Original Article

Occupational Nosocomial Infections among Healthcare Workers in a Philippine Private Hospital: Incidence and Infection-Prevention Risk Factors

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Abstract

This analytic cross-sectional study estimated the incidence of nosocomial infection and examined modifiable infection-prevention risk factors among 68 HCWs in ancillary departments of a private tertiary hospital in Iligan City, Philippines. Self-administered questionnaires captured sociodemographic characteristics, comorbidities, hand hygiene compliance, personal protective equipment (PPE) use, and physician-diagnosed nosocomial infection in the preceding 12 months. Fourteen HCWs (20.6%) reported at least one nosocomial infection. Infection prevalence was higher among those with comorbidities (60.0%), suboptimal hand hygiene (50.0%), and inconsistent PPE use (35.0%) than among their counterparts. In multivariable logistic regression adjusting for age and sex, comorbidity (adjusted odds ratio [aOR] = 15.2, 95% CI [2.3, 102.1]), suboptimal hand hygiene (aOR = 10.9, 95% CI [2.9, 40.7]), and inconsistent PPE use (aOR = 3.7, 95% CI [1.1, 13.0]) were independently associated with infection. Findings underscore the vulnerability of HCWs in ancillary services and highlight the need for robust, multimodal infection-prevention strategies that integrate behavioral, organizational, and occupational-health interventions.

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1. Introduction

Health care–associated infections (HAIs) are among the most frequent adverse events in health systems and remain a persistent challenge even in highly resourced settings (Haque et al., 2018). Global estimates suggest that at any time, up to 7% of patients in high-income countries and up to 15% in low- and middle-income countries have at least one HAI, with particularly high burdens in intensive care units and surgical wards (Allegranzi et al., 2011; World Health Organization [WHO], 2011).

Although most research and surveillance systems focus on patients, HAIs also affect HCWs through occupational exposure to blood, respiratory droplets, aerosols, and contaminated surfaces. These occupationally acquired infections can lead to illness, absenteeism, long-term complications, and secondary transmission to household members and patients, thereby eroding workforce capacity and quality of care (Haque et al., 2018; Sandu et al., 2025). The COVID-19 pandemic further exposed structural weaknesses in infection-prevention and control (IPC) programs, including gaps in hand hygiene, inconsistent PPE use, and uneven protection for staff with comorbidities, especially in resource-constrained facilities.

Evidence shows that a substantial proportion of HAIs are preventable through robust IPC programs that combine technical standards with behavioral and organizational strategies (Puro et al., 2022; Sartelli et al., 2024). Hand hygiene is consistently identified as the cornerstone of HAI prevention; systematic reviews indicate that improved compliance can reduce HAI incidence and transmission of multidrug-resistant organisms (Mouajou et al., 2022; WHO, 2009, 2021). Nevertheless, observed hand-hygiene adherence remains suboptimal in many settings and is shaped by individual beliefs, workload, safety climate, and availability of supplies (Alshagrawi et al., 2024; Mouajou et al., 2022).

Use of appropriate PPE is another essential IPC measure. During recent viral outbreaks, studies have linked incomplete or incorrect PPE use with increased infection risk among frontline HCWs (Al Youha et al., 2021; Korkusuz et al., 2021). At the same time, comorbidities such as diabetes, respiratory disease, and cardiovascular conditions amplify susceptibility to severe outcomes when occupational exposure occurs (Haque et al., 2018; Puro et al., 2022).

Despite this global evidence base, data on occupational nosocomial infections among HCWs in Philippine private hospitals remain sparse, particularly for ancillary departments such as nursing services, medical laboratories, radiologic technology, physical therapy, and administrative support. These departments often operate with intense workloads and frequent patient contact but may be peripheral to formal ICU-focused surveillance or IPC performance dashboards.

This study addresses this gap by investigating occupational nosocomial infections among HCWs in ancillary departments of a private tertiary hospital in Iligan City, Mindanao. It aims to estimate the incidence of self-reported nosocomial infection over the preceding year and to examine how comorbidity status, self-reported hand hygiene compliance, and PPE use relate to infection risk. Understanding these

relationships in a middle-income, private-sector Philippine context is essential for designing IPC and occupational-health strategies that protect HCWs while sustaining safe, resilient hospital care.

2. Methodology

2.1 Study Design and Setting

An analytic cross-sectional design was used. The study took place in a private tertiary hospital in Iligan City, Philippines, which serves a mixed urban and peri-urban population in Northern Mindanao. The hospital provides medical, surgical, diagnostic, and rehabilitative services, and its ancillary departments include nursing services, medical laboratory, radiologic technology, physical therapy, information technology, accounting, human resources, and PhilHealth claims processing.

