



# From Learning to Leading: Interprofessional Practice to Enhance Infection Control and Antimicrobial Stewardship among Interns

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## KEYWORDS

Infection Control, Antimicrobial Stewardship, Interprofessional Education, Collaborative Practice, Healthcare Interns

## ABSTRACT:

**Introduction:** Effective infection control training for healthcare interns is vital in reducing healthcare-associated infections (HAIs). However, barriers such as inadequate interprofessional collaboration often hinder successful implementation. Early exposure to interprofessional education (IPE) can help prevent misconceptions, foster teamwork, and enhance the development of essential skills and attitudes required for patient safety.

**Aim:** To evaluate the effectiveness of Interprofessional Collaborative Practice (ICP) training in strengthening infection control and antimicrobial stewardship (AMS) practices, and to assess interns' perceptions of IPE and collaborative practice before and after the program.

**Objectives:** To enhance interns' knowledge and skills in infection control and AMS through ICP-based training, and to analyze changes in their perceptions, attitudes, and interprofessional collaboration following the intervention.

**Methods:** A prospective interventional study is being conducted at SLIMS, Puducherry, from October 2023 to October 2025, involving 120 healthcare interns (Medical = 43, Nursing = 36, Paramedical = 41) selected by universal sampling. An interprofessional team was formed, and focus group discussions were held. Existing modules and questionnaires were validated by experts, followed by ethical clearance and participant selection. Twelve groups were created for ICP activities. Educational interventions were delivered over two weeks, with two-hour sessions. Pre- and post-tests were administered, and self-assessment on ICP perceptions was obtained using a 35-item questionnaire. Data were analyzed using SPSS version 25.

**Results & Conclusion:** ICP training significantly improved interns' knowledge and skills in infection control and AMS, with knowledge scores increasing from 37% to 79% ( $p = 0.001$ ). The program effectively strengthened teamwork, supported collaborative practice, and enhanced patient safety.

## 1. Introduction

The rising prevalence of major healthcare-associated infections (HAIs) can be mitigated through the adoption of robust infection control practices, which rely heavily on timely and effective educational training for healthcare interns. While such practices may seem straightforward, their implementation is often hindered by various challenges within the healthcare environment. A key barrier is the lack of effective interprofessional teamwork, which is crucial for preventing HAIs (Han et

al., 2019; Srisatidnarakul et al., 2021). Early exposure to interprofessional collaboration can help to prevent the development of misconceptions and stereotypes regarding other healthcare professionals. Embedding Interprofessional Education (IPE) and Collaborative Practice (CP) throughout medical training can significantly enhance students' interprofessional competencies and attitudes.

Infection control and antimicrobial stewardship are critical components of healthcare, aimed at reducing



healthcare-associated infections (HAIs) and addressing the growing challenge of antimicrobial resistance (AMR). Interns—spanning medicine, nursing, and paramedical disciplines—play a vital role in patient care, underscoring the importance of integrating comprehensive infection control strategies and stewardship principles into their training. The adoption of an Interprofessional Collaborative Practice (IPCP) model can enhance infection prevention efforts and promote responsible antibiotic use by fostering effective teamwork among diverse healthcare professionals. This, in turn, leads to improved patient outcomes and overall quality of care. As healthcare interns are often newly exposed to the realities of clinical practice, targeted education and hands-on training in infection control and antimicrobial stewardship are essential. Evidence indicates that IPCP improves communication, teamwork, and collaboration across healthcare professions, thereby increasing adherence to infection control protocols and encouraging prudent antimicrobial use (2). Furthermore, interdisciplinary collaboration has been linked to reduced antimicrobial misuse, lower HAI rates, and enhanced patient safety (3).

Although antimicrobial resistance (AMR) and infection control are widely recognised as priorities, healthcare systems globally continue to face challenges in effectively implementing Interprofessional Collaborative Practice (IPCP) models among interns. Bridging this gap requires a well-structured programme that integrates education, practical training, and collaboration among interns from diverse healthcare disciplines. This article explores the implementation of an IPCP-based approach designed to improve infection control practices and antimicrobial stewardship among healthcare interns, with particular focus on its impact on protocol adherence, knowledge retention, and overall patient safety.

## 2. Objectives

### AIM

- To evaluate the effectiveness of an Interprofessional Collaborative Practice (ICP) programme in reinforcing infection control practices and antimicrobial stewardship (AMS) among healthcare interns.
- To assess healthcare interns' perceptions of Interprofessional Education (IPE) and

Collaborative Practice (CP) before and after participation in a structured interventional programme.

