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SCOPE

The Nurse Educators and Practitioners Journal (NEPJ) is a triannual publication of the Nurse Educators and Practitioners Guild, Inc. (NEPraGuild, Inc.), based in Baguio City. It strives to bridge the gap between nursing education and practice by publishing relevant studies and evidence-based practices and procedures. The journal covers a broad scope of the nursing field that include program and course development, teaching and learning approaches, educational and training needs assessment, simulation education, student evaluation, evidence based management, quality improvement, patient safety, interprofessional collaboration, role transformation, nursing administration, policy formulation, technological innovation, quantitative and qualitative research implementation and control, dignity safeguarding research, legal practice boundaries, nursing accountability, transcultural nursing, and health equity.

MISSION

To advance nursing excellence by fostering knowledge sharing, innovation, and policy influence, ultimately improving the quality of nursing education and patient care.

TARGET AUDIENCE

The primary target audience for the NEPJ includes educators (academe or in the clinical setting), clinical nurse specialists, advanced practice nurses, nursing students, researchers, healthcare administrators, and policymakers.



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Synthesis of Emerging Nursing Research: Advancements and Implications for Asean Practice, Education, and Policy

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EDITORIAL

This editorial synthesizes findings from ten studies conducted in Saudi Arabia and the Philippines, offering insights for nursing advancement across ASEAN nations. These investigations demonstrate nurses generating evidence, implementing innovations, and addressing workforce challenges in diverse healthcare contexts.

Albkeiran identifies hierarchical nurse-physician communication patterns that compromise patient safety, revealing how subordinate positioning limits nurses' contributions to collaborative decision-making. Emul evaluates closed-system cannula implementation in cardiac imaging, showing mixed-methods approaches illuminate both technical efficacy and workflow integration challenges. Flores evaluates nurse-led mental health programs, establishing peer support approaches strengthen workforce psychological wellbeing. Dablo, et al., cross-sectional diabetic foot care study establishes knowledge-attitude-practice relationships, demonstrating educational interventions can shift preventive care trajectories when culturally grounded. Celdran and Matusalem assess antenatal care awareness among rural pregnant women, applying the Health Belief Model to identify perceived barriers requiring nurse-led intervention. Ferrer and colleagues uncover climacteric women's embodied experiences of seeking care, capturing how dismissive encounters shape health-seeking behaviors. Reem demonstrates immersive virtual simulation enhances COVID-19 care competencies among nursing students, establishing virtual platforms as essential tools for democratizing education across geographic boundaries. Cristino constructs a perioperative competence framework based on expert practice wisdom, advancing beyond static skill inventories toward dynamic capability development. Paradji examines factors predicting performance on

nursing licensure examinations, identifying curriculum alignment and test-taking self-efficacy as modifiable predictors warranting institutional attention. The professional identity study of Laong and group reveals how organizational socialization and self-concept shape commitment trajectories, informing retention-focused workforce strategies.

These studies collectively advance nursing knowledge across interconnected domains. Methodologically, researchers employ diverse designs—from controlled trials to phenomenological inquiry—demonstrating methodological pluralism strengthens evidence applicability. Thematically, investigations center nurses as knowledge producers, practice innovators, and workforce advocates who actively shape healthcare outcomes.

For ASEAN nursing, three implications emerge. First, educational innovations require shared regional infrastructure supporting mutual curriculum development and competency recognition. Second, workforce strategies must address hierarchical and systemic barriers limiting professional contribution. Third, patient-centered approaches necessitate community-engaged research that privileges local knowledge and participation.

As ASEAN nations navigate healthcare transformation, this research corpus demonstrates nursing's evidence-generating capacity and implementation leadership. Sustained investment in nursing research infrastructure, workforce development, and interprofessional reform will advance regional health security and equity.

Quality of Nurse–Physician Communication in Two Saudi Arabian Hospitals: Nurses’ Perceptions and Educational Implications

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ABSTRACT

Introduction: High-quality nurse–physician communication is fundamental to patient safety, collaborative clinical practice, and effective healthcare delivery, and reflects competencies developed through professional education and clinical experience.

Aim: This study assessed and compared nurses' perceptions of the quality of nurse–physician communication in two Saudi Arabian hospitals and examined factors associated with communication quality.

Methods: A cross-sectional study was conducted among 756 nurses from Almoosa Specialist Hospital (ASH; $n = 508$) and Almoosa Rehabilitation Hospital (ARH; $n = 248$) using convenience sampling. Data were collected between March 9 and March 31, 2026, using the validated 18-item Nurse–Physician Communication Scale (NPCS), which measures four domains: openness, relevance and satisfaction, mutual understanding, and frustration with interaction. Analyses included descriptive statistics, chi-square tests, and Pearson correlation coefficients.

Results: Nurses perceived communication quality as moderate overall. Openness and relevance/satisfaction were strongest, whereas mutual understanding and frustration with interaction presented greatest challenges. ASH nurses reported significantly higher quality than ARH nurses in openness ($p = .038$), relevance/satisfaction ($p < .001$), and frustration with interaction ($p = .031$), but not mutual understanding ($p = .472$). Higher educational attainment and specific experience intervals were significantly associated with better communication quality. Clinical nurses demonstrated higher mutual understanding than those in supervisory roles.

Conclusion: While nurses generally perceived communication positively, gaps remain in achieving mutual understanding and reducing interaction frustration. Communication quality reflects competencies that can be strengthened through targeted education, professional development, and setting-specific organizational strategies.

Keywords: *communication; interprofessional relations; nurses; nursing education; patient safety*

I. INTRODUCTION

High-quality nurse–physician communication underpins safe, effective, and patient-centered healthcare. Beyond information exchange, communication quality influences clinical decision-making, care coordination, patient safety,

teamwork, and organizational performance. Communication failures remain leading contributors to preventable adverse events, medication errors, treatment delays, and reduced patient satisfaction, establishing effective interprofessional communication as essential to healthcare quality rather than merely a professional expectation [1–3]. Consequently,

improving communication has become a strategic priority for organizations seeking to strengthen outcomes and collaborative practice.

Research attention has shifted from whether communication occurs to the quality of communication experienced during daily practice. High-quality communication encompasses openness, mutual understanding, relevance of exchanged information, satisfaction with interactions, and constructive conflict resolution—competencies developed through professional preparation, clinical experience, organizational culture, and workplace learning. Evaluating communication quality thus provides more comprehensive understanding of interprofessional collaboration than assessing frequency alone.

Studies consistently demonstrate divergent nurse–physician perceptions of communication quality. Nurses commonly report lower satisfaction, greater frustration, and reduced shared decision-making opportunities compared with physicians [4]. These patterns associate with professional hierarchy, role expectations, clinical experience, communication training, leadership responsibilities, and linguistic diversity in multinational workforces [2,3,5], suggesting that communication quality reflects organizational and professional factors, not merely individual interpersonal skills.

These challenges are particularly relevant in Saudi Arabia's healthcare system, where Vision 2030 emphasizes patient-centered care, quality improvement, workforce capability, and interprofessional collaboration [6,7]. As organizations expand multidisciplinary care models, understanding nurses' communication perceptions becomes critical for supporting collaborative practice. Within multi-hospital organizations, institutional differences in culture, patient populations, and clinical specialization may influence communication despite shared governance.

Evidence regarding multidimensional communication quality across hospitals within single organizations remains limited, particularly in Saudi Arabia and the Gulf region [2,3,5]. Few studies have simultaneously examined all four key quality domains—openness, relevance/satisfaction, mutual understanding, and frustration with interaction—while exploring associated demographic and organizational factors. Such multidimensional assessment enables identification of specific strengths and improvement targets, informing targeted strategies for competency development and collaborative practice.

This study examined nurses' perceptions of nurse–physician communication quality in two hospitals within Almoosa Health Group, Saudi Arabia. Specific objectives were to: (1) assess communication quality across four domains; (2) compare perceptions between ASH and ARH; and (3) examine demographic and professional factors associated with communication quality. Findings aim to inform organizational strategies, nursing education, and professional development initiatives to strengthen interprofessional collaboration and patient care quality.

II. METHODS

Research Design

A cross-sectional institution-based study assessed nurses' communication perceptions and compared quality between two hospitals within one healthcare organization. This design enabled concurrent assessment of communication quality, institutional differences, and domain relationships.

The setting was Almoosa Health Group in Al-Ahsa, Eastern Province, Saudi Arabia, comprising ASH (730-bed multidisciplinary acute care hospital with emergency, medical, surgical, and critical care services; four consecutive Joint Commission International accreditations; Magnet® recognition) and ARH (300-bed specialized rehabilitation hospital providing inpatient rehabilitation, long-term care, and outpatient services) [8,9]. Despite shared organizational governance, the hospitals differ substantially in patient populations, clinical services, and practice environments, providing appropriate comparison conditions.

Participants and Sampling

The population comprised registered nurses employed at both hospitals across medical, surgical, critical care, emergency, maternal–child, and rehabilitation units. Inclusion criteria required ≥ 6 months organizational experience to ensure adequate exposure to nurse–physician communication. Staff nurses, nursing supervisors, nurse managers, and nursing office-assigned nurses were eligible.

Exclusion criteria comprised nursing students, interns, trainees, and those on maternity, medical, or extended leave during data collection. Incomplete or improperly completed questionnaires were excluded from analysis.

Convenience sampling recruited available, consenting participants during the study period. Sample size was estimated using Raosoft Sample Size Calculator (97% confidence level, 4% margin of error, 50% response distribution), yielding minimum $n = 804$. Of 1,072 surveys distributed to eligible nurses, 756 completed questionnaires were analyzed (508 ASH, 248 ARH; 70.5% response rate).

Data Gathering Tools

The Nurse–Physician Communication Scale (NPCS), originally developed by Schmidt and Svarstad [10] and validated for Saudi Arabian nurses by Daheshi et al. [2], comprises 18 items across four domains: openness (4 items), relevance and satisfaction (8 items), mutual understanding (2 items), and frustration with interaction (4 items). Five-point Likert scales with item-appropriate anchors yield total scores of 18–90, with higher scores indicating better perceived communication quality.

Internal consistency in this study was: overall $\alpha = .804$; openness $\alpha = .860$; relevance/satisfaction $\alpha = .879$; mutual understanding $\alpha = .755$; frustration with

interaction $\alpha = .875$ —all exceeding the .70 threshold [11], consistent with prior validation [2].

Data Gathering Procedure

Following ethical approval, trained research team members administered an anonymous electronic survey (Google Forms) between March 9–31, 2026. Distribution occurred via: (1) nurse managers disseminating links through organizational email; and (2) direct recruitment during the Nursing Research and Evidence-Based Practice Council Survey Campaign. Multiple channels maximized departmental participation. Electronic informed consent preceded survey access; anonymity and voluntary participation were emphasized, with assurance of no employment consequences. Only fully completed questionnaires were retained.

Data Analysis Procedure

Data were analyzed using IBM SPSS Statistics version 27. Descriptive statistics summarized participant characteristics and domain scores. Composite scores were calculated for overall NPCS and each domain. Communication quality was categorized as low, moderate, or high using tertile-based classification derived from observed score distributions. Interpretation: high = consistently supports shared understanding, timely clarification, and collaborative decision-making; moderate = established and functional but inconsistently effective; low = frequently ineffective, potentially compromising care coordination and safety.

Chi-square tests examined differences between hospitals and across participant characteristics. Pearson correlation coefficients assessed domain relationships, justified by established robustness in large samples ($N = 756$) despite potential non-normality of Likert-derived composites [12–14]. Assumptions of linear, monotonic associations were considered; absence of formal normality testing represents a methodological limitation, with coefficients interpreted as descriptive sample measures. Significance was set at $p < .05$.

Ethical Consideration

Ethical approval was obtained from Almoosa Health Research Center (IRB Log No. ARC-26.3.02). Electronic informed consent was obtained from all participants, with assurance of anonymity, confidentiality, and no personally identifiable information collection.

III. RESULTS AND DISCUSSION

Participants Characteristics

Table 1 presents socio-demographic characteristics. Most participants were female (88.5%), held bachelor's degrees (86.6%), and were non-Saudi nationals (94.4%). Clinical nurses comprised 76.6% of the

sample. Approximately 40.2% had 1–3 years of unit experience; 81.3% worked shifts exceeding 9 hours.

Table 1

Socio-demographic Characteristics of Nurses in Almoosa Health Group (N = 756)

Characteristic	Category	n	%
Gender*	Male	87	11.5
	Female	669	88.5
Hospital	ASH	508	67.2
	ARH	248	32.8
Position	Clinical Nurse	579	76.6
	Charge Nurse	142	18.8
	Nurse Manager	27	3.6
	Nursing Supervisor	8	1.1
Education	Diploma	63	8.3
	Bachelor's*	655	86.6
	Master's	38	5.0
Nationality	Saudi	42	5.6
	Non-Saudi	714	94.4
Experience in current unit	<1 year	140	18.5
	1–3 years	304	40.2
	4–6 years*	140	18.5
	7–10 years	100	13.2
	>10 years*	72	9.5
Hours per shift	<8 hours	141	18.7
	>9 hours	615	81.3

Note: ASH = Almoosa Specialist Hospital; ARH = Almoosa Rehabilitation Hospital.

Overall Quality of Nurse–Physician Communication

Table 2 summarizes perceived quality across domains. Nurses rated communication as predominantly moderate overall. Openness and relevance/satisfaction showed most favorable ratings; mutual understanding and frustration with interaction showed comparatively lower ratings, indicating greater challenges.

These findings indicate that communication processes are established but inconsistently support optimal collaboration—a pattern consistent with Saudi Arabian and international literature [2,3,15]. Communication quality depends not merely on interaction presence but on information exchange effectiveness, interpretation, and translation into collaborative practice. Unlike studies relying solely on overall ratings, this multidimensional assessment reveals that quality varies substantially across communication aspects.

Table 2
*Nurses' Perceived Quality of Nurse–Physician
 Communication Level (N = 756)*

Domain	Low n (%)	Moderate n (%)	High n (%)
Openness ^a	51 (6.7)	416 (55.0)	289 (38.2)
Relevance and satisfaction	25 (3.3)	446 (59.0)	285 (37.7)
Mutual understanding	177 (23.4)	449 (59.4)*	130 (17.2)
Frustration with interaction ^a	256 (33.9)	420 (55.6)	80 (10.6)

Note: ^aHigher scores on this domain indicate lower frustration (i.e., better communication quality); percentages reflect categorized scores after reverse-coding for consistency with other domains.

Notably, quality was non-uniform across domains. While nurses perceived opportunities to communicate (openness) and found interactions relevant and satisfactory, achieving shared understanding remained difficult. This pattern aligns with observations that professional hierarchy, divergent clinical perspectives, and organizational culture persistently influence nurse–physician communication [4,15]. Lower mutual understanding ratings indicate that quality assessment must extend beyond openness to examine whether communication produces shared clinical understanding, coordinated decision-making, and constructive relationships—reinforcing communication quality as multidimensional competency rather than singular outcome.

Communication Quality According to Participant Characteristics

Table 3 presents associations between participant characteristics and domain quality (full data in Supplementary Tables S1–S4). Significant associations emerged for hospital, education level, and experience with openness and relevance/satisfaction. Mutual understanding associated significantly with position and experience; frustration with interaction differed significantly only by hospital. No significant associations were found for gender, nationality, or working hours.