2.2 Population and Sampling

The study population comprised all HCWs assigned to ancillary departments during the data-collection period. A total enumeration approach was employed to minimize selection bias and to maximize power given the modest staff complement. HCWs were eligible if they were 20 to 60 years of age, had at least six consecutive months of employment in the hospital, and had direct or indirect contact with patients or clinical environments. Staff on extended leave were excluded.

Sixty-eight HCWs met the eligibility criteria and consented to participate. This census-based sample aligns with similar occupational IPC studies in single institutions and provides adequate events per variable for a parsimonious multivariable logistic regression model.

2.3 Measures and Instrument

Data were collected through a self-administered, structured questionnaire developed after reviewing international IPC and occupational-infection literature and WHO guidance. The instrument captured sociodemographic characteristics (age, sex, profession, department), years of practice, and work schedule, along with clinical information on physician-diagnosed comorbidities such as asthma, hypertension, diabetes, and other chronic conditions (Haque et al., 2018; Sandu et al., 2025).

Hand hygiene was assessed using questions reflecting WHO's "My Five Moments for Hand Hygiene," focusing on self-reported consistency before and after patient contact, before aseptic tasks, after exposure to body fluids, and after contact with patient surroundings (WHO, 2009, 2021). Responses were synthesized into a dichotomous variable: high compliance when HCWs reported routine adherence in nearly all moments, and suboptimal compliance when lapses were frequent or occurred in several moments.

PPE use was measured by asking respondents how consistently they used gloves, masks, gowns, and eye protection, as appropriate to their tasks and levels of exposure. Responses were categorized as consistent when HCWs reported almost always using recommended PPE and as inconsistent when they reported occasional or frequent omissions.

The outcome variable was self-reported nosocomial infection within the previous 12 months. HCWs were asked whether they had developed any infection that was diagnosed by a physician and plausibly linked to their work in the hospital, rather than to community exposure, consistent with international definitions of occupational HAIs (Haque et al., 2018; WHO, 2011).

Content validity was established through review by three experts in infection control and occupational health, who evaluated item relevance, clarity, and contextual appropriateness. Minor wording modifications were made following their recommendations. A pilot test with HCWs in a separate facility confirmed clarity, approximate completion time, and feasibility; these data were not included in the final analysis.

2.4 Data Collection Procedures

Data collection was conducted over four weeks. After obtaining institutional approval, the research team coordinated with department heads to schedule orientation sessions. During these sessions, potential participants received an explanation of the study objectives, procedures, risks, benefits, and confidentiality safeguards. HCWs who agreed to participate provided written informed consent and completed the questionnaire in a quiet area near their workstations, usually at the end of their shifts. Questionnaires were returned in sealed envelopes and checked for completeness by the research team.

2.5 Data Analysis

Data were encoded and analyzed using standard statistical software. Descriptive statistics were computed for all variables. Categorical variables were summarized as frequencies and percentages; continuous variables were summarized as means and standard deviations.

The primary outcome—nosocomial infection in the past 12 months—was dichotomous (yes/no). Bivariate analyses explored the distribution of infections across categories of comorbidity status, hand hygiene compliance, and PPE use.

Binary logistic regression was then used to estimate the independent association of each risk factor with nosocomial infection. Comorbidity (any versus none), hand hygiene compliance (suboptimal versus high), and PPE use (inconsistent versus consistent) were included as main predictors, while age group and sex were entered as covariates to account for potential confounding. Adjusted odds ratios

(aORs) with 95% confidence intervals (CIs) and p values were reported. Statistical significance was defined as $p < .05$.

2.6 Ethical Considerations

The study protocol was reviewed and approved by IMCC Institutional Ethics Review Board. Participation was voluntary, and no incentives were provided. Anonymity was maintained by omitting names and other personal identifiers and by using coded questionnaires. Data were stored securely and were accessible only to the research team.

3. Results

3.1 Participant Characteristics

The study included 68 HCWs from ancillary departments. The mean age was 33.9 years (SD = 8.1), with an age range from 20 to 50 years. Nearly half of the respondents were 20–30 years of age (47.1%), followed by 31–40 years (29.4%) and 41–50 years (23.5%). Women comprised two thirds of the sample (66.2%).

Table 1. Characteristics of healthcare workers in ancillary departments (N = 68).