### OBJECTIVES

- To enhance healthcare interns' knowledge of infection control and antimicrobial stewardship through targeted Interprofessional Collaborative Practice (ICP) training.
- To assess the practical infection control skills of healthcare interns following ICP training.
- To strengthen healthcare interns' understanding required for the effective implementation of antimicrobial stewardship programmes, particularly in regulating the use of high-end antibiotics.
- To evaluate changes in healthcare interns' perceptions, attitudes, and knowledge regarding Interprofessional Education (IPE) and Collaborative Practice (CP) after the completion of the interventional programme.

### IPE team and their roles<sup>(4-6)</sup>

- An Interprofessional Education (IPE) team in infection control (IC) and antimicrobial stewardship (AMS) brings together different healthcare professionals to strengthen patient safety and reduce healthcare-associated infections and antimicrobial resistance. Key team roles include:
- **Administrators:** Ensure resources, policy enforcement, collaboration, and compliance with IC and AMS standards.
- **Heads of Department (HODs):** Lead departmental adherence to infection prevention and AMS, promoting staff training and best practices.
- **Physicians:** Guide diagnosis and management of infections, mentor interns in safe antimicrobial use.
- **Pharmacists:** Advise on antimicrobial dosing, interactions, and resistance, supporting adherence to AMS guidelines.
- **Infection Control Nurses & Link Nurses:** Develop policies, educate staff, and champion



IC/AMS practices at the ward level for daily protocol adherence.

- **Microbiologists:** Provide lab data on pathogens and resistance, supporting accurate diagnosis and stewardship decisions.
- **Environmental Services Personnel (EVS):** Ensure proper cleaning and disinfection to minimize infection risk.
- Their combined efforts directly improve IC and AMS application among interns, lowering infection rates and combating resistance.

### 3. Methods

A prospective interventional study was conducted over a one-year period (October 2023 to October 2025 – ongoing) involving 120 interprofessional interns from medical (n=43), nursing (n=36), and paramedical (n=41) disciplines at Sri Lakshmi Narayana Institute of Medical Sciences (SLIMS), Puducherry. Universal sampling was used, and interns were randomly assigned into ten interprofessional groups using the lottery method. These groups were posted in different clinical areas on a one-week rotational basis to assess interprofessional education (IPE) and collaborative practice (CP).

An interprofessional (IP) team was constituted, and a focus group discussion was conducted to guide implementation. Existing modules and questionnaire items were validated by an expert panel. Ethical clearance was obtained, and participants were selected accordingly.

Initially, 12 groups were formed to facilitate Interprofessional Collaborative Practice (ICP). Educational interventions were delivered over two weeks, with daily sessions conducted for two hours in both the morning and afternoon. Pre- and post-tests were administered before and after each intervention, covering both knowledge and skill domains.

Students' perceptions of IPE and CP were assessed before and after the clinical postings using a 35-item questionnaire. This tool focused on four key dimensions: communication and teamwork (CTW – 9 items), interprofessional learning (IPL – 9 items), interprofessional interaction (IPI – 8 items), and interprofessional relationships (IPR – 9 items). Responses were recorded using a 5-point Likert scale ranging from “strongly agree” to “strongly disagree.”

The internal consistency of the questionnaire was confirmed with a Cronbach's alpha value of 0.8.

Data were analysed using SPSS version 25. Results were reported in percentages and proportions for categorical variables, while numerical variables were expressed as mean  $\pm$  standard deviation.

### 4. Results

A total of 120 healthcare interns—comprising 43 medical, 36 nursing, and 41 paramedical interns—participated in this prospective interventional study conducted at Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry. Following a two-week structured Interprofessional Collaborative Practice (ICP) training programme, significant improvements were observed in both infection control skills and knowledge across all assessed modules.

**Skill Assessment:** Following the intervention, mean scores for practical infection control skills increased significantly across all domains. For hand hygiene, the mean score rose from  $4.47 \pm 1.81$  to  $8.10 \pm 1.18$  ( $p < 0.001$ ). Personal protective equipment (PPE) skills improved from  $6.87 \pm 2.03$  to  $11.88 \pm 1.08$  ( $p < 0.001$ ). Similarly, scores for needlestick injury management increased from  $2.56 \pm 0.60$  to  $3.88 \pm 0.60$  ( $p < 0.001$ ), biomedical waste handling from  $5.98 \pm 1.10$  to  $8.93 \pm 0.84$  ( $p < 0.001$ ), and spill management from  $5.78 \pm 1.44$  to  $8.64 \pm 0.80$  ( $p < 0.001$ ).

