MINH
MALAHAYATI INTERNATIONAL JOURNAL OF NURSING AND HEALTH SCIENCE
ISSN 2620-9152 (Print)
ISSN 2621-4083 (Online)
DOI: 10.33024
Nomor: 79/E/KPT/2023

ARTICLE INFORMATION
Received: July, 13, 2026
Revised: August, 23, 2026
Available online: August, 24, 2026
at : https://e-jurnal.iphorr.com/index.php/minh

Supervision models in infection prevention and control programs: A scoping review

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Abstract

Background: Infection Prevention and Control (IPC) is essential for reducing Healthcare-Associated Infections (HAIs) and improving patient safety. Effective supervision is crucial for ensuring healthcare workers' compliance with IPC practices. However, evidence on IPC supervision models remains fragmented.
Purpose: To map supervision models used in IPC programs across healthcare facilities.
Method: A scoping review was conducted using Scopus, PubMed, and Google Scholar for studies published in 2020–2026. Of 194 records identified, 24 articles were included and analyzed using thematic synthesis in accordance with PRISMA-ScR. Methodological quality was assessed using the Joanna Briggs Institute (JBI) critical appraisal tools.
Results: Four supervision models were identified: direct (n = 9), technology-based (n = 3), peer-led (n = 5), and interprofessional (n = 7). Direct supervision was the most frequently reported and was associated with improved hand hygiene compliance, PPE use, and IPC practices.
Conclusion: Direct and interprofessional supervision were the most frequently reported models. Supervision that combines direct performance monitoring with interprofessional collaboration may strengthen IPC implementation and support healthcare quality and patient safety.

Keywords: Infection Prevention and Control; IPCLN; IPCN; Patient Safety; Supervision.

INTRODUCTION

Healthcare-Associated Infections (HAIs) are one of the major threats to patient safety worldwide. The World Health Organization (WHO) reports that about 7% of patients in high-income countries and 15% of patients in low- to middle-income countries experience at least one healthcare-related infection during the treatment period (World Health Organization, 2024). HAIs have an impact on increasing morbidity, mortality, length of hospitalization, and health service costs. This condition has become a greater challenge post-pandemic due to the rising workload of health workers and limited resources that can affect the implementation of the Infection Prevention and Control (IPC) programs in various healthcare facilities (World Health Organization, 2024; Supriadi et al., 2023; Gunawan et al., 2021). In addition, low compliance of health workers with IPC practices, including hand hygiene and the use of personal protective equipment (PPE), is still an important factor contributing to the occurrence of HAIs (Idris et al., 2021; Faridah & Alvionita, 2023).

In Indonesia, the prevalence of HAIs is reported to reach 15.74% to 30.4% in various hospitals, indicating that the burden of healthcare-related infections remains an important challenge for improving the quality and safety of patient care. Various studies show that the implementation of the IPC programs, including compliance with hand hygiene and the use of PPE, is still not optimal in various health service units (Purwacaraka, 2023; Gunawan et al., 2021; Afridayani et al., 2021). This condition has

DOI: https://doi.org/10.33024/minh.v9i6.3895

encouraged increasing attention to strengthening supervision as a strategy to support the implementation of IPC. Various forms of supervision have been developed, ranging from direct supervision to digital technology-based supervision (Rahmadani et al., 2024; Supit et al., 2026). However, existing research still tends to focus on compliance with specific IPC practices and has not comprehensively mapped the supervision models in IPC programs.

In the implementation of the IPC programs, nurses have an important role because they are the health workers who interact with patients the most. The competence of nurses and the quality of supervision received have an effect on compliance with IPC implementation and patient safety (Setiawan et al., 2021; Arruum et al., 2026). Various studies show that effective supervision contributes to increased adherence to infection prevention protocols, including hand hygiene, the use of PPE, and medical device decontamination procedures (Purwacaraka, 2023; Sugiarti et al., 2025; Baseer et al., 2025). In addition to improving compliance, supportive and reflective supervision is also reported to support the motivation and job satisfaction of health workers in carrying out clinical practice (Gustini et al., 2022; Santoso et al., 2017).

As the complexity of implementing IPC programs increases, various models of supervision have been developed, including technology-based supervision, peer supervision, and interprofessional supervision. These approaches reportedly support compliance with IPC practices, team coordination, and patient safety culture (Rahmadani et al., 2024; Supit et al., 2026; Afriani et al., 2021; Tage et al., 2021; Lee et al., 2024). However, the implementation of IPC supervision still faces various challenges, such as the high workload of supervisors, limited resources, weak institutional support, and the unavailability of standardized supervision instruments (Hafni et al., 2022; Afriani et al., 2021; Batran et al., 2025).

Although various studies have reported the importance of the role of supervision in supporting the implementation of IPC practices, the available evidence is still scattered across different healthcare contexts, types of supervision, and different outcomes. To date, there has been no study that comprehensively maps the supervision models in the IPC programs, the contextual factors that affect its implementation, and the outputs produced in various health service settings. This study not only maps the available evidence regarding supervision in IPC programs, but also develops a conceptual classification of supervision models based on implementation characteristics, actors involved, and outcomes reported in various healthcare facilities. Therefore, this study employed a scoping review approach to map the supervision models in the IPC programs, as well as synthesize evidence that can be the basis for the development of more integrated IPC supervision.

