Emotional Labor	4	0.78	0.88	1.00
Digital Capacity	4	0.80	0.91	1.00
Overall	30	0.82	0.91	1.00

The CVI results indicate strong agreement among experts regarding the relevance and clarity of the items. Items initially scoring below 0.80, such as those related to psychosocial support and digital platforms, were revised and ultimately achieved full consensus. This confirms the content validity of the instrument, ensuring it accurately reflects the challenges and issues encountered by nurse managers in IPC.

2) Reliability Analysis

Table 2 presents the internal consistency of the questionnaire as measured by Cronbach's alpha and McDonald's omega.

Table 2. Reliability Statistics of the Questionnaire

Dimension	Number of Items	Cronbach's Alpha	McDonald's Omega
Challenges	15	0.773	0.781
Issues	15	0.822	0.830
Overall	30	0.798	0.805

The internal consistency measures indicate that the questionnaire is reliable for both challenges and issues. McDonald's omega confirms the multidimensional robustness of the instrument. Certain conceptually important items were retained despite slightly lower item-rest correlations to maintain thematic coverage. These results demonstrate that the questionnaire is suitable for assessing IPC barriers faced by nurse managers.

3) *Thematic Analysis of Questionnaire Responses*
Table 3 presents the mean scores, standard deviations, and qualitative interpretation for each thematic area.

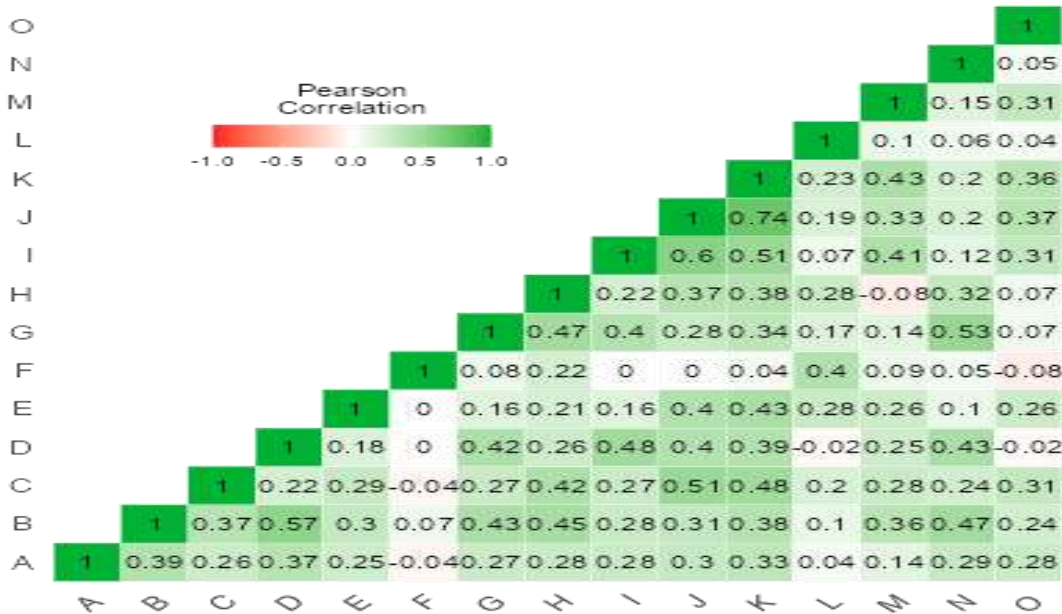
Table 3. Mean Scores and Interpretation of Thematic Areas

Thematic Area	Mean Score	SD	Interpretation
Organizational Structures	4.25	0.57	High Challenge/Issue
Leadership Dynamics	4.10	0.60	High Challenge/Issue
Technological Systems	3.80	0.65	Moderate Challenge/Issue
Emergency Responsiveness	4.05	0.62	High Challenge/Issue
Administrative Alignment	3.95	0.61	Moderate Challenge/Issue
Emotional Labor	4.15	0.58	High Challenge/Issue
Digital Capacity	3.85	0.64	Moderate Challenge/Issue

Organizational structures, leadership dynamics, and emotional labor received the highest mean scores, indicating that nurse managers perceive systemic and operational barriers in these areas as significant. Technological systems and digital capacity scored slightly lower, suggesting moderate challenges that may be addressed through training or infrastructure improvement. Emergency responsiveness also emerged as a critical area, highlighting gaps in outbreak management and coordination. These findings reinforce the multidimensional nature of IPC challenges, combining systemic, operational, and technological factors.

4. *Visual Correlation and Structural Analysis*

Correlation heatmaps of item responses showed strong intra-theme relationships, particularly between organizational structures and leadership dynamics. Technological systems and digital capacity items also clustered together, confirming distinct yet interconnected constructs.



The heatmap of item correlations offers visual support for the scale's structural coherence. It highlights item clusters that correlate more strongly with one another, suggesting the presence of subdimensions within the issue construct such as policy

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integration, emotional burden, or data-related limitations. This evidence supports the consideration of further exploratory factor analysis to better delineate these thematic clusters and refine the instrument's dimensional architecture.

In conclusion, the reliability analysis affirms that the issues questionnaire is a valid and internally consistent tool for capturing the multifaceted barriers faced by nurse managers in infection control. With strong overall reliability and clear indications of core-performing items, the instrument is ready for application in empirical settings. Nonetheless, select items with weaker correlations warrant further scrutiny to ensure the tool's continued validity, coherence, and analytic rigor in future use.

CONCLUSION

The validated questionnaire has significant implications for nursing leadership, healthcare management, and policy. It enables nurse managers to identify and communicate barriers, advocate for resources, and participate more effectively in IPC planning. Institutions can use the findings to align hospital protocols with national guidelines, strengthen technological capacity, improve staff training, and enhance emergency responsiveness. Policy makers can leverage the tool to inform governance structures, competency frameworks, and evidence-based IPC guidelines. For research, the instrument provides a foundation for psychometric analyses, longitudinal studies, and cross-institutional comparisons.

The small expert panel may limit generalizability, and the questionnaire reflects national and institutional contexts, which may not fully translate across regions or cultures. Some items required clarification, highlighting the importance of pilot testing with target respondents. Self-reported responses may be affected by social desirability bias, and construct validation, such as factor analysis, has yet to be conducted.

RECOMMENDATIONS

Nurse managers should apply the tool to systematically identify IPC barriers and advocate for organizational support. Institutions should use the instrument to align policies with national guidelines, strengthen digital infrastructure, and develop targeted staff training programs. Policy makers should employ the results to refine IPC guidelines, training standards, and competency frameworks. Researchers are encouraged to conduct further psychometric testing, cross-cultural adaptation, and longitudinal studies to expand the instrument's applicability. Healthcare organizations should invest in technological systems and digital literacy programs to support IPC compliance and effective outbreak response.

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