Table 3
*Significant Associations Between Participant
 Characteristics and Communication Quality
 Domains*

Domain	Significant associations (p < .05)
Openness	Hospital (p = .038); Education (p = .011); Experience (p = .006)
Relevance and satisfaction	Hospital (p < .001); Education (p = .011); Experience (p = .007)
Mutual understanding	Position (p = .019); Experience (p = .008)
Frustration with interaction	Hospital (p = .031)

Higher educational attainment correlated with more positive communication experiences, supporting evidence that education and structured development

enhance communication competency, confidence, and collaboration [15,16]. Experience patterns were non-linear: nurses with 1–3 years reported highest openness, while those with 4–6 years showed highest mutual understanding. Early-career nurses, having completed structured orientation and competency training, may remain actively engaged in interdisciplinary communication while developing clinical confidence. Conversely, highly experienced nurses in supervisory roles may have reduced direct clinical interaction with physicians*

The finding that clinical nurses demonstrated higher mutual understanding than charge nurses, nurse managers, and nursing supervisors (p = .019) underscores frequent bedside collaboration's importance. Direct care nurses engage in continuous physician communication regarding patient assessment, treatment planning, and decision-making, creating greater shared understanding opportunities. Leadership roles' reduced routine bedside communication may yield different quality perceptions, suggesting that communication competencies develop through repeated clinical interaction and workplace learning, not merely professional experience accumulation.

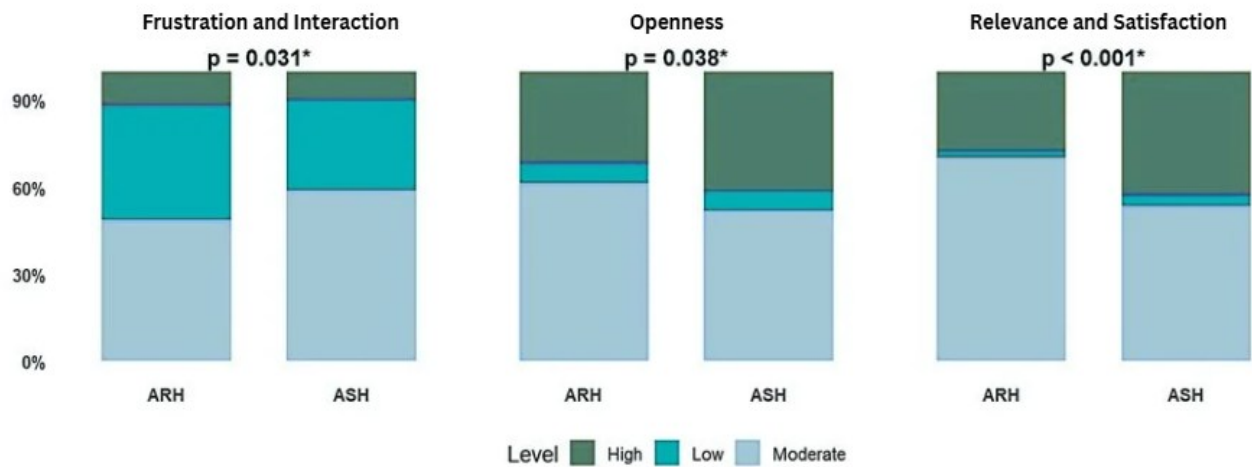
Hospital Comparison

ASH nurses reported significantly higher quality than ARH nurses in openness (p = .038), relevance/satisfaction (p < .001), and frustration with interaction (p = .031). No significant difference emerged for mutual understanding (p = .472). Figure 1 illustrates these comparisons.

These institutional differences highlight organizational context's influence on communication experiences. Despite shared governance, variations in patient populations, clinical workflow, multidisciplinary interaction, culture, and practice environment likely explain these findings [3,7,15]. Communication quality reflects individual competencies and institutional factors that facilitate or hinder effective interdisciplinary communication.

Interpretation requires understanding care organization differences rather than attributing findings to individual ability. ASH acute care operates with continuous physician presence, structured multidisciplinary rounds, and short decision cycles, generating frequent, time-bound nurse–physician contact. ARH rehabilitation and long-term care follows longer clinical trajectories with lower physician contact frequency, scheduled clinical reviews, and goal-based planning across multiple disciplines—conditions with fewer routine direct dialogue opportunities. Reduced perceived openness, relevance, and satisfaction, with increased frustration when clarification is delayed, aligns with this structural difference. The absence of mutual understanding differences suggests shared clinical understanding depends more on interaction

Figure 1
Comparison of nurses' perceived quality of nurse–physician communication across four communication domains between Almoosa Specialist Hospital and Almoosa Rehabilitation Hospital.



[Figure showing mean composite scores or quality level distributions by hospital and domain]
Note. p-values: Openness .038; Relevance/satisfaction <.001; Mutual understanding .472; Frustration with interaction .031.

nature than setting, possibly because rehabilitation's collaborative goal-setting creates alternative pathways to shared understanding despite less frequent contact.

These findings suggest targeted organizational interventions: structured interdisciplinary rounds at fixed times, standardized escalation pathways with defined response windows, and consistent SBAR use provide predictable communication opportunities independent of informal contact [17]. Shared governance structures (unit-based practice councils) enable formal communication concern resolution; joint nurse–physician case conferences and interprofessional simulation directly address mutual understanding [15,16]. Organization-wide policies alone are insufficient—strategies must adapt to each setting's clinical model and workflow.

Domain Correlations

Pearson correlations demonstrated significant inter-domain associations (Figure 2). Openness and

relevance/satisfaction showed strongest association ($r = .584, p < .01$). Mutual understanding correlated weakly positively with openness and relevance/satisfaction. Frustration with interaction correlated moderately with mutual understanding and weakly negatively with openness.

These relationships suggest that while openness and satisfaction are interconnected, mutual understanding and frustration operate somewhat independently, with frustration particularly linked to mutual understanding deficits*

This study contributes evidence that nurse–physician communication quality is multidimensional, varying across domains, institutional settings, and professional characteristics. Nurses' moderate overall ratings mask important domain-specific variations: openness and satisfaction strengths coexist with mutual understanding and frustration challenges.

Figure 2
Pearson's correlation matrix among the four nurse–physician communication subdomains (N = 756).



[Correlation heatmap or matrix showing coefficients between all domain pairs]
Note. * $p < .05$; ** $p < .01$.

The hospital comparison findings advance understanding by demonstrating that communication quality differs markedly between settings with divergent care models despite shared organizational governance. This challenges assumptions that communication improvement can rely solely on organization-wide initiatives. Instead, setting-specific workflow and clinical model characteristics require tailored strategies.

Professional characteristic findings emphasize communication competencies' developmental nature. The non-linear experience pattern—peak openness at 1–3 years, peak mutual understanding at 4–6 years—suggests different competency trajectories that education and development should acknowledge. The clinical nurse versus supervisor mutual understanding difference further indicates that maintaining communication quality requires preserved clinical interaction opportunities even as nurses advance to leadership roles.

Limitations of the Study

This study has several limitations. The cross-sectional design precludes causal inference. Convenience sampling may introduce selection bias and limits inferential statistics' generalizability—reported significance values describe the participating sample rather than estimating population-level relationships. Single-source nurse self-report, without physician data, provides one perspective on dyadic communication. Restriction to one Saudi Arabian healthcare organization limits external validity. Finally, the two-item mutual understanding domain, while reliable, may constrain construct breadth.

Implications

Nursing Education: Curricula should emphasize communication as clinical competency supporting collaborative practice, beyond technique instruction [18]. Interprofessional learning opportunities, shared clinical reasoning, feedback, conflict management, and structured frameworks (SBAR) should be integrated across undergraduate, orientation, residency, simulation, and continuing education [17,19].

Organizational Practice: Healthcare organizations should foster collaborative environments through interdisciplinary rounds, shared governance, mentorship, and regular skills training. Workplace cultures encouraging mutual respect, open communication, and collaborative partnerships require sustained attention [15,20].

Research: Future studies should incorporate physician perspectives for comprehensive dyadic understanding. Mixed-methods and longitudinal designs can elucidate communication quality evolution and intervention effectiveness. Studies comparing communication quality across diverse hospital types and using probability sampling would enhance generalizability.

IV. CONCLUSION

Nurse–physician communication quality is a multidimensional aspect of collaborative practice with important domain-specific and contextual variations. While nurses in this study perceived communication moderately positively, substantial challenges remain in mutual understanding and interaction frustration. Quality reflects competencies developable through education, professional development, and setting-adapted organizational strategies. These findings support investment in communication competency development as fundamental to patient safety, collaborative practice, and healthcare quality improvement.

V. RECOMMENDATIONS

This study demonstrates that the quality of nurse–physician communication within Almoosa Health Group is a multidimensional phenomenon characterized by moderate overall perceptions, with distinct variations across communication domains and significant institutional differences. While nurses generally reported positive perceptions regarding the quality of openness and the quality of relevance and satisfaction in their physician interactions, critical gaps persist in achieving mutual understanding and minimizing frustration during professional interactions. These findings reveal that organizational context—including the nature of care delivery, frequency of nurse–physician interaction, and clinical acuity—substantially influences the quality of communication experiences and outcomes. Additionally, significant associations between education level and years of professional experience with the quality of nurse–physician communication suggest that nursing competencies developed through formal education and clinical practice contribute meaningfully to interprofessional collaboration effectiveness. These findings indicate that improving the quality of nurse–physician communication extends beyond promoting willingness to communicate; rather, it requires a comprehensive approach that addresses organizational structures, workplace cultures, and nursing professional development. Healthcare organizations seeking to enhance the quality of communication must recognize that effective interprofessional collaboration depends upon creating supportive environments where mutual respect, structured communication protocols, and shared understanding are systematically cultivated. Implementation of targeted interventions, including communication skills training, structured interprofessional learning opportunities, organizational strategies tailored to specific clinical contexts, and workplace cultures that support collaborative practice, holds promise for strengthening the foundation for safe, high-quality patient care.

CONTRIBUTION OF AUTHORS

Neilda Faith Ambray Baldoviso: Conceptualization, methodology, data curation, formal analysis, visualization, original draft preparation, writing – review and editing

Nesrine Trabelsi: Conceptualization, methodology, supervision, writing – review and editing

Aysheh Abu-alburak: Data collection, writing – review and editing

Nour Elbatal: Supervision, validation, resources, writing – review and editing

Hera Tashjian: Supervision, validation, resources, writing – review and editing.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this study.

DISCLOSURE OF USE OF GENERATIVE AI

During the preparation of this manuscript, the authors used ChatGPT (OpenAI) and Grammarly to assist with language refinement, manuscript organization, and improvement of academic writing. All scientific content, interpretation of findings, and final editorial decisions were made by the authors, who reviewed and approved the final version of the manuscript and take full responsibility for its accuracy and integrity.

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Clinical Acceptability, Ease of Use of Closed-System Cannula among Nurses and Its Impact on Workflow Efficiency in Cardiac CTA: A Convergent Parallel Mixed-Method Study in a Tertiary Hospital in Saudi Arabia

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ABSTRACT

Introduction: Cardiac computed tomography angiography (CCTA) requires high-flow contrast injection, which necessitates reliable peripheral intravenous access. Conventional open cannulas are associated with extravasation and occupational exposure to blood. Closed-system fenestrated cannulas may mitigate these risks, yet evidence from nursing practice in CCTA settings remains limited.

Methods: A convergent parallel mixed-methods design was employed at a tertiary cardiac hospital in Riyadh, Saudi Arabia. Twenty-two CCTA nurses completed a validated 15-item survey based on the Technology Acceptance Model, measuring perceived clinical acceptability (10 items) and perceived ease of use (5 items) on 5-point Likert scales. The device evaluated was the B.Braun Introcan Safety® 22-gauge closed-system peripheral intravenous catheter with a fenestrated, multi-port tip and passive needlestick safety mechanism (B. Braun Melsungen AG, Melsungen, Germany). Extravasation data were extracted from hospital records for six months pre-implementation (July–December 2024; 1,030 scans) and six months post-implementation (January–June 2025; 1,171 scans) of the closed-system cannula. Fifteen nurses were purposively selected for semi-structured interviews; transcripts were analyzed using Braun and Clarke's thematic analysis framework.

Results: Median scores for clinical acceptability (5.00, IQR = 0.13) and ease of use (5.00, IQR = 0.10) were very high. Mean scores were 4.70 and 4.80, respectively. Years of experience significantly influenced clinical acceptability ($p = .045$); nurses with >10 years of experience reported higher scores than those with 1–3 years (adjusted $p = .041$). No demographic differences were observed for ease of use. Extravasation rates decreased from 3.39% (35/1,030) pre-implementation to 0.43% (5/1,171) post-implementation ($p = .028$). Qualitative analysis yielded three themes: enhanced patient and staff safety, improved patient comfort, and increased workflow efficiency.

Conclusion: CCTA nurses demonstrated strong acceptance of the closed-system cannula and rated it as highly usable. Implementation was associated with a significant reduction in extravasation, achieving levels within international benchmarks (0.1%–1.2%). Nurses perceived improvements in safety, comfort, and efficiency. These findings support routine adoption of closed-system cannulas for CCTA, although larger multi-centre studies are warranted.

Keywords: *closed-system cannula; extravasation; cardiac computed tomography angiography; technology acceptance model; nurse perception; patient safety*

I. INTRODUCTION

There is growing concern about the need to optimize image quality for Cardiac Computed Tomographic Angiography (CCTA). Therefore, the use of power injectors to deliver iodinated contrast media rapidly through a peripheral IV line is needed. This is reliably delivered to of 5 – 8 mL/s, large bore catheters (Weinbeck et al., 2010) to providing a technological platform for the success or failure of CCTA. Despite the importance of achieving this technological goal, securing such a line in clinical practice poses a substantial challenge (Wang et al., 2018; Behzadi et al., 2018). Traditionally, large bore catheters have been used to administer iodinated contrast media (ICM) in CCTA. However, this method

also has its limitations. Large bore catheters result in considerable discomfort for patients who require invasive medical procedures. In addition, larger bore sizes increase the likelihood of ICM extravasation when delivering high flow rates.

A recent meta-analysis comparing two prospective cohort studies found that extravasation due to ICM was approximately .0019 – .0054% of all injections. The authors concluded that injection flow rates > 3 mL/s represented a primary risk factor for extravasation (Behzadi et al., 2018). Given that most patients receive ICM at flow rates > 5 mL/s, the potential for complications increases exponentially. In providing safety concerns to patients receiving injections of ICM, traditional open system IV devices pose significant

occupational health risks to nursing staff. Due to the lack of a secure seal surrounding the needle during insertion and removal of IV needles, nursing staff members are at risk of experiencing needlestick injury and potential exposure to bloodborne pathogens. In fact, a needlestick injury related to intravenous catheter stylet use across 26 hospitals in Japan. The authors reported that after implementing safety-engineered needle devices, the number of needlestick injuries decreased dramatically from 6.39 per 100,000 devices to 0.95 per 100,000 devices (Fukuda et al., 2016). Therefore, it is logical to assume that the risk of needlestick injury will be much higher in busy CCTA departments where staff are required to perform cannulations quickly and efficiently.

Closed systems represent an advancement in technology in regards to IV catheters. Closed systems contain a sealed mechanism designed to prevent blood leakage from occurring during insertion and removal of IV needles. Moreover, closed systems utilize a fenestrated tip with multiple laser-cut side ports which helps reduce the velocity of the contrast jet ejected from the catheter. In reducing the velocity of the contrast jet, closed systems help minimize movement within the venous structure as well as distribute flow uniformly across each port rather than having all flow exit from one end (Harraz et al., 2020).