RESEARCH METHOD

A scoping review design was employed to identify and map scientific evidence regarding the supervision models used in IPC programs in various healthcare facilities. The preparation of this scoping review followed the guidelines of the Joanna Briggs Institute (JBI) Manual for Evidence Synthesis and was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR). The review process included literature identification, article selection based on inclusion and exclusion criteria, data extraction, and descriptive synthesis of results.

The review questions were prepared using the Population–Concept–Context (PCC) framework recommended by JBI for scoping review. "What are the supervision models used in the IPC programs in healthcare facilities, and what are the implementation characteristics and reported outputs of each model?"

The eligibility criteria were developed using the Population–Concept–Context (PCC) framework. The population comprised individuals involved in the implementation, supervision, and evaluation of Infection Prevention and Control (IPC) programs, including implementing nurses, Infection Prevention and Control Nurses (IPCNs), Infection Prevention and Control Link Nurses (IPCLNs), ward heads, IPC team members, and other multidisciplinary healthcare workers. The concept was supervision within IPC programs, defined as approaches used to monitor, guide, evaluate, and improve healthcare workers' compliance with IPC standards. The types of supervision considered included direct

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supervision, technology-assisted supervision, peer-led supervision, and interprofessional supervision. The context included healthcare settings in which IPC programs and supervision were implemented, such as hospitals, clinics, primary health centers, long-term care facilities, and other healthcare institutions.

Inclusion criteria required that articles be published between 2020 and 2026, available in full text, and written in either English or Indonesian. Eligible studies were primary research employing quantitative designs such as randomized controlled trials (RCTs), quasi-experimental studies, cohort studies, cross-sectional studies, or other intervention designs. Furthermore, articles had to address supervision within the Infection Prevention and Control (IPC) program, specifically examining the role of supervision, Infection Prevention and Control Nurses (IPCNs), Infection Prevention and Control Link Nurses (IPCLNs), infection control nurses, or related supervisory mechanisms such as audit, monitoring, mentoring, coaching, champions, or clinical supervision that support IPC implementation. Exclusion criteria encompassed duplicate publications, studies with a methodological quality score below 50% according to the Joanna Briggs Institute (JBI) guidelines, and unpublished works such as theses or dissertations. Articles failing to meet these standards were excluded from the review.

Literature research was carried out systematically on three electronic databases, namely Scopus, PubMed, and Google Scholar. The search was conducted in May 2026 to identify relevant articles regarding supervision in the context of the Infection Prevention and Control or Infection Prevention and Control programs. The search strategy was developed using a combination of keywords and Boolean (AND/OR) operators, which were tailored to the characteristics of each database. The main keywords used *were "supervision", "clinical supervision", "nursing supervision", "supervisory model", "infection prevention", "infection control", "IPC", "HAIs", "healthcare-associated infection", "nurse", "nursing", "healthcare worker", "health professional"*. Search strategies used were: *(supervision OR "clinical supervision" OR "nursing supervision" OR "supervisory model") AND ("infection prevention" OR "infection control" OR IPC OR HAIs OR "healthcare-associated infection") AND (nurse OR nursing OR "healthcare worker" OR "health professional")*.

All articles obtained from the three databases were exported into the reference management tool for the duplicate identification process. Articles that passed the deduplication stage were then screened based on titles, abstracts, and full text in accordance with the inclusion and exclusion criteria that had been set.

The article selection followed PRISMA-ScR guidelines in a staged process. From 194 records initially identified, 52 duplicates were excluded, leaving 142 for title and abstract screening. Of these, 96 were excluded for lack of relevance to IPC supervision, resulting in 46 full-text articles assessed for eligibility. Twenty-two were excluded for not meeting inclusion criteria or lacking relevant information, yielding 24 studies included in the final synthesis. The identification, screening, eligibility, and inclusion steps are detailed in the PRISMA-ScR flowchart to ensure transparency.

The screening and data extraction was conducted by two independent reviewers to mitigate selection bias. Discrepancies were resolved by third reviewer. Data from eligible articles were systematically extracted using a Joanna Briggs Institute (JBI)-based charting form to capture study characteristics and map supervision within IPC programs. Extracted variables included study identity, design, purposes, supervision models, and main findings. Articles were further classified by the dominant supervision type, actors involved, implementation mechanisms, and reported results. Findings were compiled into Research Characteristics and Evidence Synthesis tables to support analysis. The extraction process was repeated to ensure consistency, and descriptive analysis was conducted to identify key themes across the literature.