**Knowledge Assessment:** Knowledge scores also demonstrated statistically significant improvements. For instance, knowledge related to hospital-acquired infections increased from a pre-test mean of  $4.43 \pm 1.46$  to a post-test mean of  $8.75 \pm 0.40$  ( $p < 0.001$ ). Similar gains were observed across other modules, including hand hygiene ( $3.97 \pm 1.55$  to  $8.05 \pm 1.22$ ), PPE ( $7.77 \pm 1.40$  post-test), needlestick injury ( $7.82 \pm 1.26$  post-test), biomedical waste management ( $8.64 \pm 1.26$  post-test), transmission-based precautions ( $7.88 \pm 1.32$  post-test), spill management ( $8.07 \pm 1.15$  post-test), HAI surveillance ( $7.36 \pm 1.32$  post-test), environmental cleaning ( $7.82 \pm 1.27$  post-test), and antimicrobial stewardship ( $7.83 \pm 1.27$  post-test), all with  $p < 0.001$ .

### Interprofessional Learning Dimensions:

Self-evaluation scores across various interprofessional learning dimensions showed significant improvement



following the intervention. Scores for communication and teamwork increased from  $31 \pm 5.31$  to  $37.4 \pm 4.71$ ; interprofessional learning from  $26.63 \pm 5.13$  to  $39.82 \pm 4.15$ ; interprofessional interaction from  $28.11 \pm 4.53$  to  $34.63 \pm 4.58$ ; and interprofessional relationships from  $28.47 \pm 5.28$  to  $33.69 \pm 5.29$ .

In summary, the ICP training programme led to statistically significant improvements in infection control knowledge, practical skills, and interprofessional competencies among healthcare interns. These findings highlight the importance of early, well-structured interprofessional education in strengthening infection prevention and antimicrobial stewardship efforts, while also fostering effective teamwork and communication among future healthcare professionals.