Although there is little specific evidence regarding closed systems specifically in CCTA, early findings appear promising. A comparative study examined a 22-gauge fenestrated closed system catheter compared to a standard 18-gauge open system catheter in coronary computed tomographic angiography (coronary CTA). Researchers reported that the closed system resulted in successful first-attempt cannulations without contrast leak whereas several instances of contrast leaks were observed with the open system catheter. Patients also exhibited greater satisfaction with their cannulation experience based on pain experienced during cannulation and number of needle sticks (Harraz et al., 2020).

While there is preliminary positive evidence supporting closed systems in CCTA, there remain numerous gaps in knowledge that must be filled. Currently, there are no peer-reviewed articles regarding the use of closed systems in Saudi Arabia. Also, as noted, none of the reviewed literature pertaining to closed systems combined both qualitative/experiential data obtained from nurses with quantitative outcomes. Lastly, few studies have employed TAM as a theoretical framework for assessing closed system adoption among healthcare professionals working in CCTA settings. Importantly, there does not exist any studies examining extravasation rates before and after implementation of a closed system cannula.

Therefore, the purpose of this research study was to address each of these critical knowledge gaps. More specifically, this research project included five objectives: (1) To report how nurses view the clinical acceptability and usability of a closed system cannula in a CCTA setting; (2) To determine whether demographic factors influence how nurses view clinical

acceptability and usability; (3) To compare pre- and post-closed system extravasation rates; (4) To assess how nurses view the effects of closed systems on patient safety, comfort and operational efficiency; and (5) To generate recommendations to improve implementation practices.

II. METHODS

Research Design

A convergent parallel mixed-methods design was employed. In this design, quantitative and qualitative data are collected concurrently, analyzed separately, and then integrated during interpretation. This approach is particularly suited to research questions requiring both numerical measurement and narrative explanation. This research study was conducted based on the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines to provide a comprehensive report of the quantitative aspects of this research, as well as the GRAMMS (Good Reporting of A Mixed Methods Study) checklist that addresses reporting of the entire mixed-methods study.

The study was conducted at Prince Sultan Cardiac Center in Riyadh, Saudi Arabia, a tertiary hospital specializing in cardiac care. The Cardiac Computed Tomography Angiography department performs approximately 15 scans daily, with contrast media injected at a flow rate of 5–8 mL/s. In January 2025, the department transitioned from conventional open-system cannulas to a closed-system cannula. The device evaluated was the B.D. Nexiva Diffusics Closed IV Catheter System, Gauge 20. This specific model was selected by the hospital's procurement committee based on its compatibility with the department's power injector protocols (5–8 mL/s flow rates) and its needle-safe design. This device features a fenestrated tip, a needle-safe mechanism, and a sealed design that prevents blood leakage.

Participants and Sampling

The population of interest consisted of all registered nurses that were assigned full-time to the Cardiac CTA department. Eligibility requirements included: (a) current assignment to the Cardiac CTA department, (b) at least one year of continuous service in the Cardiac CTA department, (c) successful completion of a training program regarding the use of closed-system cannulas, and (d) voluntary signed informed consent from each participant. Excluded participants were those with fewer than 1 year of experience in the department and those who had been absent from work for extended periods of time.

The number of employees in the department was very small ($N = 22$) and it was necessary to utilize a census design. Although this type of design would provide no statistical power for conducting sub-group analysis, results obtained from the demographic variables may only be considered as exploratory.

A census was used for the quantitative portion of the study. All 22 eligible participants were contacted by

invitation to take part in the research project and all provided their voluntary consent, providing a 100 percent participation/consent rate. Purposive sampling was used to select the participants for the qualitative data collection. Of the 22 registered nurse participants, 15 were selected to ensure variability based on length of service (years working in the department), age (four categories), and sex (five males, ten females) to approximate the ratio of gender found within the Cardiac CTA department.

Data Gathering Tools

Quantitative Instruments

A fifteen-question survey was created based upon the Technology Acceptance Model with adaptations from Ruiz-Sternberg et al. (2012), and Yilmaz et al. (2024), for safety intravenous catheter. There were three parts.

Part I asked questions about demographics and job description.

Part II asked ten questions that used a five-point Likert Scale to measure how well the nurses accepted the system clinically. Each question had a value of one through five with one being strongly disagree, two being somewhat disagree, three being neutral, four being agree, and five being strong agreement. Some examples of these questions include: "The closed-system cannula works dependably when performing IV inserts" and "The device satisfies the clinical needs of cardiac CT patients."

Part III asked five questions that also used a five-point Likert Scale to measure how easily the nurses found the system to use. Some examples of these questions are: "This is easy to use when doing peripheral IV cannulations," and "I am confident in my ability to use it in emergency or high-pressure situations." (Instruments can be viewed in appendix A).

The survey was tested by a multidisciplinary group of a professor, the manager of nursing services, and a clinical nurse educator at the Prince Sultan Cardiac Center. They reviewed each item for clarity, applicability, and relevance to the CCTA environment. Based on their input, minor word changes were made to some of the items.

Internal consistency was determined after the first 15 nurses completed the survey. The Cronbach alpha coefficient for both the clinical acceptance and ease of use scales were .90, which provides evidence for the internal consistency of each scale. As no modifications were made to the survey after the initial 15 surveys, all 22 participating nurses were included in the final analysis. Including all participants may have been considered a methodological limitation due to the relatively low numbers of nurses available for this type of assessment.

Data regarding extravasations associated with cannulas were obtained by reviewing hospital records in the Cardiac CTA department. This review provided the number of scans performed, as well as the number of extravasation events noted for each month. These

data were collected over two six-month intervals: pre-implementation (7/01 – 12/31/24); and post implementation (1/01 – 6/30/25). For each month, only aggregate totals (number of scans and number of extravasation events) were recorded; patient identifiable information was not gathered.

Qualitative Instrument

An unstructured/semi-structured interview guide was developed to explore how the closed system cannula impacted perceptions of nurses. Three open-ended questions were used: (1) How did the closed system cannula affect patient safety during Cardiac CTA procedures? (2) What are your thoughts about how the closed system cannula impacted patient comfort during the procedure? And (3) In what ways do you believe using the closed system cannula impacted your workflow efficiency during Cardiac CTA? Probing questions like "can you think of a time when you saw that happen?" were asked to generate additional detail in responses. Interviews ranged from ten to fifteen minutes, took place in a private area of the Department and were audiotaped with the permission of each participant; they were also transcribed word-for-word.

To improve the trustworthiness of qualitative data many strategies were employed. Member-checking occurred with three interview participants who were provided with preliminary themes for review. This process confirmed that the researchers' interpretations were reflective of those participants experiences. Peer debriefing also occurred with a senior qualitative researcher who had no association with the research site and reviewed the researchers' coding scheme and thematic structure for consistency and thoroughness. All analytical decision-making processes were documented as an audit trail throughout this investigation.

Data Gathering Procedure

Ethical approval was obtained from the Research Ethics Committee of St. Paul University Manila, as well as the Institutional Review Board (IRB) of the Prince Sultan Military Medical City. Permission to conduct this research was also received from the nursing administration of the Prince Sultan Cardiac Center.

During one staff meeting, all 22 eligible nurses were asked to participate in the study. At the start of the meeting, the researcher briefly described the research objectives, methods, voluntary nature of participation and ways that their information would remain confidential. Each participant signed an informed consent document before completing a survey.

Each participant independently completed a survey using paper and then put it into a sealed envelope. No identifying information such as name or ID were included on the surveys. Instead, a unique identifier (number) was assigned to each questionnaire. During completion of the surveys, the researcher was available to clarify any items/questions, although none were clarified.

Following completion of the survey and interview components of the study, extraneous data regarding extravasations were retrieved from hospital records by the researcher.

Moreover, a semi-structured interview component of the study involved the 15 purposely selected participants. All interviews were audio recorded and transcribed verbatim. A second verification of accuracy of transcripts occurred through review by the researcher. The researcher has a dual role in this study. He is a registered nurse at the site where this study took place. As a result, his position offered him both access to his colleagues/participants as well as a working relationship with them. However, being a part of their work environment requires him to maintain awareness of his own feelings and thoughts and how they may influence his interactions with participants and interpretations of data. To minimize potential bias resulting from his position within the organization, the researcher maintained a reflexive journal throughout all stages of data collection and data analysis. His journal tracked preconceptions and emotional responses she experienced while collecting data and analyzing results. Additionally, the researcher had an independent academic reviewer provide oversight over the interpretation of results.

Data Analysis Procedure

Quantitatively, data were analyzed using IBM SPSS Statistics version 28. The descriptive statistic frequency, percentage, median and IQR were calculated for all demographic characteristics and survey response questions. Due to the fact that data were found to be non-normal (Shapiro-Wilk), the researcher applied non-parametric inferential testing. For example, the Mann Whitney U test was used to compare perceptions among genders. Similarly, the Kruskal Wallis test was used to assess differences based on demographics including age group, years of experience and job title. Moreover, the chi-square test of independence was applied to assess whether there was an association in terms of the rate of extravasation as it relates to before and after the implementation. Furthermore, relative risk and a 95% confidence interval were determined. The Wilcoxon signed rank test was used to assess the monthly extravasation rates. This test was chosen due to the limited number of months (n=6) of data collected in both time frames. All statistical testing will be done at a p-value less than 0.05.

Thematic analysis using the Braun and Clark (2006) six phase framework was used. It follows phases such Phase 1: Familiarization Phase; Phase 2: Initial Coding; Phase 3: Searching for Themes; Phase 4: Reviewing Themes; Phase 5: Defining Themes; Phase 6: Writing Up the Report). Manual thematic analysis was involved the use of qualitative research software. The researcher repeatedly read through each of the transcripts and developed codes. Potential themes were identified from these codes. Each theme was evaluated to ensure they were coherent with one another and distinct from other themes. Each theme was defined utilizing a specific definition of what the theme is.

Both the quantitative and qualitative results were synthesized while interpreting them via a "weaving" process. In addition to presenting the findings side-by-side within one single narrative, a joint display table was created to map quantitative findings to corresponding qualitative themes.

Ethical Consideration

Ethical approval was obtained from the Research Ethics Committee of St. Paul University Manila, as well as the Institutional Review Board (IRB) of the Prince Sultan Military Medical City. Permission to conduct this research was also received from the nursing administration of the Prince Sultan Cardiac Center.

III. RESULTS AND DISCUSSION

Participant Demographic Characteristics

Quantitatively, there were 22 nurses participated in the quantitative survey. The majority were aged 31–40 years (54.5%), female (68.2%), and held bachelor's degrees in nursing (100%). Most were staff nurses (95.5%), with one charge nurse (4.5%). Regarding years of experience in the Cardiac CTA department, 45.5% had 7–10 years, 31.8% had more than 10 years, 13.6% had 4–6 years, and 9.1% had 1–3 years. For the qualitative interviews, 15 nurses were purposively selected to represent the full range of experience levels, age groups, and both genders.

Table 1
Frequency Distribution of the Demographic Profile of the Respondents (N = 22)

Nurses Profile	<i>f</i>	%
Age Group		
21–30 years	4	18.2
31–40 years	12	54.5
41–50 years	2	9.1
51 years and above	4	18.2
Sex		
Male	7	31.8
Female	15	68.2
Educational Attainment		
Bachelor's degree in nursing	22	100.0
Job Title		
Staff nurse	21	95.5
Charge nurse	1	4.5
Total	22	100.0

Table 2
Median and Interquartile Range (IQR) Distribution of Perceived Clinical Acceptability of the Closed-System Cannula (N = 22)

Item	Median	IQR	Interpretation
1. The closed-system cannula performs reliably during IV insertions.	5.00	0.25	Very high
2. It is a valuable addition to our current nursing practice.	5.00	0.00	Very high
3. I would recommend its use to colleagues in cardiac CT.	5.00	0.25	Very high
4. I feel confident using it in my daily work.	5.00	0.00	Very high
5. It meets the clinical needs of cardiac CT patients.	5.00	0.00	Very high
6. It is preferable to the previous IV access system we used.	5.00	0.25	Very high
7. I am satisfied with its overall performance.	5.00	0.25	Very high
8. It contributes positively to patient care in our unit.	5.00	0.00	Very high
9. I would support its continued use in our department.	5.00	0.00	Very high
10. The closed-system cannula is acceptable to me as a nurse.	5.00	0.00	Very high

Note. Scale interpretation: 1.00–1.49 = Very low; 1.50–2.49 = Low; 2.50–3.49 = Moderate; 3.50–4.49 = High; 4.50–5.00 = Very high. IQR = interquartile range.

Perceived Clinical Acceptability and Ease of Use

Table 2 provides a summary of the medians and IQRs for the perceived clinical acceptability of the closed-system cannula. For each of the 10 questions that were used to measure the perceived clinical acceptability of the closed-system cannula, the median response was 5.00 (Very High) with an IQR ranging from .00 to .25. Five of the 10 questions measured clinical acceptability and had no variation among the respondents (i.e., IQR = 0.00); these include: “It is a valuable addition to our current nursing practice”; “I feel confident using it in my daily work”; “It meets the clinical needs of cardiac CT patients”; “It contributes positively to patient care”; “I would support its continued use”; and the “closed-system cannula is acceptable to me as a nurse.” Thus, all respondents felt very high levels of confidence in their ability to clinically utilize this product. The median clinical acceptability score was 5.00 (IQR = .13).

All five of the questions that measured the perceived ease of use of the closed system cannula resulted in median responses of 5.00 (Very High). Similarly, the question “It is easy to become proficient with regular practice” indicated that there was no variation among the respondents (IQR = 0.00); therefore, there was complete agreement regarding proficiency. Additionally, although all other questions related to ease of use demonstrated low amounts of variation (all IQR values = 0.00 – 0.25), they still generally supported a perception of high ease of use. Overall, the median ease-of-use score was 5.00 (IQR = .10).

Differences in Perceptions According to Demographic Profile

For perceived clinical acceptability, no significant differences were observed for job title ($p = .388$), age

group ($p = .433$), or gender ($p = .203$). However, years of experience yielded a statistically significant difference (Kruskal-Wallis $H = 8.036$, $p = .045$). Effect size for the Kruskal-Wallis test was $\eta^2 = .37$, indicating a large effect (Cohen, 1988). No other pairwise comparisons reached significance (Table 3).

For perceived ease of use, no significant differences were found for any demographic variable. Job title ($p = .591$), years of experience ($p = .240$), age group ($p = .886$), and gender ($p = .630$) all failed to achieve statistical significance. All subgroups rated ease of use consistently high (median = 5.00 across all subgroups).

Extravasation Rates Before and After Implementation

Table 4 presents the comparison of cannula-related extravasation rates before and after implementation of the closed-system cannula during the six months before implementing the new device (July to December 2024). During this time, there were 1,030 cardiac CTA's and 35 extravasations were documented. This resulted in a rate of 3.39% (CI: 2.42–4.64%) for extravasation. There were 1,171 CTA's from January through June of 2025; however, there were only five documented extravasations. This results in a rate of 0.43% (CI: 0.14–0.99%) for extravasation. Extravasation case counts decreased by 2.96 percentage points and by 87.3% on a comparative basis during this time frame.

A chi-squared test revealed that there is a statistical relationship between the time of implementation and extravasation occurrences ($\chi^2(1) = 24.87$, $p < .001$). The RR of extravasation was 0.13 (CI: 0.05–0.33), thus the risk of extravasation is reduced by approximately 87% after implementation. The Wilcoxon Signed-Ranks Test indicates a decrease in the average number of extravasations per month ($Z = -2.20$, $p = .028$, $r = .64$).