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RESEARCH RESULTS

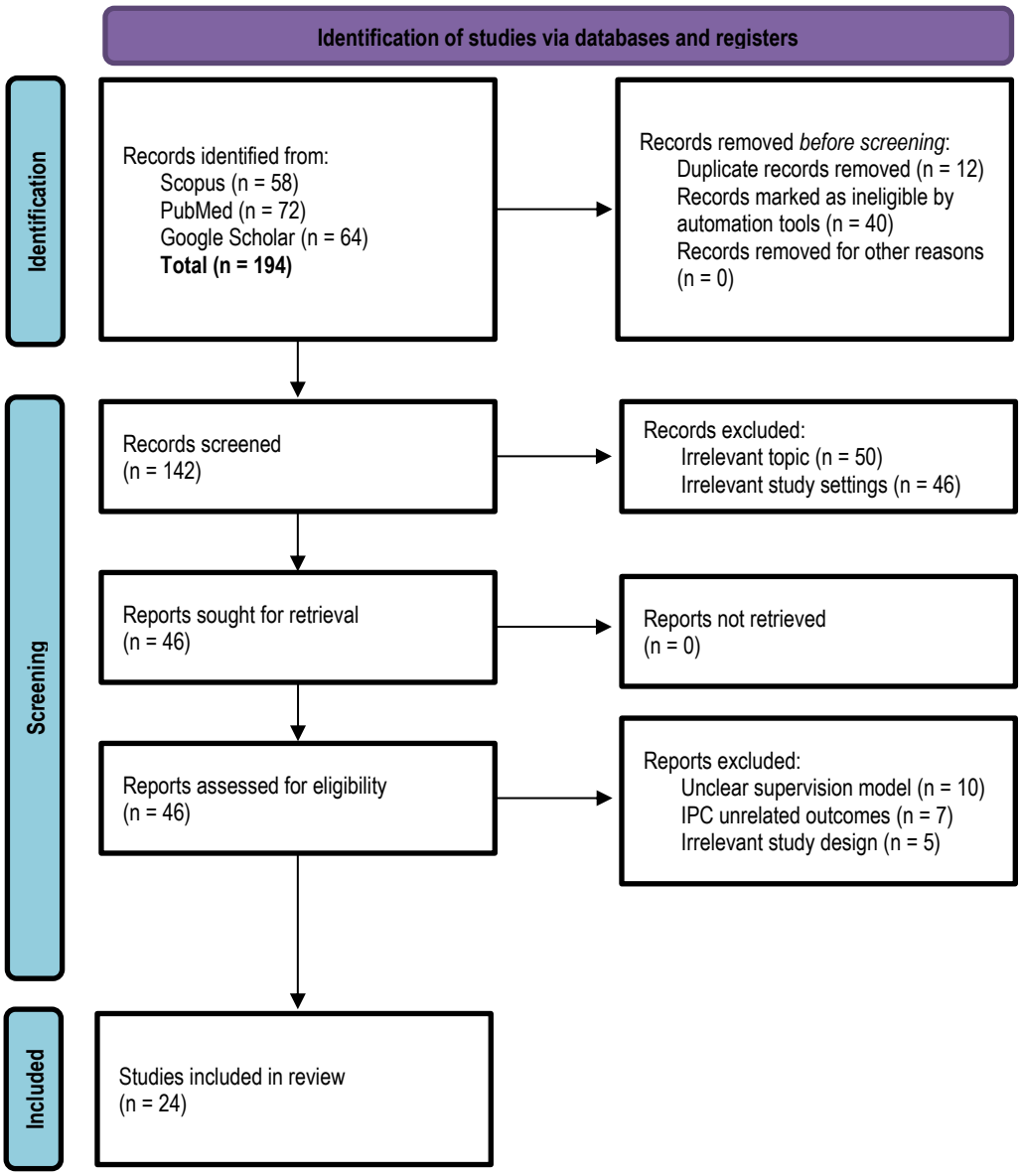


Figure 1. PRISMA Flow Diagram

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Table 1. JBI Critical Appraisal Table

No	Author (Year)	Design	Scores	Percentage	Category
1	Teesing et al. (2021b)	Intervention Study	8/9	88.9%	High
2	Teesing et al. (2021a)	Intervention Study	8/9	88.9%	High
3	Annisa et al. (2022)	Cross-sectional	7/8	87.5%	High
4	Wijaya & Putri (2024)	Cross-sectional	7/8	87.5%	High
5	Mendrofa et al. (2024)	Quasi Experimental	8/9	88.9%	High
6	Purwacaraka (2023)	Cross-sectional	7/8	87.5%	High
7	Gnanasekaran et al. (2025)	Implementation Study	8/9	88.9%	High
8	Gustini et al. (2022)	Quasi Experimental	8/9	88.9%	High
9	Sundoro (2020)	Program Evaluation	7/9	77.8%	Medium
10	Supit et al. (2026)	Quasi Experimental	8/9	88.9%	High
11	Rahmadani et al. (2024)	Development Study	5/6	83.3%	High
12	Ören & Kes (2026)	RCT	11/13	84.6%	High
13	Ye et al. (2026)	Implementation Study	8/9	88.9%	High
14	Boyce (2024)	Intervention Study	8/9	88.9%	High
15	Kalani et al. (2022)	Observational Study	9/11	81.8%	High
16	Astari et al. (2022)	Cross-sectional	7/8	87.5%	High
17	Afriani et al. (2021)	Cross-sectional	7/8	87.5%	High
18	Yang et al. (2022)	Intervention Study	8/9	88.9%	High
19	Lee et al., (2024)	Program Evaluation	8/9	88.9%	High
20	Taweesuk et al. (2026)	Cluster RCT	11/13	84.6%	High
21	Mody et al. (2021)	Intervention Study	8/9	88.9%	High
22	Reynolds et al. (2021)	Implementation Study	8/9	88.9%	High
23	Alrubaiee et al. (2021)	Intervention Study	8/9	88.9%	High
24	Susanto et al. (2025)	Program Evaluation	8/9	88.9%	High

Methodological quality assessment was carried out using the Joanna Briggs Institute (JBI) Critical Appraisal Tools instrument which was tailored to the research design of each article. The instruments used include the JBI Critical Appraisal Checklist for Randomized Controlled Trials, the JBI Critical Appraisal Checklist for Quasi-Experimental Studies, the JBI Analytical Cross-Sectional Checklist, and other relevant instruments according to the characteristics of the study.