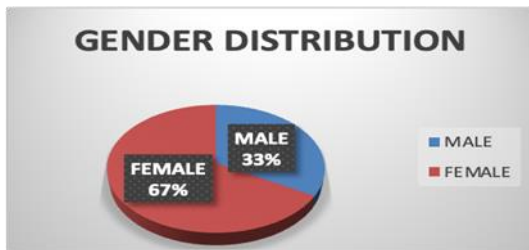


Figure.1: Gender distribution

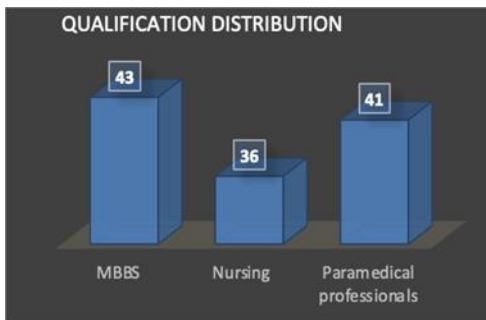


Figure.2: Qualification distribution

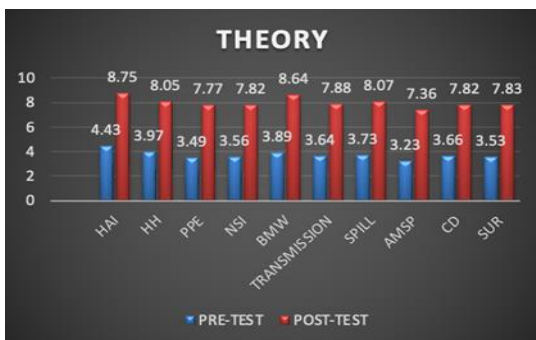


Figure.3: Pre & Post Theory

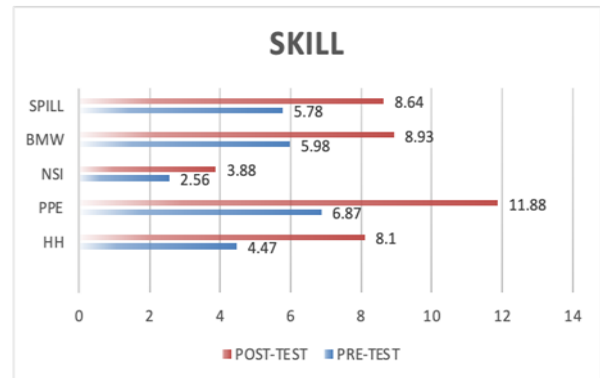


Figure.4 : Pre & Post Skill

Table. I: Pre & Post Test theory -Mean score

MODULE	PRE-TEST	POST-TEST	PAIRED T TEST MEAN±SD	T VALUE	SIG
	MEAN±SD	MEAN±SD			
HAI	4.43±1.46	8.75±0.4	4.23±1.56	30.22	0.001
HH	3.97±1.55	8.05±1.22	4.08±1.53	28.59	0.001
PPE	3.49±1.56	7.77±1.40	4.27±1.61	28.92	0.001
NSI	3.56±1.49	7.82±1.26	4.25±1.35	34.38	0.001
BMW	3.89±1.49	8.64±1.26	4.15±1.30	34.95	0.001
TBP	3.64±1.52	7.88±1.32	4.24±1.52	30.51	0.001
SPILL	3.73±1.46	8.07±1.15	4.33±1.57	30.06	0.001
HAI surveillance	3.23±1.40	7.36±1.32	4.12±1.48	30.5	0.001
Environmental Cleaning and Disinfection	3.66±1.50	7.82±1.27	4.15±1.60	28.4	0.001
Strategies for Overcoming Antibiotic Resistance & AMSP	3.53±1.36	7.83±1.27	4.30±1.45	32.92	0.001

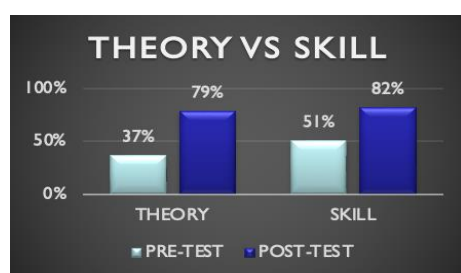
Table. II: Pre & Post Test Skill -Mean score

MODU LE	PRE-TEST	POST-TEST	PAIRED T TEST MEAN±SD	T VALU E	SIG
	MEAN± SD	MEAN± SD			
HH	4.47±1.8	8.10±1.1	3.66±1.49	26.6	0.001



PPE	6.87±2.0 3	11.88±1.08	5±2.28	24.0 5	0.00 1
NSI	2.56±0.6 0	3.88±0.6	1.31±0.85	16.9 7	0.00 1
BMW	5.98±1.1 0	8.93±0.8	2.94±1.35	23.7 7	0.00 1
SPILL	5.78±1.4 4	8.64±0.8	2.86±1.48	21.0 8	0.00 1

Figure.5 : Theory vs Skill



## 5. Discussion

This prospective interventional study evaluated the impact of an interprofessional collaborative practice (ICP) training program on infection control and antimicrobial stewardship among healthcare interns, yielding significant positive outcomes. Most notably, there was a significant improvement in adherence to infection control guidelines. Interns trained in an ICP setting demonstrated a better understanding of, and greater compliance with, key infection control measures, including hand hygiene, appropriate use of personal protective equipment (PPE), correct sterilisation procedures, and the management of needlestick injuries (7). This enhanced compliance contributed to a reduction in healthcare-associated infections (HAIs) within clinical settings, as interns played a vital role in frontline patient care.

Another significant outcome was the improvement in antimicrobial stewardship practices. Healthcare interns who participated in the ICP programme demonstrated greater discernment when prescribing antimicrobials, particularly high-end antibiotics. This contributed to a reduction in unnecessary antibiotic use and encouraged the more appropriate selection of antimicrobial agents. According to research by Wagner et al. (8), interns

involved in ICP were more likely to adhere to stewardship guidelines, which emphasise accurate diagnosis and appropriate infection management—factors that ultimately help to mitigate the risk of antimicrobial resistance.

Table I highlights significant improvements in theoretical knowledge across all infection control and antimicrobial stewardship modules. Notably, knowledge relating to hospital-acquired infections (HAIs) increased by 97% (from 4.43 to 8.75), with similar gains observed in areas such as hand hygiene, personal protective equipment (PPE), and antimicrobial stewardship. These results align with the findings of Thangarajoo et al. (9), who reported that structured training enhances knowledge and attitudes towards infection control. Likewise, Goh et al. (14) and Abu-Rish et al. (15) found that targeted educational programmes significantly improve healthcare professionals' knowledge and awareness, reinforcing the equal importance of both theoretical knowledge and practical skills in effective infection prevention.