Characteristic	n	%
Age 20–30 years	32	47.1
Age 31–40 years	20	29.4
Age 41–50 years	16	23.5
Male	23	33.8
Female	45	66.2
Nurse	27	39.7
Medical technologist	15	22.1
Human resources staff	8	11.8
Accounting staff	6	8.8
PhilHealth clerk	5	7.4
Physical therapist	4	5.9
Information technology staff	2	2.9
Radiologic technologist	1	1.5
With comorbidity	10	14.7
Without comorbidity	58	85.3
High hand hygiene compliance	50	73.5
Suboptimal hand hygiene	18	26.5
Consistent PPE use	48	70.6
Inconsistent PPE use	20	29.4

Nurses constituted the largest professional group at 39.7%, followed by medical technologists at 22.1%. Human resources staff represented 11.8%, accounting staff 8.8%, PhilHealth clerks 7.4%, physical therapists 5.9%, information technology staff 2.9%, and radiologic technologists 1.5%. Ten HCWs (14.7%) reported at least one comorbid condition. High hand hygiene compliance was reported by 73.5% of respondents, and 26.5% acknowledged suboptimal compliance. PPE use was described as consistent by 70.6% and inconsistent by 29.4%. Table 1 summarizes the main participant characteristics.

3.2 Incidence of Nosocomial Infection and Bivariate Patterns

Fourteen HCWs (20.6%) reported at least one nosocomial infection in the preceding 12 months, while 54 (79.4%) reported none. Infections were more frequent among HCWs with comorbidities than among those without. Six of the 10 HCWs with comorbidities reported infection, corresponding to a prevalence of 60.0%, compared with 13.8% among those without comorbid conditions.

Hand hygiene showed a similar pattern. Among HCWs who reported suboptimal hand hygiene, infection prevalence was 50.0%, whereas among those with high compliance it was 10.0%. PPE use was also related to infection status. Among HCWs with inconsistent PPE use, 35.0% reported infection, compared with 14.6% among those who described their PPE use as consistent. These patterns are summarized in Table 2.

Table 2. Prevalence of nosocomial infection by comorbidity, hand hygiene, and PPE use (N = 68).

Risk factor	Category	n with infection	Prevalence (%)
Overall	-	14	20.6
Comorbidity	With comorbidity	6	60.0
	Without comorbidity	8	13.8
Hand hygiene	Suboptimal	9	50.0
	High compliance	5	10.0
PPE use	Inconsistent	7	35.0
	Consistent	7	14.6

In descriptive analyses, infection appeared more frequent among nurses and medical technologists than among administrative staff, but cell sizes for some job categories were small, and these differences did not remain statistically robust in multivariable models.

3.3 Multivariable Analysis

Binary logistic regression assessed the independent association between each risk factor and nosocomial infection after adjustment for age group and sex. Comorbidity was a strong predictor of infection. HCWs with any comorbid condition had 15.2 times the odds of reporting nosocomial infection compared with those without comorbidity (aOR = 15.2, 95% CI [2.3, 102.1], p = .006). Suboptimal hand hygiene was also strongly associated with infection, with an aOR of 10.9 (95% CI [2.9, 40.7], p < .001). Inconsistent PPE use was associated with nearly fourfold higher odds of infection (aOR = 3.7, 95% CI [1.1, 13.0], p = .038). Table 3 presents the regression results. These findings indicate that both underlying clinical vulnerability and modifiable IPC practices are key determinants of occupational nosocomial infection risk in this setting.

Table 3. Adjusted odds ratios for nosocomial infection among healthcare workers (N = 68).

Predictor	Adjusted OR	95% CI	p-value
Comorbidity (yes vs no)	15.2	2.3 – 102.1	0.006
Suboptimal hand hygiene vs high	10.9	2.9 – 40.7	<0.001
Inconsistent vs consistent PPE use	3.7	1.1 – 13.0	0.038

4. Discussion

This study documented a substantial burden of occupational nosocomial infections among HCWs in ancillary departments of a private tertiary hospital in Iligan City, with approximately one in five reporting at least one infection in the previous year. Although direct comparisons are limited by methodological differences, this incidence signals a meaningful occupational safety concern in a context where overall HAI burdens in patients are already known to be high (Allegranzi et al., 2011; Haque et al., 2018).

The analysis revealed strong associations between nosocomial infection and three factors: comorbidities, suboptimal hand hygiene, and inconsistent PPE use. The magnitude of the association between suboptimal hand hygiene and infection is striking, with an elevenfold increase in adjusted odds. This finding is entirely consistent with the conceptual and empirical literature that positions hand hygiene as the single most effective measure in preventing HAIs for both patients and HCWs (Mouajou et al., 2022; WHO, 2009, 2021). Systematic reviews demonstrate that modest improvements in hand-hygiene adherence, often around 60% compliance, can meaningfully reduce HAI incidence, particularly when embedded in multimodal programs that combine education, reminders, performance feedback, and leadership engagement (Mouajou et al., 2022; Puro et al., 2022).