The results of the assessment show that most of the articles are of good to very good methodological quality. A total of 23 articles were included in the high-quality category with an assessment score of ≥80%, while one article was included in the medium quality category with a score between 60–79%. No articles of low methodological quality were found. These findings suggest that the evidence synthesized in this review comes from research that generally has sufficient methodological quality to answer the research question. However, overall, the methodological quality of the included articles is considered sufficient to provide an overview of the implementation and variations of the supervision models in the IPC programs.

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Table 2. Characteristics of the Included Studies

Author (Year), Country	Purpose	Design	Supervision Models	Results
Teesing et al. (2021b), Netherlands	To examine if a nursing home's participation in a hand hygiene intervention resulted in residents having fewer healthcare associated infections (HAIs) when compared to nursing homes without the hand hygiene intervention.	Intervention Study	Direct Supervision	"The intervention arm showed significantly higher gastroenteritis ($p < 0.001$) and lower influenza-like illness ($p < 0.01$) compared with controls, while no significant differences were observed for pneumonia, urinary tract infections, or MRSA. Sensitivity analysis indicated that gastroenteritis was no longer significantly elevated ($p = 0.92$).
Teesing et al. (2021a), Netherlands	To investigate whether the hand hygiene intervention in the HANDSOME study decreased substitution of hand hygiene by glove use. We also explore other glove use at hand hygiene opportunities.	Intervention Study	Direct Supervision	Across 4,666 hand hygiene (HH) opportunities involving 476 nurses in 36 nursing home units, substitution was more frequent than HH without gloves at baseline (15% vs. 9%). Following the intervention, substitution remained unchanged, while HH without gloves rose markedly to 30% (OR 3.40; 95% CI 2.55–4.55). Gloves left unchanged declined slightly (13% to 9%), and HH with donning/doffing gloves increased modestly (3% to 9%). Substitution varied across WHO moments at baseline (4%–27%) but showed little change at follow-up, while combined HH and glove use remained infrequent (≤13%).
Annisa et al. (2022), Indonesia	To determine the relationship between supervision and the implementation of infection prevention and control by implementing nurses.	Cross-sectional	Direct Supervision	Statistical test results showed a significant relationship between supervision (p value = 0.025) and the implementation of IPC.
Wijaya & Putri (2024), Indonesia	To examine the relationship between supervision by Infection Prevention and Control Nurses (IPCNs) and nurses' compliance with the implementation of standard operating procedures for universal precautions.	Cross-sectional	Direct Supervision	IPCN supervision was categorized as high among 34 respondents (87.2%), while nurses' compliance with implementing the SOP for universal precautions was categorized as high among 31 respondents (79.5%). The Chi-square test yielded a p-value of 0.049 (<0.05), indicating a significant association between IPCN supervision and nurses' compliance with universal precaution SOPs.

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Author (Year), Country	Purpose	Design	Supervision Models	Results
Mendrofa et al. (2024), Indonesia	To analyze the effect of supervision by IPCNs on nurses' compliance in preventing HAIs.	Quasi Experimental	Direct Supervision	The results indicated that 53% of supervision was categorized as poor, whereas nurse compliance was high at 98%. IPCN supervision significantly influenced compliance in preventing HAIs ($p < 0.05$). However, the coefficient of determination was 0.5, suggesting that supervision accounted for only 50% of the variance in nurse compliance.
Purwacaraka (2023), Indonesia	To examine the relationship between supervision by the Infection Prevention and Control (IPC) team and nurses' compliance in the use of personal protective equipment, specifically gloves.	Cross-sectional	Direct Supervision	The effectiveness of supervision by the IPCN team reached 80%, while nurses' compliance in using PPE was 83.3%. Statistical analysis revealed a significant correlation between supervision and PPE utilization ($p = 0.003$). Continuous supervision plays a crucial role in reinforcing nurses' adherence, as it provides consistent support and fosters habitual compliance in the proper use of protective equipment.
Gnanasekaran et al. (2025), India	To improve the water, sanitation, and infection control practices in Rural health facilities of Jodhpur District through supportive supervision.	Implementation Study	Direct Supervision	At baseline, none of the facilities had bed occupancy above 60%, with average OPD attendance of 57 in CHCs and 22 in PHCs. Human resources were below IPHS 2012 standards, and major gaps were noted in water quality, sanitation, menstrual hygiene, PPE use, and cleaning practices. Hygiene deficiencies included non-functional hand hygiene stations, poor compliance, and limited knowledge of cleaning solutions. Following the intervention, all facilities showed statistically significant improvements in WASH FIT scores across all domains.
Gustini et al. (2022), Indonesia	To determine the effect of interactive reflective supervision on nurses' motivation to carry out nursing care documentation at Meulaboh Hospital.	Quasi Experimental	Direct Supervision	Interactive reflective supervision has a significant effect on nurses' motivation to perform nursing care documentation in hospitals, as evidenced by differences in mean scores before and after the intervention. Moreover, a notable difference was observed between the intervention and control groups.