Table 4
Comparison of Cannula-Related Extravasation Rates Before and After Implementation of the Closed-System Cannula

Variable	Before implementation (July–December 2024)	After implementation (January–June 2025)	Variance (change)
Total scans	1,030	1,171	+141
Extravasation cases	35	5	–30
Extravasation rate (%)	3.39%	0.43%	–2.96 %

Note. Extravasation rate was computed as (number of extravasation cases / total scans for the period) × 100. The pre-implementation rate of 3.39% was calculated as (35/1030) × 100 = 3.398%, rounded to 3.39%. The post-implementation rate was calculated as (5/1171) × 100 = 0.427%, rounded to 0.43%. The variance shows a reduction of 30 extravasation cases (an 85.7% decrease) and a 2.96-percentage-point reduction in the extravasation rate following implementation of the closed-system cannula.

The post-implementation rate of 0.43% falls within the American College of Radiology benchmark range of 0.1% to 1.2% for contrast extravasation during CT procedures. The pre-implementation rate of 3.39% substantially exceeded this benchmark.

Qualitative Findings

Three core themes emerged from the thematic analysis of the 15 semi-structured interviews.

Theme 1: Perceived enhancement of patient and staff safety.

Nurses continually identified that the closed-system cannula was safe for both patients and staff. They felt this due to the fact that the sealed cannula greatly decreased blood exposure when inserting the cannula. The participants thought this would decrease their needle stick risks and the risk of becoming infected. A participant stated, "There is less blood exposure than with regular cannulas therefore it seems much safer during the time you are inserting the cannula." Participant P5 added, "The closed system reduces your risk of getting an infection as it provides more control over your system and exposes less to contamination." In addition, they noticed fewer extravasations. Participant P10 commented on this by stating, "We have seen many fewer instances of extravasations since we began using the closed system cannula.

Theme 2: Perceived improvement in patient comfort and experience.

Nurses observed that patients reported less pain and lower anxiety and tolerated the procedure better using closed system cannulas. One participant noted, "Patients complain less about pain when inserting this closed cannula," (P4). Reduced visibility of blood during the procedure was cited as something that calmed patients: "They seem calmer compared to when we used usual cannulas," (P8). Smaller gauge of closed cannula (22 gauge compared to conventional 18 gauge) was also noted as contributing to patient comfort: "Patients are calmer because we are using smaller gauge compared to 18 gauge," (P15). Difficult access veins tolerated the procedure better with this new device as well.

Theme 3: Perceived improvement in workflow efficiency.

Nurses said they had a simpler workflow with the closed system cannula for several reasons. Because the open system was designed as an integral unit, nurses did not have to gather or assemble various parts, therefore making it easier to set up. A nurse summarized this by stating, "I do not have to collect additional supplies to prepare the device" (P2). Nurses felt their first-time success rate at cannulating patients increased because there was less of a chance to make repeated insertion attempts. "We are not spending extra time trying to place IV catheters," (P11) added one nurse. Additionally, quicker cannulation times gave nurses more opportunity to attend to other responsibilities related to patient care. "We use our time differently while placing IV catheters; we can now focus on more patient-related activities," (P5), commented another nurse. "We experience no delay in the time to complete procedures," (P12), was another comment from a nurse regarding how the ease of cannulation impacted their ability to provide care to patients.

Integration of Quantitative and Qualitative Findings

There was a strong consensus for the results across both methodologies. The extremely high ratings for clinical acceptability (Median = 5.00; IQR = 0.13) that were provided are consistent with qualitative reports showing improved safety, fewer complications and better comfort for patients. Nurses reported very easy-to-use devices based on their ratings (Median = 5.00; IQR = 0.10), as they also described using simpler processes, having less time to complete procedures, and being able to be successful on their first attempt at cannulating. The statistically significant decrease in the rate of extravasations from 3.39% to 0.43% (p = 0.028) is consistent with nurses reporting fewer problems with cannulation and an increase in the confidence in performing cannulation. There were no major differences found between the quantitative and qualitative results

Table 5
Convergence and Divergence of Quantitative and Qualitative Results

Quantitative Finding	Qualitative Theme	Convergence/Divergence
Very high clinical acceptability (median = 5.00, IQR = 0.13)	Theme 1: Perceived enhancement of patient and staff safety	Convergence—High acceptability aligns with nurses' reports of reduced blood exposure and fewer extravasations
Very high ease of use (median = 5.00, IQR = 0.10)	Theme 3: Perceived improvement in workflow efficiency	Convergence—Ease-of-use ratings supported by descriptions of simplified setup and faster cannulation
Significant reduction in extravasation (3.39% to 0.43%, $p = .028$)	Theme 1: Perceived enhancement of patient and staff safety	Convergence—Objective reduction corroborates subjective safety perceptions
No demographic differences in ease of use	Theme 3: Perceived improvement in workflow efficiency	Convergence—Uniform ease-of-use ratings across groups match uniform workflow improvement reports
Years of experience significantly influenced clinical acceptability ($p = .045$)	Theme 2: Perceived improvement in patient comfort and experience	Partial convergence—Experienced nurses' higher acceptability may reflect broader frame of reference for comparison

Note. IQR = interquartile range.

Discussion

This qualitative and quantitative study looked at how easily accepted by nurses (at all levels) was a closed system cannula, the ease of its use, and how it impacted their work flow. Nurses' perceptions indicated that they found the device to be both clinically acceptable and extremely user friendly regardless of age or experience. The implementation of this cannula resulted in a significantly lower rate of contrast extravasation compared to the pre-closed system cannula rate. In addition to providing quantifiable data regarding the efficacy of the device, qualitative results added an additional layer of context for the study by demonstrating that nurses believed that the closed system cannula improved patient and staff safety, improved patient comfort, and streamlined the nursing workflow.

Comparison with Existing Literature

Previous studies have shown similar results as well. Ruiz-Sternberg and colleagues (2012) concluded that nurses preferred closed systems over traditional open systems based upon the reduction of potential blood contact, and increased safety. Additionally, Harraz et al. (2020) showed that closed systems provided successful first attempts in performing CT coronary angiography and prevented extravasations in patients. In addition to the previous research mentioned above; this current study expands those findings by utilizing the technology acceptance model within a specific application in the field of CT Coronary Angiography, and through collecting both quantitative and qualitative data. The uniform perceptions of how easy-to-use the closed-system cannula was among all demographic groups (regardless of age, sex, job title, etc.) will be particularly relevant moving forward. It provides evidence that even inexperienced nurses can use the closed-system cannula successfully without having to undergo extended training. The qualitative data collected also supports the perception that the workflow became simpler with fewer items needed to gather from elsewhere.

Years of Experience as a Moderator of Clinical Acceptability

The results of this study found that the number of years of nursing experience had a significant impact on clinical acceptability ($p = .045$). The most experienced group (>10 years of experience) scored higher in clinical acceptability than the least experienced group (1-3 years of experience) (adjusted $p = .041$). Although statistically significant, the difference between median values of 5.0 versus 4.43 was small in terms of magnitude and both groups still rated the device as acceptable ("very high"). However, the findings suggest that clinicians' experience influences how they evaluate new technologies.

An important potential explanation is that more experienced nurses are able to draw upon a broader knowledge base. As a result, they have developed extensive experience using traditional open systems and can recall the frustration associated with blood exposure; need stick injuries; and extravasation problems. Therefore, to them the closed system will represent an improved product. Less experienced nurses (i.e., 1-3 years of experience) were either exposed to the closed system early in their career or began their careers using it. As such, they do not have extensive first-hand knowledge regarding the use of the older technology. Consequently, they are likely to view the closed system as being less innovative.

Clinical Significance of Extravasation Reduction

In comparison to the pre-implementation extravasation rate of 3.39%, the post-implementation rate of 0.43% represents a statistically significant improvement. The extravasation rate of 3.39% before implementation exceeded the American College of Radiology's (ACR) (2024) recommended benchmark range for extravasation rates of 0.1%-1.2%. Thus, the Department had an increased level of risk before implementing this closed system. The post-implementation rate of 0.43% is clearly below the ACR's benchmark of 1.2% and therefore the use of the closed system cannula has helped the Department comply with internationally recognized safe practices.

The results are in line with Harraz et al. (2020) who found no extravasation events when using a closed

system catheter while there were 23 extravasations when a standard catheter was used for coronary CTA. While the current study did not report zero extravasation events, there was an approximate 85.7% reduction in the number of extravasation events (from 35 to 5). There are many possible explanations for the residual extravasation events including patient specific characteristics that were not assessed in this study (e.g. patients' history of chemotherapy; fragile veins; connective tissue disease; etc.), and operator related variables (i.e. insertion techniques; sites selected).

The reduced incidence of extravasation associated with closed-system cannulas can be attributed to their unique fenestrated-tipped design. The numerous small holes at the end of the catheter allow for dispersal of the contrast medium, resulting in decreased flow velocity and pressure at the vein wall and minimizing catheter whipping within the lumen (Harraz et al., 2020). Additionally, the smaller size (22-gauge vs. 18-gauge) of these systems causes less damage to the vein during high-pressure injections.

Qualitative Insights

The qualitative themes contribute to an understanding of context in which patients are receiving care. Nurses noted decreased frequency of blood exposures and decreased frequency of needle-stick injuries and contaminants as a result of using safety engineered devices. This perception was consistent with existing literature regarding the use of safety engineered medical devices (e.g. needles), which demonstrate a decrease in rates of needle stick injuries (Rashidov et al., 2024; Fukuda et al., 2016).

Nurses also perceived patient comfort to be improved due to the reduction in pain experienced by patients, decrease in anxiety levels and improvement in patient tolerance during these procedures. It is possible that this increased patient comfort can be attributed to the smaller gauge of the catheter used (i.e. 22 vs. 18) since studies have demonstrated that the insertion pain increases with increasing diameter of catheters (Kaplan et al., 2024). Finally, nurses reported that the time required to perform these procedures were significantly reduced compared to previous methods, as well as the simplicity of set up and increased likelihood of successful first attempts at vascular access. As such, there are practical applications for departments performing CCTAs, as it has been established that high volume through put is an essential component in many departments.

Strengths and Limitations

There are many recognized restrictions of this study.

The study methodology employed was a single-group pre-post study design. Therefore, while the association between the new method of application for closed-system cannula and lower rates of extravasation can be supported, it cannot be conclusively determined whether the lower rate of extravasation is directly related to the new method of application of the closed-system cannula. Other temporal variables (i.e., increase

in the level of vigilance by nursing personnel secondary to the Hawthorne effect and concurrent training of nursing staff related to the implementation of the new technology) may have contributed to reported decreases in extravasation rates. Furthermore, the association between use of the new device and decreased rates of extravasation is further diminished by the knowledge of nursing personnel and patients of the nature of devices used.

Additionally, the sample size for this study was quite limited (22 nurses for quantitative analysis and 15 participant nurses for qualitative interviews). Due to this small sample size, the power for subgroup analysis was severely impaired. Therefore, any statistically significant findings related to years of nursing experience should be viewed as preliminary and require replication in future studies involving larger numbers of nurses.

It also appears that ceiling effects existed for all survey questions with median scores of 5.0 and very low IQR values. While the results do indicate high levels of acceptance of closed-system cannula by participating nurses; they also could be indicative of either limits in the scale's capacity to differentiate between different levels of acceptance or social desirability bias resulting from the researcher's insider role at the study site.

Reliability was estimated simultaneously with data collection using the first 15 participants remaining in the final analysis. This is required due to the small pool of subjects available within the target population; however, it does not align with traditional practice of conducting pilot testing separately from the main study and therefore may result in an overestimation of reliability.

This study took place at one tertiary cardiac facility located in Saudi Arabia. Therefore, demographics of participating nurses (all BA graduates; mostly females; with considerable amounts of experience); and/or patient populations studied may not represent other environments; specifically, community facilities or other countries with varying educational programs for registered nurses.

Further, several patient-specific demographic characteristics which influence extravasation risk (patient age, BMI, vein condition, diabetic status, previous chemotherapy administration(s)) were neither documented nor did the study assess severity of extravasations. Therefore, adjustment for confounding variables and determination of consistent benefit derived from utilization of the closed-system cannula across strata of risk are not possible.

Claims made by nurses concerning improvement in efficiency within their workflow as a result of decreased time to administer medication via closed-system cannulas may be biased by self-report due to lack of objective measurements to document timing. Further, there was no independent confirmation of the nurse's capability to complete successful first attempt at venipuncture and there was no documentation/evaluation of direct observational data.

Finally, due to absence of automated coding software for qualitative analysis, all qualitative analysis was performed by one researcher. Peer debriefing was however employed to improve the quality/rigor of qualitative analysis.

Although short-term benefits of closed-system cannulas (lower rates of extravasation) were shown in this study; long term cost effectiveness (economic viability) and occupational health consequences (needlestick injury rate over 12 months after study completion) were not investigated.

Implications for Practice, Education, and Policy

Closed systems must be used for high flow contrast procedures because they are more acceptable to patients, easier to use and have a lower rate of extravasation than open systems. Therefore, all hospitals using open systems should evaluate whether or not to adopt a closed system.

Further, new nurse students who have no experience with either type of system need specific training on how the two types of systems differ. This would best be done through an educational simulation of the different ways blood can enter the skin while administering intravenous contrast. Peer mentoring from more experienced nurses will also provide significant benefits to novice nurses.

The hospital administration needs to review/update policies that require the use of closed systems for all high flow contrast administrations. Additionally, the procurement process needs to provide continuous availability of these devices by automatically ordering them when inventory levels reach a predetermined “par” level. monthly tracking of extravasation incidents as part of the hospital’s quality metrics and displaying those numbers at each nursing station(s) will allow for sustaining the improvement in patient safety. Every six months, conduct focus groups with nursing staff to identify any potential issues related to continued adoption of closed systems. There is likely cost savings due to fewer complications requiring management &/or additional imaging (repeat scans). A reduction in the number of extravasations from 35-5 in just six months supports this theory. However, formal cost-benefit analysis must be completed in future studies to assist in making purchasing decision regarding which device is most cost-effective.

IV. CONCLUSION

The outcomes of this study indicate that the closed-system cannula has high clinical acceptability and extreme user-friendliness for cardiac CTA nurses working at a University Teaching Hospital in Saudi Arabia. There appears to be a correlation between the number of years a nurse has been practicing and their clinical acceptance of the closed-system cannula. However, based on the demographic information of the participating nurses, no differences were identified between the ease or difficulty of using the closed-system cannula. The use of the closed-system cannula

was associated with a statistically significant decrease in contrast extravasation rates compared to open systems used for similar procedures; therefore, this study found that the closed-system cannula enabled the radiology department to meet international standards for the performance of coronary CT angiography (CCTA). Cardiac CTA nurses subjectively reported that the use of the closed-system cannula provided increased safety to both patients and employees within the workplace environment. In addition, these nurses believed that the use of the closed-system cannula improved patient comfort levels and increased workflow efficiencies in their work environments. Therefore, the data from this study support the development of institutional policies/guidelines addressing the use of closed-system cannulas during CCTA examinations. Future studies should include large-scale multicenter trials with appropriate controls to confirm/validate the findings of this study and examine additional issues relevant to the practical implementation of closed-system cannulas (i.e., costs and potential long-term effects to the occupational health of personnel utilizing these devices).