Figures 1 and 2 illustrate a balanced distribution of gender and professional backgrounds among participants, thereby enhancing the generalisability of our findings. This is in line with the work of West and Lyubovnikova (18) and Salas et al. (19), who emphasise the positive impact of gender-diverse and multidisciplinary teams on clinical decision-making and patient outcomes.

The outcomes, presented in Tables I, II and III, demonstrate significant improvements in practical skills, theoretical knowledge and interprofessional competencies. These findings are consistent with international evidence highlighting the importance of interdisciplinary education and collaboration in healthcare settings (8, 9, 10).

Table II highlights substantial improvements in practical infection control skills following the ICP intervention. The average post-test scores across all skill modules—including hand hygiene (HH), personal protective equipment (PPE), needlestick injury (NSI), biomedical waste (BMW), and spill management—were significantly higher than the pre-test scores (all  $p < 0.001$ ). For instance, hand hygiene proficiency increased by 81% (from 4.47 to 8.10), while PPE skills improved by 73% (from 6.87 to 11.88). These findings



are consistent with those of Manjunath et al. (11), who reported that hands-on educational interventions significantly enhanced infection control practices among healthcare workers. Similarly, the work of Pittet et al. (12) and WHO guidelines (13) underscore the critical importance of practical training in reducing healthcare-associated infections (HAIs).

Table III illustrates a marked improvement across various interprofessional learning dimensions, including communication and teamwork (CTW), interprofessional learning (IPL), interprofessional interaction (IPI), and interprofessional relationships (IPR). The most significant increase was observed in IPL, which rose from  $26.63 \pm 5.13$  to  $39.82 \pm 4.15$ . These findings align with those of Reeves et al. (16) and O'Leary et al. (17), who demonstrated that interprofessional education promotes collaborative attitudes and enhances team performance—both of which are essential for sustainable improvements in patient safety and quality of care.

The findings of our study are consistent with the existing literature, which highlights the value of interprofessional education (IPE) in enhancing infection control practices (8,9,11,14). The extent of improvement observed in both skill and knowledge domains is comparable to previous reports (10,11,14), although our intervention's emphasis on early immersion and rotational postings may have contributed to particularly notable gains in interprofessional competencies. While earlier studies have identified barriers such as time constraints and resistance to adopting new practices (15,20), our results suggest that strong institutional support and well-structured, interactive curricula can effectively address these challenges.

## Limitations

Despite the favourable results, the implementation of Interprofessional Collaboration (IPC) faced several challenges, including time constraints, limited resources, and varying levels of intern participation. Some interns felt that the initiative impacted their other clinical responsibilities. Additionally, differences in professional cultures posed barriers to effective collaboration. Addressing these issues requires strong institutional support, formal integration of IPC into the curriculum, and targeted training to overcome interprofessional cultural barriers.

## Conclusions

The integration of Interprofessional Collaboration (IPC) in the context of infection control and antimicrobial stewardship (AMS) for healthcare interns yielded promising results. Interprofessional collaboration fostered improved adherence to infection control guidelines and AMS protocols, which directly contributed to better patient outcomes. This aligns with existing research indicating that IPC models enhance communication and teamwork, leading to more effective healthcare delivery.

One of the most notable improvements was in infection control compliance, with interns demonstrating a better understanding of the importance of hand hygiene, personal protective equipment (PPE), and other preventive measures. Furthermore, the IPC model reinforced the significance of antimicrobial stewardship, as interns became more conscientious in the appropriate use of antibiotics.

Interprofessional interns also demonstrated a readiness to engage in learning activities with peer students as well as members of other professions. These findings support the incorporation of Interprofessional Education (IPE) to advance specific competencies in learners—such as collaborative teamwork (CTW), interprofessional learning (IPL), interprofessional interaction (IPI), and interprofessional relationships (IPR)—and positively influence their perception of roles and responsibilities in the workplace.

## Implications and Future Directions

The collective improvements observed across all domains reinforce the importance of early, structured, and collaborative training in infection control and antimicrobial stewardship for healthcare interns. Institutional support and innovative educational strategies are essential for overcoming barriers and sustaining progress. Future research should focus on evaluating long-term outcomes and exploring scalable models for interprofessional education.

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