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Author (Year), Country	Purpose	Design	Supervision Models	Results
Sundoro (2020), Indonesia	To examine the hospital program for the prevention and control of Healthcare-Associated Infections (HAIs).	Program Evaluation	Direct Supervision	The HAIs program covers hand hygiene, infection surveillance, periodic risk assessment, and PPI training such as PPE use. However, hand hygiene campaigns have not been implemented, and staff compliance with hand washing remains below the 100% standard. Strengthening a culture of five-moment hand hygiene, along with regular supervision and evaluation by ward heads, IPCN/IPCLN nurses, and the hospital PPI committee, is necessary to improve adherence.
Supit et al. (2026), Indonesia	To evaluate the effectiveness of WhatsApp-based monitoring in improving nurse compliance.	Quasi Experimental	Technology-based Supervision	No baseline differences between groups, but both showed significant post-intervention improvements ($p < 0.001$), with superior outcomes in the intervention group ($p = 0.04$). Participants considered the intervention beneficial, highlighting WhatsApp as an effective, simple, and low-cost monitoring tool.
Rahmadani et al. (2024), Indonesia	To design a web- and Android-based patient safety e-supervision system (SI ATAN) for hospitals.	Development Study	Technology-based Supervision	The development of the web- and Android-based patient safety e-supervision system (SI ATAN) using the waterfall method is an appropriate approach for projects requiring precision within a relatively short timeframe.
Ören & Kes (2026), Turkey	To examine the effect of short messaging on nurses' hand hygiene behaviors.	RCT	Technology-based Supervision	Results posttest scores for the Hand Washing Form, Surgical Hand Washing Form, and Form for Hand Rubbing with Antiseptic Agent were significantly higher in the intervention group compared with baseline ($p < .001$).
Ye et al. (2026), United States	To evaluate an intervention leveraging social network analysis (SNA) to engage key influencers for HHC improvement.	Implementation Study	Peer-led	Baseline HHC rates were comparable between groups (41.8% vs. 42.6%; $p = 0.62$), while key influencers showed centrality scores 2.4 times the network average. At 12 months, HHC rose to 79.2% (+37.4%) in the intervention group versus 59.3% (+16.7%) in controls, with mixed-effects modeling confirming a significant group-by-time interaction ($p < 0.001$). The intervention also reduced SSI incidence (1.3 vs. 2.2 per 1,000 procedures; 43.2% relative reduction) and significantly enhanced nurse knowledge and team climate ($p < 0.01$).

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Author (Year), Country	Purpose	Design	Supervision Models	Results
Boyce (2024), United States	To address the prevention and control of healthcare-associated infections (HAIs) caused by multidrug-resistant organisms (MDROs), focusing on the role of hand hygiene and environmental hygiene practices in reducing transmission.	Intervention Study	Peer-led	"Hand hygiene adherence and environmental cleaning were critical to reducing MDRO transmission. Alcohol-based hand rubs were effective against most MDROs except C. difficile, which required soap and water. Sporicidal agents outperformed detergents and quaternary ammonium compounds, while continuous monitoring, education, and feedback enhanced compliance. Bundled interventions integrating hand hygiene, environmental disinfection, and staff training achieved meaningful reductions in transmission.
Kalani et al. (2022), Iran	To investigate the effect of liaison nurse management on the incidence of pneumonia and urinary tract infection in patients with stroke after discharge from the hospital.	Observational Study	Peer-led	The two groups were homogenous in terms of mean age; gender frequently distribution and having urinary catheter. The incidence of pneumonia in intervention and control groups (11.6% vs. 19.2%, P = 0.35) had no statistically significant differences, but there was a significant difference in the incidence of urinary tract infection (0% vs. 24.6%, P < 0.001).
Astari et al. (2022), Indonesia	To identify the relationship between knowledge, motivation, and supervision with the performance of IPCLN in infection prevention and control during the COVID-19 pandemic.	Cross-sectional	Peer-led	Performance measurement of IPCLN showed that 21 nurses (61.8%) were categorized as good. In terms of knowledge, 27 nurses (79.4%) were in the good category, while motivation was moderate in 20 nurses (58.8%). Supervision was rated good in 24 nurses (70.6%). Bivariate analysis revealed strong correlations between knowledge and performance (r = 0.68; p = 0.00), motivation and performance (r = 0.80; p = 0.00), and supervision and performance (r = 0.60; p = 0.00).
Afriani et al. (2021), Indonesia	To determine the relationship between motivation and supervision with the performance of nurses in implementing infection prevention and control in hospitals in Aceh Province.	Cross-sectional	Peer-led	The motivation and supervision were significantly related to the performance of Infection Prevention and Control Nurses in Banda Aceh City Hospital and Kab. Aceh Besar (P-value < 0.05).