V. RECOMMENDATIONS

Future multi-site studies conducted in numerous hospitals across Saudi Arabia and the Middle East are needed to determine if the results from this study are generalizable. Further research is also needed using longitudinal follow-up (e.g., 12–24 months) of needlestick injury rates to evaluate the occupational health benefits of these devices. Additionally, future studies could assess cost-benefit effectiveness of these devices by determining if there is a decrease in complications, and an increase in workflow efficiency; this data could assist with decision-making processes at each hospital when budgeting. Finally, additional data related to patient satisfaction may also be collected utilizing objective measurements of patient reported outcomes, i.e., standardized assessment tools measuring patient discomfort and/or anxiety levels post-procedure; which would further support the nurse's belief that their patients have less discomfort.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this study.

DISCLOSURE OF USE OF GENERATIVE AI

The author utilized a language model tool solely to assist with rephrasing and structural reorganization of the manuscript from the original thesis format. All data, analyses, interpretations, and the final wording are the author's own. The author assumes full responsibility for the content of this manuscript.

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Evaluation of a Nurse-Led Workplace Mental Health Program Among Employees in a Private Logistics Company in the Philippines

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ABSTRACT

Introduction: Workplace mental health has become a major occupational health concern, particularly in high-demand industries such as logistics, where employees are exposed to heavy workloads, prolonged working hours, operational pressures, and rapidly changing work environments. Although workplace mental health policies have been established in the Philippines, their implementation remains inconsistent, limiting employees' access to structured psychological support and mental health promotion initiatives.

Aim: This study evaluated a nurse-led workplace mental health program among employees in a private logistics company in the Philippines by examining changes in employees' mental well-being and workplace stress before and after participation in a nurse-led workplace mental health program.

Methods: A one-group pre-test-post-test practice-based evaluation was conducted among 105 employees of a private logistics company in the Philippines. Mental well-being and workplace stress were measured before and after the intervention using the World Health Organization 5 Well-Being Index and the Workplace Stress Scale. The nurse-led intervention included mental health screening, psychoeducational toolkit distribution, workplace mental health awareness activities, individualized counselling, referral services, and post-intervention program evaluation. Descriptive statistics and the Wilcoxon signed-rank test were used to analyze changes in mental well-being and workplace stress.

Results: Following implementation of the program, participants demonstrated statistically significant improvements in mental well-being ($Z = -8.875$, $p < .001$) and significant reductions in workplace stress ($Z = -8.845$, $p < .001$). Participants also reported favorable evaluations regarding the clarity and relevance of the workplace mental health program.

Conclusion: The nurse-led workplace mental health program was associated with improved mental well-being, reduced workplace stress, and positive participant evaluations. High participant retention, with all 105 employees completing both pre- and post-intervention assessments, further supports the feasibility and acceptability of the program. These findings strengthen the evidence base for integrating structured nurse-led workplace mental health initiatives into occupational health services to promote employee well-being and healthier workplace environments. Future controlled studies are recommended to establish the long-term effectiveness, sustainability, and cost-effectiveness of workplace mental health interventions.

Keywords: *workplace mental health, occupational health, mental well-being, workplace stress, nurse-led workplace mental health program*

I. INTRODUCTION

Mental health is a fundamental component of overall health, mental well-being, and quality of life. In recent years, it has become increasingly recognized as a critical determinant of workforce productivity, employee engagement, organizational resilience, and sustainable economic development. Poor mental health among employees is associated with absenteeism, presenteeism, reduced work performance, occupational injuries, increased healthcare utilization, and staff turnover, resulting in substantial social and economic

costs for both employers and society (de Oliveira et al., 2023). Recognizing these consequences, the International Labour Organization (ILO) and the World Health Organization (WHO) identified workplace mental health as a global public health priority and estimated that depression and anxiety contribute to the loss of approximately 12 billion working days annually, costing the global economy an estimated US\$1 trillion each year due to reduced productivity (International Labour Organization & World Health Organization [ILO & WHO], 2022). These findings emphasize that promoting mental health in the workplace is not only a

health imperative but also an organizational and economic necessity.

The logistics industry is widely recognized as one of the most demanding occupational sectors because employees routinely work under strict deadlines, fluctuating operational demands, shift schedules, and rapidly changing work environments. These occupational conditions increase employees' exposure to psychosocial hazards, including excessive workload, time pressure, fatigue, role ambiguity, and work-related stress, all of which may adversely affect psychological well-being and job performance. Prolonged exposure to these stressors has been associated with an increased risk of anxiety, burnout, emotional exhaustion, absenteeism, and reduced work productivity (de Oliveira et al., 2023). Furthermore, evidence from systematic reviews indicates that poor psychosocial working conditions not only compromise employees' mental health but also negatively affect organizational performance, workplace safety, employee retention, and overall quality of work life (Aust et al., 2024). These findings underscore the importance of implementing comprehensive workplace mental health interventions that address both individual well-being and organizational factors, particularly in high-demand industries such as logistics.

Occupational health nurses play a pivotal role in promoting workplace mental health by integrating health promotion, early identification of psychological concerns, mental health education, supportive counselling, referral coordination, and employee advocacy. Workplace mental health refers to the promotion, protection, and support of employees' mental well-being through workplace policies, practices, and interventions that reduce psychosocial risks, foster resilience, and create psychologically safe working environments. It is about fostering safe, inclusive, and supportive conditions where employees can thrive emotionally and professionally. In the Philippines, workplace mental health has become an important occupational health priority following the enactment of the Philippine Mental Health Act (Republic Act No. 11036), the first national legislation that recognizes the right of all Filipinos to accessible, comprehensive, and integrated mental health services. To operationalize mental health promotion within the workplace, the Department of Labor and Employment (DOLE) issued Department Order No. 208, Series of 2020, which provides guidelines for the implementation of workplace policies and programs that promote mental health, prevent stigma and discrimination, facilitate early identification of mental health concerns, and establish appropriate referral mechanisms. Collectively, these policies encourage employers to integrate mental health promotion into occupational safety and health programs and foster psychologically healthy work environments. Despite these national initiatives, the implementation of structured workplace mental health programs remains inconsistent across many organizations, particularly within the private sector, where mental health services are often limited and primarily focused on reactive rather than preventive approaches. Consequently, many employees continue

to lack access to comprehensive mental health promotion, early intervention, and supportive occupational health services. In this study, employees' mental well-being was assessed using the World Health Organization-Five Well-Being Index (WHO-5), which measures positive psychological well-being. Accordingly, the term "mental well-being" is used throughout this manuscript to describe the study outcome, while "psychological well-being" is retained only when referring to the WHO-5 instrument or terminology used in cited literature.

As frontline healthcare professionals within the workplace, occupational health nurses are uniquely positioned to identify employees at risk of psychological distress through health promotion, early identification of psychological concerns, mental health education, supportive counselling, referral coordination, and employee advocacy. They also facilitate access to appropriate mental health services and collaborate with employers to develop psychologically healthy work environments. Evidence indicates that comprehensive workplace mental health programs improve employees' mental well-being, reduce work-related stress, and strengthen organizational support for mental health (International Labour Organization & World Health Organization [ILO & WHO], 2022). In the Philippine context, workplace psychosocial support initiatives among nurses—including confidentiality policies, peer support, and hospital-based wellness programs—have been associated with improved compassion satisfaction and reduced burnout (Castillejos et al., 2025). Similarly, the Department of Health, in collaboration with the World Health Organization and the Australian Government, launched the Wellness Movement in 2023 to strengthen psychosocial support and promote mental well-being among healthcare workers (World Health Organization, 2023). Although these initiatives demonstrate a growing national commitment to workplace mental health, published evidence evaluating structured nurse-led workplace mental health programs in private-sector industries, particularly the logistics sector, remains limited. This gap highlights the need for practice-based studies evaluating the effectiveness of occupational health nursing interventions in non-healthcare workplaces.

The present study was guided by Peplau's Interpersonal Relations Theory, which conceptualizes nursing as a therapeutic interpersonal process that facilitates growth, problem-solving, and health promotion through collaborative nurse-client relationships (Peplau, 1952). According to Peplau, the phases of orientation, identification, working, and resolution provide a framework for establishing trust, promoting effective communication, and supporting behavioral change. The independent variable was the implementation of the nurse-led workplace mental health program, consisting of screening, psychoeducation, counselling, referral, and evaluation. The dependent variables were employees' mental well-being and workplace stress, measured using the WHO-5 Well-Being Index and the Workplace Stress Scale. The framework assumes that structured nurse-led

interventions foster trust and communication, which in turn improve well-being and reduce stress. This relationship demonstrates how occupational health nurses, through therapeutic interactions, can influence employee outcomes and embed mental health promotion into workplace practice. These principles informed the development of the nurse-led workplace mental health program by guiding the delivery of mental health screening, psychoeducation, individualized counselling, and referral services. The application of Peplau's theory reinforces the essential contribution of occupational health nurses in fostering psychologically supportive workplace environments while empowering employees to actively participate in maintaining their mental well-being (Alligood, 2022). Although Peplau's Interpersonal Relations Theory provided the primary theoretical framework for this study, other nursing theories could also support workplace mental health interventions. Pender's Health Promotion Model, for example, emphasizes individual beliefs, self-efficacy, and commitment to health-promoting behaviours. This model complements workplace mental health promotion by encouraging employees to actively engage in self-care, stress management, and healthy coping strategies that contribute to sustained mental well-being (Pender, 2011). Nevertheless, Peplau's theory was considered the most appropriate framework because the intervention centred on therapeutic nurse–employee interactions, counselling, and collaborative problem-solving.

Despite increasing recognition of workplace mental health as a public health and organizational priority, evidence regarding nurse-led workplace mental health programs implemented in private-sector organizations in the Philippines remains limited. Most published workplace mental health studies have focused on healthcare professionals, educational institutions, and public-sector organizations (Aust et al., 2024; ILO & WHO, 2022). In contrast, relatively few studies have examined nurse-led workplace mental health interventions among employees in the logistics industry, despite the sector's high operational demands, shift work, and time-sensitive responsibilities that may increase the risk of psychological distress. Moreover, previous workplace mental health interventions have often evaluated individual program components, such as psychoeducation or stress management, rather than integrated programs combining mental health screening, health education, individualized counselling, referral services, and program evaluation within routine occupational health practice. This gap limits the availability of practice-based evidence to guide occupational health nurses and employers in designing comprehensive and sustainable workplace mental health programs. Local studies highlight psychosocial support among Filipino nurses, which improved compassion satisfaction and reduced burnout (Castillejos et al., 2025), and employee wellness programs in publishing, which emphasized culturally responsive and emotionally attuned approaches to workplace mental health (Manansala, 2025).

Therefore, this study evaluated the implementation and outcomes of a nurse-led workplace mental health program among employees of a private logistics company in the Philippines. The program incorporated structured components such as mental health screening, health education, individualized counselling, referral services, and program evaluation within routine occupational health practice. The study addressed the lack of practice-based evidence on nurse-led workplace mental health initiatives in private-sector organizations, particularly in the logistics industry where operational demands, shift work, and time-sensitive responsibilities heighten risks of psychological distress. To respond to this gap, the study evaluated the feasibility, outcomes, and employee perceptions of the intervention. The independent variable was the implementation of the nurse-led workplace mental health program, while the dependent variables were employees' mental well-being, workplace stress levels, and program evaluation outcomes. The significance of the study lies in its contribution to occupational health nursing practice by generating preliminary evidence on the value of integrating structured nurse-led mental health initiatives into private-sector workplaces. Findings are expected to guide employers, occupational health nurses, and policymakers in designing comprehensive and sustainable workplace mental health programs, thereby fostering psychologically healthy work environments and advancing workplace mental health promotion in the Philippines.

II. METHODS

Research Design

This study employed a one-group pre-test-post-test practice-based evaluation design to evaluate the implementation and outcomes of a nurse-led workplace mental health program among employees of a private logistics company in the Philippines. Baseline and post-intervention assessments were conducted to examine changes in participants' mental well-being and workplace stress following implementation of the intervention. A one-group pre-test-post-test design was considered appropriate because it enables the evaluation of workplace health interventions under real-world organizational conditions where randomization or the inclusion of a comparison group may not be feasible. Although the absence of a comparison group limits causal inference, this design is widely used in practice-based evaluations and quality improvement initiatives to assess intervention outcomes within routine organizational practice (Polit & Beck, 2021).

Participants and Sampling

This study was conducted in a private logistics company located in Parañaque, Metro Manila, Philippines, that provides freight forwarding, transportation, and supply chain management services. The specific company name is withheld to preserve organizational confidentiality and protect the privacy of participants. The organization operates in a dynamic work environment where employees are routinely exposed to operational demands, workload pressures,

and time-sensitive responsibilities, making it an appropriate setting for evaluating a workplace mental health program.

A purposive sampling technique was employed to recruit participants who met the predetermined inclusion criteria. This one-group pre-test–post-test design was chosen for its feasibility in a real-world organizational setting, allowing direct measurement of changes in mental well-being and workplace stress. Its strength lies in ecological validity and practical application within routine occupational health practice, though the absence of a control group limits causal inference and requires cautious interpretation. Logistics employees were selected because the sector is characterized by high operational demands, strict deadlines, and shift work, which increase vulnerability to psychological distress and make it an appropriate population for evaluating workplace mental health interventions. Eligible participants were employees assigned to the selected operational and administrative departments, had been employed by the company for at least six months, were available during the implementation period, and voluntarily agreed to participate by providing written informed consent. Employees who were newly hired, on approved leave during the study period, assigned outside the selected departments, or directly involved in implementing the intervention, were excluded to minimize potential sources of bias.

As this study was conducted as a practice-based evaluation within a single organization, all eligible employees who met the inclusion criteria and consented to participate during the implementation period were invited to take part in the study. The sample size of 105 employees was determined by the total number of eligible and consenting participants who completed both the pre-intervention and post-intervention assessments, rather than by a formal sample size calculation. This approach is appropriate for practice-based evaluation studies, as it enables the assessment of interventions under real-world organizational conditions while enhancing the practical relevance and applicability of the findings to occupational health practice.

The inclusion criteria consisted of regular employees who had been with the company for at least six months, were actively working during the study period, and voluntarily consented to participate in the program. The exclusion criteria included probationary employees, those on extended leave (e.g., medical or maternity leave), and individuals who declined to provide informed consent. By applying these criteria, the study ensured that participants were representative of the active workforce while safeguarding confidentiality and ethical standards.

Data Gathering Tools

Data were collected using two standardized instruments and one researcher-developed program evaluation questionnaire.

Mental well-being was assessed using the World Health Organization-Five Well-Being Index (WHO-5), a five-item self-report instrument developed by the World Health Organization to measure positive psychological well-being. The WHO-5 assesses positive mood, vitality, relaxation, and general interest in daily activities. Each item is rated on a six-point Likert scale ranging from 0 (At no time) to 5 (All of the time), yielding a total raw score ranging from 0 to 25, with higher scores indicating better mental well-being. The WHO-5 is a widely used instrument with established validity and reliability across clinical, community, and occupational populations (Topp et al., 2015).

Perceived workplace stress was measured using the Workplace Stress Scale (WSS) developed by The Marlin Company in collaboration with the American Institute of Stress (The Marlin Company & American Institute of Stress, 2023). The instrument consists of eight items that assess employees' perceptions of workplace stress related to workload, communication, organizational support, job control, recognition, and the work environment. Responses are recorded using a five-point Likert scale ranging from 1 (Never) to 5 (Very Often), with higher scores indicating greater perceived workplace stress. The Workplace Stress Scale has been widely utilized in occupational health and organizational settings as a practical screening instrument for assessing work-related stress and evaluating workplace mental health initiatives.