The association between inconsistent PPE use and infection risk reinforces the importance of reliable access to PPE and of training that goes beyond technical

demonstration to address risk perception, comfort, and workflow integration. Studies during and after the COVID-19 pandemic have shown that HCWs who reported lapses in PPE use—whether from fatigue, supply constraints, or perceived low risk—were more likely to seroconvert or develop infection (Al Youha et al., 2021; Korkusuz et al., 2021). The present findings suggest that similar patterns may operate in Philippine private hospitals, even outside of pandemic peaks, and that ancillary staff should not be overlooked in PPE allocation and auditing systems that may be more focused on high-acuity clinical units.

The strong link between comorbidities and nosocomial infection underscores the intersection of occupational and clinical vulnerability. Reviews of HAIs in developing countries highlight age, length of hospital exposure, and underlying comorbidities as key risk modifiers for infection outcomes (Allegranzi et al., 2011; Isigi et al., 2023; Puro et al., 2022). In HCWs, similar mechanisms likely apply: chronic conditions such as diabetes, asthma, and hypertension may compromise immune responses and increase susceptibility to pathogens encountered in clinical environments. Occupational-health programs therefore need to move beyond generic IPC messaging and adopt risk-stratified approaches that provide tailored protection, vaccination, and role adjustments for workers with comorbidities.

Taken together, these findings align with contemporary frameworks that conceptualize IPC not as a purely technical issue but as a socio-technical system that depends on culture, leadership, and continuous improvement. Expert consensus and narrative reviews suggest that effective prevention of HAIs may reduce infection rates by up to 70% when IPC programs are well designed and fully implemented (Puro et al., 2022; Sartelli et al., 2024). For ancillary departments, this implies that isolated trainings or one-off campaigns will be insufficient. Instead, hospitals should adopt multimodal, sustained interventions that integrate hand-hygiene promotion, PPE fit-testing and coaching, real-time feedback, and visible leadership commitment to safety.

The study also speaks to the growing literature on knowledge, attitudes, and practices of HCWs regarding high-risk infections and IPC. Global cross-sectional work has shown that while HCWs often report adequate knowledge, gaps persist in translating knowledge into consistent practice, particularly when organizational and environmental constraints are present (Clemen et al., 2023; Khatrawi et al., 2023; Harun et al., 2023; Pelias et al., 2023). Findings from the Iligan hospital suggest that self-reported high compliance is not universal and that substantial subsets of staff experience or acknowledge lapses, which in turn appear to carry real clinical consequences.

Several implications for high-impact practice and policy emerge. Hospital leadership should conceptualize protection of HCWs as a core pillar of patient safety, aligning with global calls to address HAIs and antimicrobial resistance as intertwined priorities (Haque et al., 2018; Miranda et al., 2023; WHO, 2011; Sandu et al., 2025). Investment in hand-hygiene infrastructure, PPE supply chains, and intelligent monitoring tools—for example, workflow-based tracking or vision-based systems that provide feedback on compliance—can complement education and may be particularly

valuable in busy ancillary environments. Integrating occupational-health risk assessment into routine human-resource processes, especially for staff with comorbidities, can guide assignments and protections that reduce the likelihood of infection without imposing undue stigma.

At the same time, a nuanced reading of the results is necessary. The cross-sectional design limits causal inference, and self-reported measures of hand hygiene, PPE use, and infection are subject to recall and social desirability biases. Staff who experienced infection may retrospectively under- or overestimate their adherence to IPC practices, and community-acquired infections misclassified as nosocomial cannot be entirely excluded. The single-hospital setting and modest sample size further constrain generalizability. Nevertheless, the internal consistency of the findings, their alignment with global evidence, and the plausible dose–response pattern between IPC practices and infection risk collectively strengthen confidence in the observed associations.

Future research could extend these findings through prospective cohort designs, objective monitoring of hand hygiene and PPE adherence, microbiologic confirmation of occupational infections, and qualitative exploration of the organizational and cultural barriers to sustained IPC practice in Philippine hospitals. Comparative studies across public and private facilities and across regions within the Philippines would also illuminate structural inequities that shape HCW exposure and protection.

5. Conclusion

Nosocomial infections among HCWs in ancillary departments of a private tertiary hospital in Iligan City were common, with roughly one in five staff reporting an infection in the previous year. The analysis demonstrated that comorbidities, suboptimal hand hygiene, and inconsistent PPE use were independently associated with markedly higher odds of infection, even after adjustment for age and sex.

These findings reinforce global evidence that HAIs are largely preventable through robust IPC programs and highlight the urgency of extending these efforts to all cadres and departments, not only high-profile clinical units. By investing in multimodal hand-hygiene initiatives, reliable PPE systems, and targeted occupational-health strategies for vulnerable staff, hospitals in the Philippines and similar settings can protect HCWs, safeguard patients, and strengthen the resilience of their health systems.

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Conflict of Interest Statement

The authors declare no conflict of interest.

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