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Author (Year), Country	Purpose	Design	Supervision Models	Results
Yang et al. (2022), China	To evaluate the effect of setting up a full-time infection control nursing service on reducing the prevalence of multidrug-resistant organism (MDRO) in the orthopedic ward.	Intervention Study	Interprofessional Supervision	"During the pre-intervention period, 11,759 patients were admitted, with 177 MDRO isolates (145 hospital-acquired, 32 community-acquired). In the intervention period, 8,142 patients were admitted, yielding 47 MDRO isolates (29 hospital-acquired, 18 community-acquired). Prior to intervention, MDRO density in the orthopedic ward showed an upward trend (β1 = 0.02; p = 0.003), whereas post-intervention it declined significantly (β3 = −0.05; p = 0.018).
Lee et al. (2024), South Korea	To evaluate the effectiveness of establishing an infection prevention and control (IPC) programs with WHO's core components in an NH.	Program Evaluation	Interprofessional Supervision	Analysis of 18,124 resident-days showed that during the sustainability phase, the risk of respiratory tract infection was significantly reduced compared with the pre-intervention period (OR = 0.51, 95% CI 0.30–0.86; p = 0.012). In addition, staff demonstrated marked improvements in knowledge (p = 0.002) and performance (p < 0.001) following the intervention.
Taweesuk et al. (2026), Thailand	To evaluate the program's impact on CRE cumulative incidence and the CRE acquisition–free time in the general medicine wards.	Cluster RCT	Interprofessional Supervision	Among 363 patients (174 intervention; 189 control), the cumulative incidence of CRE acquisition was slightly lower in the intervention group (36.8% vs. 46.6%; p = .06), with a significantly reduced incidence rate per patient-day (0.038 vs. 0.058; p = .007). Post hoc analysis excluding early acquisitions showed similar cumulative incidence between groups (25.7% vs. 33.6%; p = .16). The probability of remaining CRE-free yielded an unadjusted HR of 0.72 (95% CI, 0.52–1.00; p = .05) and an adjusted HR of 0.75 (95% CI, 0.54–1.05; p = .09). No differences were observed in mortality or hospital stay.
Mody et al. (2021), United States	To determine whether a multicomponent infection prevention intervention can reduce MDRO prevalence in nursing homes (NHs).	Intervention Study	Interprofessional Supervision	Six nursing homes with 245 patients (mean age 72.5 years; 54.7% women) were enrolled, with 113 assigned to the intervention and 132 to the control group. Most patients (95.9%) were receiving post-acute care, and 808 study visits yielded 3,654 patient and 5,606 environmental cultures. The intervention reduced environmental MDRO prevalence by 43% (aOR = 0.57; 95% CI, 0.35–0.94), but patient-level differences were not significant (aOR = 0.57; 95% CI, 0.29–1.14). No significant effects were observed for MRSA, VRE, resistant gram-negative bacilli, mortality, or hospital stay.

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Author (Year), Country	Purpose	Design	Supervision Models	Results
Reynolds et al. (2021), United States	The primary objective was to evaluate the impact of a tailored, multifaceted program on nursing staff compliance with CHG bathing and EHR documentation in critically ill patients. Secondary objectives included assessing the moderating role of unit characteristics and culture, and examining the intervention's effects on staff knowledge, perceptions of CHG bathing, and CLABSI rates	Implementation Study	Interprofessional Supervision	Of the 14 clinical units, 8 were university hospitals and 6 community hospitals. Following the intervention, CHG bathing compliance, staff knowledge, and perceptions improved significantly (p = .009, .002, and .01). Documentation compliance and CLABSI rates did not show statistical improvement, though CLABSI rates declined by a clinically meaningful 27.4%.
Alrubaiee et al. (2021), Yemen	To evaluate the implementation of an educational module on NIs control measures among Yemeni nurses.	Intervention Study	Interprofessional Supervision	Data analysis revealed significant improvements in mean knowledge scores in the intervention groups compared with the waitlist group, both immediately post-intervention (MD = 4.31; $p < 0.001$) and at 3 months (MD = 4.48; $p < 0.001$). Practice scores also improved significantly post-intervention (MD = 2.74; $p < 0.001$) and at 3 months (MD = 2.46; $p < 0.001$). Intervention-1 (face-to-face training plus module) was more effective than Intervention-2 (module only) in enhancing Yemeni nurses' knowledge and practices on NI control measures.
Susanto et al. (2025), Indonesia	To evaluate the implementation of the IPC program at Unimedika Hospital of Setu Bekasi and its effectiveness in improving service quality. Specifically, this study examines healthcare worker compliance, infection surveillance data, and challenges in implementing the IPC	Program Evaluation	Interprofessional Supervision	The study found low hand hygiene compliance, with about half of individuals not adhering, and PPE use also below standard, with 40% non-compliance. Surveillance data revealed a high incidence of HAIs, particularly phlebitis (5.24%) and surgical site infections (3.6%).

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DOI: https://doi.org/10.33024/minh.v9i6.3895

Data Analysis and Synthesis

Data extracted from all articles meeting the inclusion criteria were analyzed using a descriptive synthesis approach. The analysis of 24 studies demonstrated that supervision constitutes a critical component in the implementation of Infection Prevention and Control (IPC) programs. Four principal models of supervision were identified: *direct supervision*, *technology-assisted supervision, peer-led supervision*, and *interprofessional supervision*. Although each model possesses distinct characteristics, all were shown to enhance healthcare worker compliance, strengthen IPC programs implementation, and contribute to the prevention of healthcare-associated infections (HAIs).

Within the synthesis, direct supervision was characterized by practices such as direct observation, field monitoring, compliance audits, and immediate feedback to healthcare personnel. Technology-assisted supervision involved the use of digital platforms, including web-based applications, electronic systems, social media, and electronic messaging, to facilitate monitoring and evaluation of IPC activities. Peer-led supervision was implemented through a peer-based approach, engaging champions, link nurses, Infection Prevention and Control Link Nurse (IPCLNs), or other healthcare workers who functioned as agents of change in IPC programs delivery. Interprofessional supervision encompassed collaborative efforts across multiple health professions and organizational structures, involving IPCNs, IPC teams, unit heads, hospital management, and multidisciplinary staff.

Overall, these findings highlight that adaptive, collaborative, and technology-assisted supervision strategies hold considerable potential to optimize the effectiveness of IPC programs.