Following implementation of the intervention, participants completed a researcher-developed program evaluation questionnaire designed to assess their perceptions of the nurse-led workplace mental health program. The questionnaire comprised two items that evaluated (1) the clarity of the information presented and (2) the relevance of the workplace mental health awareness campaign to participants' needs. Responses were rated using a five-point Likert scale, with higher scores indicating more positive evaluations of the program.

Prior to implementation, the questionnaire underwent expert content review by professionals with expertise in human resource management, organizational administration, and nursing research, including the research adviser with doctoral-level qualifications, to assess the clarity, relevance, and appropriateness of the evaluation items in relation to the objectives of the workplace mental health program.

Data Gathering Procedure

The nurse-led workplace mental health program was implemented from May 1 to June 2, 2026, using the Plan–Do–Check–Act (PDCA) cycle as the quality improvement framework and Peplau's Interpersonal Relations Theory as the theoretical framework guiding therapeutic nurse–participant interactions. The PDCA cycle provided a systematic approach for planning, implementing, monitoring, and evaluating the workplace mental health program, while Peplau's theory guided the establishment of therapeutic relationships that promoted trust, effective

communication, psychological support, and collaborative problem-solving throughout the intervention (Deming, 1986; Peplau, 1952; Alligood, 2022).

The intervention was implemented in four sequential phases.

Phase 1. Initial Assessment

This phase lasted one week (May 1–7, 2026). Eligible employees were invited to participate in the study and were provided with a detailed explanation of the study objectives, procedures, potential benefits and risks, confidentiality measures, and their rights as research participants. Written informed consent was obtained before participation.

Baseline data were collected using the World Health Organization-Five Well-Being Index (WHO-5) and the Workplace Stress Scale (WSS) to determine participants' initial levels of mental well-being and workplace stress. Each assessment session lasted approximately 30–45 minutes and was conducted face-to-face in a private office setting by the occupational health nurse. The findings from the baseline assessment were used to guide the implementation of the workplace mental health program. During this phase, the occupational health nurse established rapport and initiated therapeutic communication with participants, consistent with the orientation phase of Peplau's Interpersonal Relations Theory (Peplau, 1952).

Phase 2. Mental Health Promotion

Following the baseline assessment, the occupational health nurse implemented the workplace mental health promotion program. This phase spanned two weeks (May 8–21, 2026). Each participant received a printed and digital toolkit containing evidence-based information on workplace mental health, stress management techniques, adaptive coping strategies, self-care practices, and employees' rights under the Philippine Mental Health Act. The toolkit was distributed at the start of the program and reinforced during awareness sessions. Content was designed to be concise and practical, with materials reviewed by experts in nursing research and organizational administration to ensure clarity and relevance.

Workplace mental health awareness sessions were conducted twice weekly (four sessions in total), each lasting 60 minutes. Sessions were delivered in small departmental groups (8–12 participants) through face-to-face interactive discussions, supplemented by digital materials for reinforcement. The occupational health nurse facilitated all sessions, using case-based examples and participatory activities to enhance engagement. Throughout this phase, the nurse encouraged participants' recognition of individual mental health needs and active engagement in the intervention, reflecting Peplau's identification phase (Peplau, 1952; Alligood, 2022).

Phase 3: Counselling and Referral

This phase was conducted over two weeks (May 15–28, 2026), overlapping with the promotion phase to provide timely support. Employees identified during screening as requiring additional psychological support received individualized counselling from the occupational health nurse. Counselling sessions were scheduled once weekly per participant, with each session lasting 45–60 minutes, conducted face-to-face in a private office to ensure confidentiality. Follow-up sessions were offered as needed, depending on participant progress.

When specialized psychological assessment or treatment was indicated, participants were referred to external mental health professionals (e.g., psychiatrists or clinical psychologists) through the organization's established referral pathway. Referrals were made only after obtaining informed consent and maintaining strict confidentiality. This phase corresponded with Peplau's working phase, in which the nurse supports problem-solving, facilitates behavioral change, and assists participants in utilizing appropriate health resources.

Phase 4. Post-Intervention Evaluation

The final phase lasted one week (May 29–June 2, 2026). Participants completed the WHO-5 Well-Being Index, the Workplace Stress Scale, and the program evaluation questionnaire. Each evaluation session lasted approximately 30–45 minutes and was conducted face-to-face by the occupational health nurse. The post-intervention assessment measured changes in employees' mental well-being and workplace stress and evaluated participants' perceptions of the nurse-led workplace mental health program. The pre-intervention and post-intervention findings were compared to evaluate changes in mental well-being and workplace stress following implementation of the intervention and to assess its feasibility for integration into routine occupational health services.

Data Analysis Procedure

Data were analyzed using Jamovi statistical software (Version 2.6; The Jamovi Project, 2024). Descriptive statistics, including frequencies, percentages, means, standard deviations, medians, and interquartile ranges (where appropriate), were used to summarize participants' demographic characteristics, mental well-being scores, workplace stress scores, and program evaluation responses.

To evaluate changes in mental well-being and workplace stress following implementation of the nurse-led workplace mental health program, pre-intervention and post-intervention WHO-5 Well-Being Index and Workplace Stress Scale scores were compared using the Wilcoxon signed-rank test. The magnitude of the observed changes was quantified by calculating the effect size (r) for each Wilcoxon signed-rank test using the formula $r = Z/\sqrt{N}$. The considerable effect sizes were interpreted according to Cohen's guidelines, where 0.10 represents a small effect, 0.30 a medium effect, and 0.50 or greater a large effect.

This non-parametric statistical test was selected because the study involved paired observations obtained from the same participants before and after the intervention and is appropriate for analyzing related samples when the assumptions for parametric testing are not met (Field, 2018; Pallant, 2020). Statistical significance was established at $p < .05$, and all statistical tests were two-tailed.

Ethical Consideration

Ethical approval for this study was obtained from the Institutional Research Ethics Committee of St. Paul University Manila prior to the commencement of data collection (REC Proposal No. 2026-146 IMA – CNAHS). Ethical principles governing research involving human participants were observed throughout the study (Philippine Health Research Ethics Board, 2022). Participation was voluntary, and written informed consent was obtained from all participants before data collection. Participants were informed of the purpose of the study, study procedures, potential benefits and risks, and their right to withdraw from the study at any time without penalty. Confidentiality and anonymity were maintained by assigning codes to participant responses and securely storing all research data. Information obtained during mental health screening and counselling was treated confidentially in accordance with the Data Privacy Act of 2012 (Republic of the Philippines, 2012). Referrals to external mental health professionals were made only with the participant's consent.

III. RESULTS AND DISCUSSION

Participant Characteristics

Table 1
Demographic Characteristics of the Participants
 (N=105)

Variable	Category	f	%
Gender	Female	55	52.4
	Male	50	47.6
Length of Service	6 – 1 months	16	15.2
	1 year	21	20.0
	2 years	28	26.7
	3 years	6	5.7
	4 years	6	5.7
	5 years and above	28	26.7
Department	Airfreight	18	17.1
	Finance	10	9.5
	National Operational Excellence Center	66	62.9
	Ocean freight	8	7.6
	Transport	3	2.9

Table 1 presents the demographic characteristics of the 105 employees who participated in the study. Of the participants, 55 (52.4%) were female and 50 (47.6%) were male. Regarding length of service, the largest proportions of participants had been employed for two years (26.7%) and five years or more (26.7%), followed by one year (20.0%) and six to eleven months (15.2%).

Only 5.7% of participants had three years of service, and 5.7% had four years of service. Most participants were assigned to the National Operational Excellence Center (62.9%), followed by Air Freight (17.1%), Finance (9.5%), Ocean freight (7.6%), and Transport (2.9%).

The participant profile reflects a workforce with diverse occupational backgrounds and varying lengths of organizational experience, providing an appropriate context for evaluating the workplace mental health program. The relatively balanced gender distribution and representation from multiple operational departments suggest that the intervention was implemented across a broad segment of the participating organization rather than within a single occupational group. Although this study was not designed to compare outcomes across demographic characteristics, including employees with different lengths of service and departmental assignments enhances the practical relevance of the findings and supports the feasibility of implementing nurse-led workplace mental health initiatives across diverse workplace settings.

All 105 employees who consented to participate completed both the pre intervention and post intervention assessments. No participants withdrew or were lost to follow up during the implementation period. The absence of attrition reduced the risk of attrition bias and ensured complete paired pre-intervention and post-intervention data from all participants, thereby enhancing the reliability of the findings and supporting the feasibility of implementing structured nurse-led workplace mental health programs in organizational settings.

Effect of the Nurse-Led Workplace Mental Health Program on Mental Well-Being

Table 2 presents the changes in participants' mental well-being before and after implementation of the nurse-led workplace mental health program. Before the intervention, participants had a mean WHO-5 Well-Being Index score of 12.15 (SD = 2.24), corresponding to poor mental well-being (48.6%). Following implementation of the program, the mean score increased to 20.00 (SD = 1.58), corresponding to good mental well-being (80.0%).

The Wilcoxon signed-rank test demonstrated a statistically significant improvement in mental well-being ($Z = -8.875$, $p < .001$) with a large effect size ($r = 0.866$). The large effect size indicates meaningful improvements in employees' positive mood, vitality, relaxation, restorative sleep, and interest in daily activities, reflecting enhanced mental well-being as measured by the WHO-5 Well-Being Index. Together, these findings suggest that the nurse-led workplace mental health program was associated with meaningful improvements in employees' mental well-being.

Table 2
Changes in Mental Well-Being Before and After Implementation of the Nurse-Led Workplace Mental Health Program (N = 105)

Variable	Pre-intervention <i>M ± SD</i>	Interpretation	Post-intervention <i>M ± SD</i>	Interpretation	Z	p	Effect Size (<i>r</i>)
WHO-5 Well-Being Index	12.15 ± 2.24	Poor well-being (48.6%)	20.00 ± 1.58	Good well-being (80.0%)	-8.875	< .001*	0.866 (Large)

Note. Higher WHO-5 scores indicate better mental well-being. The WHO-5 total score ranges from 0 to 25 and may be converted to a percentage score by multiplying the total score by four. The Wilcoxon signed-rank test was used to compare pre- and post-intervention scores. *p* < .05 indicates statistical significance.

although causal inference cannot be established because of the one-group pretest-post-test design.

These findings are consistent with the recommendations of the World Health Organization and the International Labour Organization (2022), which emphasize that comprehensive workplace mental health programs should integrate mental health promotion, early identification of psychological concerns, supportive organizational policies, and timely access to appropriate mental health services. The present intervention incorporated these recommended components through mental health screening, psychoeducation, individualized counselling, referral services, and workplace mental health awareness activities, thereby providing employees with multiple opportunities to recognize psychological concerns and access appropriate support.

The results are also consistent with the findings of de Oliveira et al. (2023), who reported that better employee mental health is associated with improved work functioning, enhanced productivity, reduced absenteeism, and greater workplace engagement. Similarly, Aust et al. (2024) concluded that workplace interventions combining organizational support with individual-level mental health strategies are associated with meaningful improvements in employees' mental well-being. Collectively, these studies support the practical value of comprehensive workplace mental health interventions that address both individual and organizational determinants of mental health.

From an occupational health nursing perspective, nurses play a critical role in identifying workplace stressors, providing timely psychological support, and facilitating access to appropriate mental health services. Guided by Peplau's Interpersonal Relations Theory (Peplau, 1952), the therapeutic relationship established between the occupational health nurse and participants may have promoted trust. Beyond these nursing strategies, other factors likely contributed to the positive outcomes observed. Organizational support, such as management endorsement of the program, created a psychologically safe environment that reduced stigma and encouraged participation. Peer relationships and collective engagement fostered a sense of shared responsibility for mental health, which enhanced program acceptance. Additionally, the integration of multiple components—screening, education, counselling, and referral—provided a holistic approach addressing both preventive and responsive needs and may have contributed to the observed changes. The logistics industry context, with its high operational demands, may also have heightened

employee receptivity to interventions that directly address stress and workload pressures, further amplifying the benefits of the program.

Despite these encouraging findings, the results should be interpreted with caution. The one-group pretest-post-test design without a comparison group limits the ability to attribute the observed improvements solely to the intervention, and external factors occurring during the implementation period may also have influenced participants' mental well-being. Beyond the intervention itself, several possible confounding workplace and organizational factors may have contributed to the observed improvements in mental well-being. Fluctuations in workload, such as temporary reductions in operational demands or seasonal variations in logistics activity, may have alleviated stress independently of the program. Management support and concurrent organizational initiatives, including informal wellness practices or leadership communication, could also have reinforced employees' perceptions of psychological safety. Employee motivation and personal coping strategies, which were not controlled by, may have influenced outcomes as well. Additionally, participation in the study may have heightened awareness of mental health issues and encouraged positive behavioral changes through the Hawthorne effect, wherein employees improve simply because they are being observed and engaged. These factors underscore the importance of cautious interpretation and highlight the need for future controlled studies to disentangle program effects from broader organizational dynamics. Nevertheless, the magnitude of the observed improvement provides preliminary practice-based evidence supporting the feasibility and potential value of integrating structured nurse-led workplace mental health programs into routine occupational health services. Beyond statistical significance, the magnitude of the observed effect suggests that the improvement in mental well-being was substantial and may have practical relevance for workplace mental health practice. The WHO-5 findings reflect improvements in positive mood, vitality, relaxation, sleep, and interest in daily activities, which are the domains assessed by the instrument. However, downstream outcomes such as burnout, productivity, absenteeism, and employee retention were not directly measured in the present study and should be evaluated in future research. Improved mental well-being may support healthier coping with occupational demands and positive day-to-day functioning; however, these downstream outcomes were not directly measured in the present study. From an organizational perspective, these changes may have implications for employee functioning and workplace well-being; however,

productivity, absenteeism, and retention were not directly measured in the present study. Thus, the intervention demonstrates practical value not only in improving individual mental well-being but also in fostering healthier and more sustainable workplace environments. Both mental well-being ($r = 0.866$) and workplace stress ($r = 0.863$) demonstrated large effect sizes, indicating meaningful improvements following implementation of the nurse-led workplace mental health program. For mental well-being, these improvements were reflected in participants' positive mood, vitality, relaxation, restorative sleep, and interest in daily activities, consistent with the domains measured by the WHO-5 Well-Being Index.

Effect of the Nurse-Led Workplace Mental Health Program on Workplace Stress

Table 3 presents the changes in participants' workplace stress before and after implementation of the nurse-led workplace mental health program. Prior to the intervention, participants had a mean Workplace Stress Scale score of 23.01 ($SD = 3.00$), corresponding to moderate stress.

The Wilcoxon signed-rank test demonstrated a statistically significant reduction in workplace stress ($Z = -8.845$, $p < .001$), with a large effect size ($r = 0.863$). This finding was associated with a substantial decrease in employees' perceived stress levels, shifting participants from moderate stress to a calmer and more manageable state. The magnitude of the observed effect indicates that the reduction in perceived workplace stress was substantial.