Characteristics of the Included Studies

Twenty-four articles published between 2020 and 2026 were included, most appearing between 2021 and 2024. Studies originated from diverse countries, with Indonesia contributing the largest number, reflecting strong attention to IPC supervision. Research designs varied, encompassing RCTs, cluster trials, quasi-experimental, cross-sectional, implementation, evaluation, observational, and development studies, demonstrating both experimental and observational approaches. Most investigations were hospital-based, though some involved nursing homes, long-term care facilities, and other institutions, with participants including nurses, IPCN, IPCLN, unit heads, IPC teams, and multidisciplinary staff. Mapping identified four supervision models: direct supervision (9 articles), technology-assisted (3), peer-led (5), and interprofessional (7), each providing insights into IPC program implementation.

Supervision Models Evidence Mapping in IPC programs

To provide a more comprehensive picture of the distribution of evidence found, the relationship between the supervision models, the actors involved, the implementation setting, and the outcomes reported in each study was mapped. This mapping aims to identify the pattern of supervision implementation in the Infection Prevention and Control (IPC) program in various healthcare facilities.

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Table 3. Supervision Models and Reported Outcomes in Infection Prevention and Control Programs

Supervision Models	Main Actors	Supervision Mechanism	Reported Outcomes
Direct Supervision	IPCN, IPCLN, nursing manager, clinical supervisor.	Direct observation of clinical practice, compliance audits, real-time feedback, coaching and mentoring in the service unit.	Increased hand hygiene compliance, PPE use, standard vigilance compliance, decreased HAIs, SSI, and CAUTI.
Technology-based Supervision	IPCN, quality manager, healthcare IT team.	Application-based e-supervision, dashboard monitoring, WhatsApp supervision, electronic audit, digital reporting.	Improved compliance monitoring, accelerated reporting, supervision efficiency, improved documentation and IPC follow-up.
Peer-led Supervision	IPCN, Senior nurse, IPCLN, trained peer.	Collegial mentoring, practice reflection, case discussion, peer review, mentoring between nurses.	Increased intrinsic motivation, patient safety culture, psychological safety, openness in incident reporting, increased IPC compliance.
Interprofessional Supervision	Doctors, nurses, IPCN, pharmacists, sanitation workers, IPC team.	Cross-professional audits, joint clinical rounds, multidisciplinary evaluations, collaborative decision-Making.	Significantly reducing HAIs, improving team coordination, harmonizing IPC protocols, strengthening patient safety culture and service quality.

DISCUSSION

Direct Supervision as the Foundation for the Implementation of the IPC Programs

Thematic synthesis identified direct supervision as the most frequently reported model, appearing in nine studies. This predominance reflects continued reliance on direct observation, compliance audits, field monitoring, and face-to-face feedback as primary strategies to ensure healthcare workers' adherence to infection prevention practices. Evidence from prior research confirms that supervision is directly associated with improved compliance with IPC procedures (Annisa et al., 2022; Wijaya & Putri, 2024; Mendrofa et al., 2024). From a nursing management perspective, direct supervision provides strong interpersonal interaction, real-time observation, and immediate feedback, enabling supervisors to identify barriers contextually and deliver tailored coaching. However, its effectiveness depends on adequate human resources, sufficient time, and supervisory competence; in facilities with limited IPCNs or heavy workloads, sustaining direct supervision is challenging, and outcomes may be diminished if oversight occurs without constructive guidance and feedback.

Technology-based Supervision as an Adaptation to the Digital Transformation of Health Services

This review highlights the emergence of technology-based supervision as a developing approach to support IPC program implementation. Although reported in fewer studies (three articles) compared with direct supervision, synthesis findings indicate that digital tools can enhance the efficiency and effectiveness of supervisory processes. Platforms such as WhatsApp, e-supervision systems, and structured electronic messaging enable rapid communication, continuous monitoring, and systematic documentation of IPC practices (Supit et al., 2026; Rahmadani et al., 2024; Ören & Kes, 2026). This reflects a paradigm shift from reliance on physical presence toward the use of information technology to strengthen monitoring and coaching. In healthcare organizations with limited supervisory resources, technology-based supervision offers a means to expand coverage and accelerate feedback, thereby facilitating timely correction of practice inconsistencies. Beyond communication, digital systems also promote transparency, accountability, and sustainability by structuring audit records,

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compliance reporting, and IPC indicator monitoring. Nevertheless, the effectiveness of this model depends on adequate infrastructure, internet access, digital literacy among health workers, and organizational support for technological integration. Importantly, while technology-based supervision provides flexibility and scalability, it cannot fully capture behavioral and cultural aspects observable through direct interaction; thus, it should be regarded as a complement rather than a substitute for direct supervision.

Peer-led Supervision as a Peer-based Behavior Change Strategy

This scoping review shows that *peer-led supervision* is a model of supervision that has evolved in response to the need for organizations to strengthen patient safety culture through a more participatory approach. The number of articles that reviewed this model was 5 articles. This model involves health workers who act as *infection control champions*, *link nurses*, or Infection Prevention and Control Link Nurses (IPCLN) in supporting the implementation of the IPC programs (Boyce, 2024; Ye et al., 2026; Astari et al., 2022).

In contrast to direct supervision which is generally hierarchical, *peer-led supervision* places colleagues as agents of change who function to provide examples, support, and reinforcement of behavior to colleagues. This approach is based on the assumption that individuals tend to be more receptive to input and adopt new behaviors when the influence comes from coworkers who have social and professional closeness. Therefore, this model focuses not only on the surveillance aspect, but also on the formation of an organizational culture that supports infection prevention practices.

Findings from several studies show that the existence of champions and IPCLN contributes to increasing health workers' compliance with IPC practices, increasing work motivation, and strengthening the role of clinical leadership at the service unit level (Afriani et al., 2021; Astari et al., 2022). In addition, this model also supports the process of disseminating knowledge and best practices more quickly because it is carried out through social networks that have been formed in the work environment.

However, the success of this model is highly dependent on the capacity of individuals who play the role of champions or IPCLN. Differences in the level of competence, motivation, and organizational support can affect the effectiveness of its implementation. In addition, without clarity of roles and adequate management support, *peer-led supervision* risks becoming a symbolic and unsustainable program.

Interprofessional Supervision as a Systems Approach in IPC Programs

Another finding that stands out from this review is the importance of interprofessional supervision in supporting the successful implementation of the IPC programs. The number of articles that review this model is as many as 7 articles. In contrast to the supervision model that focuses on a specific individual or unit, interprofessional supervision views infection control as a shared responsibility involving various health professions and organizational structures (Yang et al., 2022; Lee et al., 2024).

This approach is in line with the modern concept of patient safety that places infection control as part of the organizational system, rather than solely the responsibility of a particular healthcare professional. The involvement of IPCN, doctors, nurses, IPC teams, room heads, and hospital management allows for better coordination in the monitoring, audit, evaluation, and decision-making processes related to the IPC programs. Thus, supervision not only functions as a supervisory activity, but also as an integration mechanism between professions and between service units.

The results of the synthesis show that the interprofessional supervision model is related to increasing the effectiveness of IPC program implementation, decreasing the incidence of resistant microorganisms, and strengthening patient safety culture (Mody et al., 2021; Yang et al., 2022; Taweesuk et al., 2026). In addition, the involvement of hospital management in the supervisory process allows for the availability of the support of resources, policies, and infrastructure necessary for the success of infection control programs (Lee et al., 2024; Susanto et al., 2025).

Compared to other supervision models, interprofessional supervision has the advantage of overcoming the complexity of IPC program

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implementation involving many actors and service processes. However, interprofessional supervision also faces more complex challenges than other models. Differences in professional culture, organizational hierarchical structure, and barriers to communication between professions can affect the effectiveness of collaboration. In addition, this model requires strong organizational support and leadership that is able to facilitate coordination across professions on an ongoing basis.

Overall, the findings of this review show that there is no single model of supervision that can be considered the most superior for all healthcare contexts. Direct supervision remains the foundation of IPC program implementation, while technology-based supervision provides opportunities for increased efficiency, *peer-led supervision* reinforces behavior change through peer influence, and interprofessional supervision supports program integration at the organizational level. Thus, a hybrid supervision model has the potential to be the most adaptive strategy to support the implementation of the IPC programs in the future.

CONCLUSION

This scoping review shows that IPC supervision plays an important role in improving healthcare worker compliance, strengthening patient safety culture, and reducing Healthcare-Associated Infections (HAIs). The four supervision models identified – direct, technology-based, peer-led supervision, and interprofessional – have different advantages and limitations according to the context of implementation. These findings suggest that a hybrid supervision approach that integrates various supervision models in an adaptive manner has the potential to be an effective strategy to strengthen the implementation of IPC in healthcare facilities.

Strengths and Limitations of the Review

This scoping review has several strengths. It successfully mapped diverse supervision models within IPC programs across healthcare contexts, applied the Joanna Briggs Institute (JBI) methodology with PRISMA-ScR reporting to ensure transparency, and developed a conceptual classification of four models—direct, technology-based, peer-led, and interprofessional supervision—providing a theoretical foundation for future IPC research and practice.

Nonetheless, limitations exist. The search was restricted to full-text open-access articles published between 2020 and 2026, potentially omitting relevant studies. The included research varied widely in design, setting, and outcomes, limiting direct comparability. Most studies focused on compliance and IPC implementation rather than long-term impacts on HAIs. Moreover, the uneven geographic distribution, with evidence concentrated in Indonesia and several high-income countries, constrains generalizability.

Overall, despite these limitations, the review offers a comprehensive overview of supervision models in IPC programs and establishes a conceptual framework that can inform policy, nursing practice, and future research.

Implications for Nursing Practice, IPCN, and Hospital Management

This scoping review highlights the critical role of supervision in strengthening IPC programs implementation. Supervision functions not only as surveillance but also as coaching, behavior reinforcement, and compliance support, underscoring its integration into quality management and patient safety systems. For nurses, consistent supervision enhances adherence to hand hygiene, PPE use, and other infection prevention practices, while fostering awareness of infection risks and patient safety culture. For IPCN and IPCLN, supervision should extend beyond audits to include innovative strategies such as digital technology and peer networks, positioning IPCN as facilitators of change and IPCLN as champions at the unit level. For hospital management, effective IPC implementation requires organizational commitment through adequate staffing, supervisor competency development, technology-based systems, and interprofessional collaboration. Evidence suggests that hybrid supervision models—combining direct, technological, peer, and interprofessional approaches—yield more optimal outcomes than single-model strategies.

ACKNOWLEDGEMENTS

The authors express their gratitude to all parties who have provided support during the process of preparing this research. Appreciation was also

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expressed to academic institutions and health service facilities that have supported the development of this study. Thanks are given to the reviewers and peers who have provided constructive input in the refinement of this manuscript.

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