The significant reduction in workplace stress observed following implementation is consistent with a favorable change in employees' perceived workplace stress. The considerable effect size observed for workplace stress ($r = 0.863$) indicates that the observed reduction was substantial in magnitude and may have practical relevance for workplace mental health practice. These findings are consistent with the recommendations of the International Labour Organization and World Health Organization (2022), which advocate comprehensive workplace mental health programs that integrate mental health promotion, early identification, supportive counselling, and organizational support to reduce work-related stress and enhance employee well-being. Similarly, Aust et al. (2024) reported that workplace interventions combining organizational and individual-level strategies are associated with meaningful reductions in psychosocial risks and improvements in employees' mental health. The present intervention incorporated

these evidence-based components through mental health screening, psychoeducation, individualized counselling, referral services, and workplace awareness activities, which may have contributed to the observed reduction in workplace stress. Although the one-group pre-test–post-test design precludes causal inference, these findings provide preliminary evidence. Additionally, the integration of multiple components—screening, education, counselling, and referral—provided a holistic approach addressing both preventive and responsive needs and may have contributed to the observed changes. From an occupational health nursing perspective, nurses play a critical role in identifying workplace stressors, providing timely psychological support, and facilitating access to appropriate mental health services. Guided by Peplau's Interpersonal Relations Theory (Peplau, 1952), the therapeutic relationship established between the occupational health nurse and participants may have promoted trust, strengthened adaptive coping strategies, and encouraged employees to seek support when experiencing work-related stress. These findings support the integration of structured nurse-led workplace mental health interventions into routine occupational health services to promote psychologically healthy workplaces (Alligood, 2022).

Despite these encouraging findings, the results should be interpreted with caution because the study employed a one-group pre-test-post-test design without a comparison group. Consequently, the observed reduction in workplace stress cannot be attributed solely to the intervention, as external factors may also have influenced participants' stress levels during the implementation period. In particular, changes in workload distribution, management practices, or organizational support during the study period may have contributed to reductions in perceived stress. Seasonal variations in logistics operations, peer support, or collective engagement could also have influenced stress outcomes. Moreover, employees' awareness of being part of a structured workplace study may have encouraged greater self-regulation and stress management, consistent with the Hawthorne effect. These potential confounders suggest that while the intervention likely played a role in reducing workplace stress, organizational and contextual factors may have amplified the observed improvements. Future evaluations should therefore incorporate comparison groups and longitudinal designs to better isolate the effects of nurse-led interventions from broader workplace influences. Nevertheless, the findings provide preliminary evidence supporting the feasibility and potential value of nurse-led workplace mental

Table 3
Changes in Workplace Stress Scores Before and After Implementation of the Nurse-Led Workplace Mental Health Program (N = 105)

Variable	Pre-intervention <i>M ± SD</i>	Interpretation	Post-intervention <i>M ± SD</i>	Interpretation	<i>Z</i>	<i>p</i>	Effect Size (<i>r</i>)
Workplace Stress Scale	23.01 ± 3.00	Moderate stress	14.30 ± 1.90	Chilled out and relatively calm	−8.845	< .001*	0.863 (Large)

Note. Higher Workplace Stress Scale scores indicate greater workplace stress. Scores were interpreted as follows: ≤15 = Chilled out and relatively calm; 16–20 = Fairly low stress; 21–25 = Moderate stress; 26–30 = Severe stress; 31–40 = Potentially dangerous stress. The Wilcoxon signed-rank test was used to compare pre- and post-intervention scores. $p < .05$ indicates statistical significance

health programs in reducing perceived workplace stress among employees.

The reduction in workplace stress may have important clinical and organizational implications. Lower perceived stress may support healthier coping, concentration, and day-to-day work functioning. From an organizational perspective, improved stress management may contribute to healthier and more supportive workplace environments. However, these potential downstream outcomes were not directly measured in the present study and should be evaluated in future research.

Program Evaluation and Participant Feedback

Table 4 presents participants' evaluation of the nurse-led workplace mental health program following its implementation. The clarity of the information presented during the awareness campaign received a mean score of 3.99 (SD = 0.54), indicating a high level of agreement among participants. The relevance of the awareness campaign to participants' needs obtained a higher mean score of 4.24 (SD = 0.58), corresponding to a very high level of agreement. The relatively small standard deviations for both items indicate consistent responses among participants regarding the clarity and relevance of the program.

A distinguishing feature of this study is its focus on employees in the logistics industry, a sector that has received limited scholarly attention despite its high operational demands, shift work, and time-sensitive responsibilities that predispose workers to psychological distress. Previous workplace mental health interventions have largely concentrated on healthcare, educational, or public-sector organizations, whereas this research contributes practice-based evidence from a private-sector logistics company. By situating the intervention within this context, the study expands the scope of occupational health nursing and underscores the feasibility of implementing structured nurse-led programs in diverse workplace environments.

The decision to examine psychological well-being and workplace stress levels as primary outcomes was grounded in their direct relevance to both individual and organizational functioning. Mental well-being is a critical determinant of resilience, engagement, and overall quality of life, while workplace stress is strongly associated with absenteeism, presenteeism, reduced productivity, and turnover. Improvements in these outcomes are clinically relevant and may have implications for employee functioning and workplace well-being. However, organizational performance outcomes were not directly measured in the present study. By targeting these outcomes, the intervention

addressed both personal and systemic dimensions of workplace mental health, reinforcing the value of nurse-led initiatives in promoting sustainable well-being and organizational resilience.

The favourable participant evaluations indicate that employees perceived the nurse-led workplace mental health program as clear, relevant, and appropriate to their workplace needs. The high rating for clarity suggests that the educational content and awareness activities were communicated effectively, enabling participants to understand the key concepts presented during the intervention. Similarly, the high rating for relevance indicates that participants considered the program applicable to their workplace experiences and responsive to their mental health needs. These findings support the acceptability and practical applicability of the nurse-led workplace mental health program within an occupational setting.

Positive participant evaluations are important in workplace health promotion because interventions that are perceived as understandable and relevant are more likely to encourage engagement, participation, and sustained organizational support. Although the present evaluation did not assess long-term behavioural change or organizational outcomes, the favourable perceptions reported by participants suggest that the program was well received and may provide a practical foundation for the integration of structured nurse-led mental health initiatives into routine occupational health services. In addition, participant retention was high throughout the intervention period, with all 105 employees who consented completing both pre- and post-intervention assessments. No withdrawals were recorded, indicating strong acceptability and feasibility of the nurse-led workplace mental health program within the organizational setting.

These findings are consistent with the recommendations of the World Health Organization and the International Labour Organization (2022), which emphasize that workplace mental health interventions should be accessible, contextually relevant, and responsive to employees' needs. Occupational health nurses play a pivotal role in translating these recommendations into practice through health education, early mental health promotion, and the delivery of evidence-informed workplace interventions. The positive participant evaluations observed in this study therefore reinforce the potential contribution of nurse-led workplace mental health programs to foster supportive workplace environments and promoting employee well-being.

Nevertheless, these findings should be interpreted with caution because the program evaluation

Table 4

Participant Evaluation of the Nurse-Led Workplace Mental Health Program (N = 105)

Evaluation Item	<i>M</i>	Median	<i>SD</i>	Interpretation
Clarity of the information presented	3.99	4.00	0.54	High
Relevance of the awareness campaign to participants' needs	4.24	4.00	0.58	Very High

Note. Responses were measured using a 5-point Likert scale, with higher scores indicating more positive evaluations of the workplace mental health program.

questionnaire assessed participants' immediate perceptions of the intervention rather than long-term behavioural or organizational outcomes. Future studies should incorporate validated implementation measures and qualitative approaches to explore participants' experiences more comprehensively and to evaluate the sustainability of workplace mental health programs over time.

Limitations of the Study

This study has several limitations that should be considered when interpreting the findings. First, the one-group pre-test-post-test design without a comparison group limits the ability to establish causal relationships between the intervention and the observed outcomes. Second, the study was conducted in a single private logistics company using purposive sampling, which may limit the transferability of the findings to other occupational settings. Third, mental well-being, workplace stress, and program evaluation were measured using self-reported questionnaires, making the findings susceptible to response and social desirability bias. Finally, the post-intervention assessment was conducted immediately after the intervention, preventing evaluation of its long-term effectiveness and sustainability. Despite these limitations, the study provides preliminary practice-based evidence supporting the feasibility and potential value of nurse-led workplace mental health programs in occupational health settings.

IV. CONCLUSION

This study demonstrated that a nurse-led workplace mental health program was associated with significant improvements in employees' mental well-being and significant reductions in workplace stress among employees of a private logistics company in the Philippines. Participants also evaluated the program positively in terms of its clarity and relevance, supporting the feasibility and acceptability of integrating structured nurse-led workplace mental health interventions into routine occupational health practice.

The findings reinforce the important role of occupational health nurses in promoting workplace mental health through structured interventions, including mental health screening, psychoeducation, counselling, referral services, and workplace awareness activities. These results suggest that integrating nurse-led workplace mental health programs into occupational health services may contribute to healthier, more supportive, and psychologically safe work environments.

Although positive outcomes were observed, the one-group pre-test-post-test design limits the ability to establish causal relationships between the intervention and the observed improvements. Therefore, the findings should be interpreted as demonstrating an association rather than a causal effect. Future research using controlled or randomized study designs, larger and more diverse samples, and longer follow-up periods are recommended to further evaluate the effectiveness,

sustainability, and generalizability of nurse-led workplace mental health interventions.

V. RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed:

For Occupational Health Nurses

Occupational health nurses should integrate routine mental health screening, psychoeducation, supportive counselling, and referral pathways into occupational health services to facilitate the early identification of psychological concerns and promote employees' mental well-being. Organizations should provide adequate staffing support, including trained peer facilitators or workplace wellness champions, to enhance program implementation while ensuring continuity of routine occupational health services. Collaboration with mental health professionals, such as psychologists and psychiatrists, should also be established to facilitate timely referral and specialized care when required.

For Employers and Organizations

Employers should strengthen workplace mental health programs by allocating sufficient resources for structured mental health promotion initiatives, confidential counselling facilities, educational materials, and digital platforms that support employee well-being. Organizational leaders and human resource departments should actively promote psychologically safe workplaces by reducing mental health stigma, facilitating employee participation, integrating mental health programs into existing occupational health services, and establishing sustainable partnerships with external mental health providers.

For Policymakers

Government agencies and professional organizations should continue strengthening the implementation of evidence-based workplace mental health programs consistent with the Philippine Mental Health Act (Republic Act No. 11036) and the Department of Labor and Employment (DOLE) Department Order No. 208, Series of 2020. Policies should support the integration of occupational health nurses into workplace mental health initiatives, encourage multidisciplinary collaboration, and provide guidance that enables organizations to implement sustainable workplace mental health programs.

For Future Researchers

Future studies should employ controlled or randomized research designs with larger and more diverse occupational populations to strengthen the evidence supporting nurse-led workplace mental health interventions. Longitudinal studies are recommended to evaluate long-term effectiveness, sustainability, and cost-effectiveness. Mixed-methods research may also provide a deeper understanding of employees'

experiences, implementation barriers, and facilitators across different workplace settings.

CONTRIBUTION OF AUTHORS

Toni Francisca Y. Marasigan: Conceptualization, methodology, implementation of the nurse-led workplace mental health program, data collection, formal analysis, interpretation of data, original draft preparation, and final approval of the manuscript.

Ian Flor Flores: Conceptualization, methodology, supervision, validation, interpretation of data, critical review and editing of the manuscript, and final approval of the manuscript.

Both authors have read and approved the final manuscript and agree to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the study are appropriately investigated and resolved.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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CONFLICT OF INTEREST

The authors declare that they have no financial or personal conflicts of interest regarding the publication of this paper. The research was conducted independently, and no financial, commercial, institutional, or personal relationships influenced the study design, data collection, data analysis, interpretation of findings, or preparation of the manuscript. The participating private logistics company provided organizational and logistical support for implementation of the program but had no role in data analysis, interpretation of findings, or manuscript preparation.

DISCLOSURE OF USE OF GENERATIVE AI

During the preparation of this manuscript, the authors used ChatGPT (OpenAI) and Grammarly to assist with language editing, grammar refinement, readability enhancement, manuscript organization, and editorial improvement. These tools were used solely to improve the clarity and presentation of the manuscript and did not contribute to the generation of research data, statistical analyses, interpretation of findings, or study conclusions. All scientific content, methodological decisions, interpretation of results, and final editorial decisions were made by the authors, who take full responsibility for the accuracy, integrity, and originality of this manuscript.

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Diabetic Foot Care: Knowledge, Attitudes, and Practices of Type 2 DM Clients

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ABSTRACT

Introduction: Type 2 Diabetes Mellitus (T2DM) is a major public health concern linked to complications such as diabetic sensorimotor peripheral neuropathy (DSPN) and diabetic foot ulcers. Proper diabetic foot care (DFC) helps prevent ulceration, infection, and amputation. However, despite existing health education and preventive programs, adherence to proper DFC remains inadequate.

Aim: The study aimed to determine the level of KAP regarding DFC among clients with T2DM in Baguio City, identify differences according to age, sex, and duration of illness, and examine the relationship between DFC KAP and DSPN severity.

Methods: The study employed a quantitative descriptive cross-sectional design with adult clients diagnosed with T2DM from selected healthcare facilities in Baguio City as respondents. Respondents were selected through purposive and snowball sampling. A KAP questionnaire, the Michigan Neuropathy Screening Instrument (MNSI), and the DSPN Severity Prediction Tool were utilized. Data were analyzed using descriptive statistics, Kruskal–Wallis Test, Mann–Whitney U Test, and Spearman’s rho correlation.

Results: The results revealed that most respondents had satisfactory knowledge (SK) (43.97%) and favorable attitudes (FA) (78.01%) regarding DFC. However, their practices remained only satisfactory (61.70%), indicating inconsistent foot care behaviors. Statistical analysis showed no significant differences in KAP regarding DFC when grouped according to age, sex, and duration of illness. Likewise, no significant relationship was found between DFC KAP and DSPN severity.

Conclusion: The study highlights the need to strengthen DFC education and behavioral interventions among clients with T2DM. Although respondents demonstrated FA, their knowledge reflected only partial understanding, while practices remained inconsistent (SP). These results suggest a gap between awareness and proper self-care behaviors and provide local evidence for improving patient education, preventive strategies, and future research on DFC and DSPN.

Keywords: *Type 2 Diabetes Mellitus, diabetic foot care, peripheral neuropathy*

I. INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic disorder and a growing global public health concern. According to the International Diabetes Federation (2025), approximately 589 million adults aged 20–79 years were living with diabetes in 2024, and this number is projected to increase to 853 million by 2050. Type 2 Diabetes Mellitus (T2DM) accounts for more than 90% of all diabetes cases and is characterized by insulin resistance and persistent hyperglycemia (Harvard Health, 2024; NIDDK, 2025). Poorly managed T2DM can lead to serious complications, including diabetic sensorimotor peripheral neuropathy (DSPN), peripheral arterial disease (PAD), and diabetic foot ulcers (DFUs), which

significantly reduce quality of life and increase healthcare burden.

Diabetic foot ulcers are among the most disabling yet preventable complications of diabetes. Globally, around 19% to 34% of individuals with diabetes are expected to develop DFUs during their lifetime (McDermott et al., 2022; Vesely et al., 2022). Neuropathy and PAD are major contributing factors, as nerve damage reduces protective sensation while impaired circulation delays wound healing. DFUs are also the leading cause of lower extremity amputations, accounting for nearly 85% of cases (Huang et al., 2023). These complications emphasize the importance of preventive diabetic foot care (DFC), which includes daily foot inspection, proper hygiene, appropriate

footwear, and early consultation for signs of injury or infection.

Despite established guidelines and educational programs, adherence to proper DFC remains inadequate. Several studies have shown that patients may possess sufficient knowledge yet fail to consistently apply preventive practices. Tuglo et al. (2021) reported that although diabetic patients demonstrated good knowledge regarding DFC, their practices remained poor, contributing to the occurrence of DFUs. Similarly, Aljaouni et al. (2024) found inadequate knowledge and poor foot self-care practices among diabetic patients, highlighting the continuing need for effective interventions. These results suggest that knowledge alone may not be enough to ensure appropriate self-care behaviors.

Research also shows inconsistencies in patients' knowledge, attitudes, and practices (KAP) regarding DFC. Singh et al. (2025) found that many respondents were unaware that diabetes increases the risk of foot complications and peripheral neuropathy. Naguib et al. (2021) similarly reported insufficient knowledge regarding symptoms, prevention, and management of diabetic complications. In contrast, Alharbi and Sulaiman (2022) found that many respondents demonstrated good awareness of diabetic foot disease and its complications. However, even with adequate KAP do not always improve correspondingly. Nandan et al. (2025) and Williams and Ranganathan (2024) observed that educational interventions improved knowledge and practices, but attitudes remained unchanged. Likewise, Alshammari et al. (2021) noted that some patients with strong knowledge and practices still demonstrated negative attitudes toward foot care.

Practice remains one of the most important yet inconsistent aspects of DFC. Naik et al. (2025) emphasized that adequate knowledge does not necessarily translate into appropriate self-care habits. Ang et al. (2024) also associated poor foot care practices with limited awareness regarding the importance of preventive care. Additionally, Ababneh et al. (2023) reported that patients at higher risk for diabetic foot complications tended to exhibit better self-care practices, suggesting that perceived vulnerability may influence adherence.

In the Philippines, T2DM continues to pose a major public health challenge. DFUs account for approximately 16–20% of medicine admissions at the Philippine General Hospital (Lusica et al., 2023). To address the growing burden of diabetes, the Department of Health implemented programs such as the Insulin Medicine Access Program (InMAP) and the Philippine Package of Essential Non-Communicable Diseases (PhilPEN), which promote early screening, education, and disease management (Eala et al., 2021; PhilHealth, 2013). Although these programs improve access to care, gaps in DFC knowledge and self-care practices persist.

The study was anchored on the Knowledge, Attitudes, and Practices (KAP) Theory, which explains that knowledge influences attitudes, and attitudes

subsequently shape practices (Zhou et al., 2022). In the context of DFC, the theory suggests that adequate understanding of diabetic complications may encourage positive attitudes and improve preventive foot care behaviors. Previous studies support this relationship, demonstrating that higher knowledge and positive attitudes are associated with better DFC practices (Jia et al., 2022; Xie et al., 2025).

Despite the growing body of literature on diabetic foot care, limited localized studies have examined the KAP regarding DFC among clients with T2DM in Baguio City, Benguet. Furthermore, results on the influence of age, sex, and duration of illness on DFC practices remain inconsistent across studies (Polikandrioti et al., 2021; Singh et al., 2025; Sezgunsay et al., 2025). The results may guide nurses in strengthening diabetic foot assessments and patient education, support community-based preventive programs, improve client self-care practices, and contribute to nursing education, administration, and future research related to diabetic foot care.

With these in mind, the study aimed to answer the following research questions:

1. What is the level of knowledge, attitudes, and practices of T2DM clients on diabetic foot care?
2. Is there a significant difference in knowledge, attitudes, and practices in diabetic foot care according to:
 - a. age;
 - b. sex; and
 - c. duration of Type 2 Diabetes Mellitus
3. Is there a relationship between the level of knowledge, attitudes, and practices and the risk level for Diabetic Peripheral Neuropathy (DPN) among clients with T2DM?

II. METHODS

Research Design

The researchers utilized a quantitative descriptive cross-sectional research design to assess the level of (KAP regarding DFC among the target population. Descriptive research systematically collects and analyzes numerical data to describe characteristics or conditions within a population (Wang and Cheng, 2020). It was the most appropriate for this study because the primary aim of the study was to describe the current levels of KAP regarding DFC among clients with T2DM, determine differences in KAP according to age, sex, and duration of T2DM, and examine the relationship between KAP and the risk of DPN without manipulating any variables. A cross-sectional approach was appropriate because it allows data collection at a single point in time (Andal-Saniano et al., 2024). This enabled the researchers to assess respondents' KAP and DPN risk simultaneously at a single point in time, providing a snapshot of their current status and allowing for the comparison of groups and analysis of

relationships among the study variables without the need for longitudinal follow-up.

Participants and Sampling

The study was conducted in selected district health centers in Baguio City, namely Aurora Hill, New Lucban, Pacdal, Loakan, and Mines View, which provide diabetes management and monitoring services for clients with T2DM. These health centers were selected because they regularly cater to individuals diagnosed with T2DM who are actively engaged in outpatient care and diabetes-related health programs.

The study included 141 adult clients diagnosed with T2DM. The sample size was determined using G*Power software under the Exact test family with the Correlation: Bivariate normal model, applying a 0.05 alpha level, 95% statistical power, and a two-tailed test.

A combination of purposive and snowball sampling techniques was utilized. Purposive sampling was used to identify selected health centers with high T2DM prevalence and recruit initial respondents who met the study criteria. Snowball sampling was then employed, wherein initial respondents referred other eligible participants until the target sample size was achieved. This approach enabled the researchers to efficiently recruit respondents who met the required characteristics for the study.

To describe the characteristics of the study population, Table 1 presents the demographic profile of the 141 respondents with Type 2 Diabetes Mellitus (T2DM) in terms of age, sex, and duration of illness.

Table 1
Profile of the respondents

Variables	Frequency	Percentage
Age		
< 40 years old	9	6.38
41 – 60 years old	53	37.59
> 60 years old	79	56.03
Sex		
Female	85	60.28
Male	56	39.72
Duration of DM		
< 5 years	64	45.39
6 – 10 years	40	28.37
> 10 years	37	26.24

Most respondents were aged 60 years and above, followed by those aged 41–60 years, while only a few were below 40 years old. This suggests that the majority of respondents were older adults, consistent with studies indicating that T2DM prevalence increases with age due to metabolic and lifestyle factors (Jia et al., 2022; Xie et al., 2025).

In terms of sex, females comprised the majority of the respondents, which is consistent with previous results that women are generally more likely to participate in health programs and seek healthcare services (Alharbi & Sulaiman, 2022; Ababneh et al., 2023).

Regarding the duration of illness, most respondents had been diagnosed with T2DM for less than five years, while others had lived with the condition for six to ten years or more than ten years. These results indicate a mix of newly diagnosed and long-term cases, reflecting patterns commonly reported in community-based studies of individuals with T2DM (Alshammari et al., 2021; Naguib et al., 2021).

The inclusion criteria consisted of adult clients aged 19 years old and above diagnosed with T2DM, regardless of duration of illness, with intact cognitive functioning based on an Mini Mental State Examination (MMSE) score of 24 or higher, and who were willing to provide informed consent. Respondents were also required to be residents or active members of the selected health centers. Exclusion criteria included individuals with conditions that could affect diabetic peripheral neuropathy assessment and foot care practices, such as recent foot amputation, active foot ulcers, stroke, sciatica, chronic kidney disease, chronic alcoholism, Vitamin B12 deficiency, and legal blindness. These criteria were established to minimize confounding variables and ensure the validity and reliability of the results.

Data Gathering Tools

The study utilized adapted and adopted instruments to assess respondents' KAP on DFC and their risk for DSPN. The KAP questionnaire, adapted from Chellan et al. (2012), consisted of 10 knowledge items, 5 attitude items, and 8 practice items. The instrument demonstrated good reliability, with Cronbach's alpha values of 0.799, 0.841, and 0.716 for the KAP domains, respectively, and an overall reliability of 0.845.

To supplement the practice assessment, selected components of the Inlow's 60-Second Diabetic Foot Screen (Blanchette et al., 2023) were used for direct observation of skin, nails, and footwear.

Risk for DSPN was assessed using the Michigan Neuropathy Screening Instrument (MNSI), developed by Feldman et al. (1994) and translated by Dagang et al. (2016). The Filipino version demonstrated excellent validity (CVI = 0.98) and reliability (Cronbach's α = 0.91). MNSI scores were further interpreted using the DSPN Severity Prediction Tool developed by Haque et al. (2023).

Data Gathering Procedure

Data gathering was conducted from March to April 2026 following approval from the Saint Louis University Research Ethics Committee (SLU-REC) and authorization from the Health Services Office (HSO), selected barangays, and participating health centers. Due to confidentiality concerns, the proposed stratified random sampling was revised to purposive and

snowball sampling, with the methodological change formally documented and approved.

Validity and reliability were ensured through the use of previously validated instruments, namely the Knowledge, Attitudes, and Practices (KAP) questionnaire (Chellan et al., 2012), the Michigan Neuropathy Screening Instrument (MNSI), and selected components of the Inlow's 60-Second Diabetic Foot Screen. To further ensure consistency in data collection, the researchers underwent standardized training, and an inter-rater reliability assessment using Cohen's Kappa was conducted prior to the actual data collection.

Prior to data collection, the researchers underwent standardized training on the administration of the MNSI and selected components of the Inlow's 60-Second Diabetic Foot Screen. An inter-rater reliability test involving 30 respondents was conducted to ensure consistency in physical assessments.

Data were collected through face-to-face interactions in health centers, respondents' homes, workplaces, and other mutually agreed locations. Eligible respondents were recruited using purposive and snowball sampling. After orientation and informed consent, cognitive eligibility was assessed using the Mini-Mental State Examination (MMSE), and only respondents scoring 24 or higher were included.

Data collection involved three components: (1) completion of a demographic profile form, the MNSI Part A questionnaire, and the KAP questionnaire; (2) a physical examination using the MNSI to assess foot deformities, vibration perception, ankle reflexes, and protective sensation through the 10-g monofilament test; and (3) selected observational components of the Inlow's 60-Second Diabetic Foot Screen to assess skin, nail, and footwear conditions. The observational results were used to supplement and validate respondents' reported DFC practices.

Following data collection, MNSI results were interpreted using the DSPN Severity Prediction Tool to determine respondents' risk levels for DSPN. All data were coded, securely stored, and managed in accordance with SLU-REC ethical guidelines to ensure confidentiality and anonymity.

Data Analysis Procedure

For the first research question, descriptive statistics, specifically frequency and percentage, were used to determine the respondents' level of KAP regarding DFC. Data was encoded and analyzed using Jamovi version 2.7.26.0. Knowledge and practice scores were interpreted as poor (≤ 3), satisfactory (4–7), and good (≥ 8), while attitude scores were classified as unfavorable (≤ 3) or favorable (≥ 4).

For the second research question, inferential statistics were used to determine differences in KAP according to age, sex, and duration of diabetes. Since the data were ordinal and non-normally distributed, non-parametric tests were applied. The Mann-Whitney U test was used for sex, while the Kruskal-Wallis test was used for age and duration of illness.

For the third research question, Spearman's rank-order correlation (Spearman's rho) was employed to examine the relationship between KAP scores and DSPN severity scores. This test was appropriate for assessing associations between ordinal and non-normally distributed variables.

Ethical Consideration

This study adhered to the ethical principles of autonomy, beneficence, non-maleficence, veracity, confidentiality, justice, and cultural sensitivity, in accordance with the Belmont Report, the Saint Louis University Research Ethics Committee (SLU-REC), and Republic Act No. 10173 (Data Privacy Act of 2012).

Ethical clearance was obtained from the SLU-REC prior to data collection, with an approval number of SLU-REC 2026-070. Participants provided informed consent after receiving complete information about the study and were informed of their right to refuse or withdraw at any time without penalty. For respondents with low literacy, the teach-back method was used to ensure understanding.

Confidentiality and anonymity were maintained through the use of coded identifiers, secure storage of research documents, and presentation of results in aggregate form. All procedures were non-invasive and conducted with appropriate safety measures to minimize discomfort.

The study promoted beneficence by increasing awareness of DFC and neuropathy prevention, while justice was upheld through fair and non-discriminatory participant recruitment based on established eligibility criteria.

III. RESULTS AND DISCUSSION

Research Objective 1

To determine the respondents' current level of KAP regarding DFC, Table 2 presents the respondents' KAP levels

The results indicate that respondents generally demonstrated satisfactory knowledge (SK), favorable attitudes (FA), and satisfactory practices (SP) regarding DFC. While most recognized the importance of DFC and expressed positive attitudes toward its prevention and management, gaps in knowledge remained, highlighting the need for continued education. Objective results from Inlow's 60-Second Diabetic Foot Screening Tool further supported the satisfactory level of practice, as most respondents had intact skin, well-maintained nails, and appropriate footwear.

Despite favorable attitudes, the results suggest that FA do not necessarily translate into adequate knowledge or optimal DFC practices. Similar results were reported by Singh et al. (2025), Mohammed and Rahman (2018), Qasim et al. (2021), and Shamim et al. (2021), who found that adequate knowledge and positive attitudes do not always result in consistent foot care behaviors.

Table 2
Level I of Knowledge, Attitudes, and Practices of T2DM Clients on Diabetic Foot Care (N=141)

Variables	Frequency	Percentage
Knowledge		
Good	35	24.82
Satisfactory	62	43.97
Poor	44	31.21
Attitude		
Favorable	110	78.01
Unfavorable	31	21.99
Practice		
Good	16	11.35
Satisfactory	87	61.70
Poor	38	26.95

In contrast, Jia et al. (2022) and Alshahrani et al. (2025) supported the KAP Theory (Rogers, 1983), demonstrating that improved knowledge promotes positive attitudes and better practices. However, the present study did not fully support this progression, as SK and FA were not consistently reflected in optimal DFC behaviors.

Overall, the results suggest that knowledge and attitudes alone are insufficient to ensure proper DFC practices. Other behavioral, motivational, and contextual factors may influence self-care behaviors. Therefore, DFC interventions should incorporate patient-centered strategies such as skills training, guided demonstrations, individualized counseling, behavioral reinforcement, and structured follow-up to promote consistent foot care practices among clients with T2DM.

Research Objective 2

To determine whether the level of KAP regarding DFC differs according to age and duration of T2DM, the researchers compared the respondents' KAP scores across the respective groups. As shown in Table 3, the Kruskal–Wallis test was used to determine whether there were statistically significant differences in KAP levels according to age and duration of T2DM.

The results revealed no statistically significant differences in respondents' KAP regarding DFC when grouped according to age and duration of DM, suggesting that these variables did not significantly influence DFC-related understanding, perceptions, or self-care behaviors.

In terms of age, the results support those of Sezgunsay et al. (2025) and Matter et al. (2026), who likewise reported no significant differences in KAP across age groups. These studies suggest that factors such as educational attainment, diabetes education, and health behaviors may have a greater influence on self-care outcomes than age itself. Although previous

studies (Alharbi & Sulaiman, 2022; Jia et al., 2022; Xie et al., 2025) reported better knowledge and self-care among older adults, respondents in the present study may have had similar exposure to diabetes education and healthcare services, resulting in comparable KAP levels.

Table 3
Kruskal-Wallis Test for the Significant Difference between the level of KAP in DFC by their Age and Duration of DM

Test Variable	Chi-square value	df	p-value
Age			
Level of Knowledge and Age	0.78	2	0.678
Level of Attitude and Age	1.02	2	0.602
Level of Practice and Age	0.96	2	0.619
Duration of DM			
Level of Knowledge and Duration of DM	1.28	2	0.527
Level of Attitude and Duration of DM	0.97	2	0.617
Level of Attitude and Duration of DM	2.18	2	0.336

Similarly, the absence of significant differences according to duration of DM indicates that length of illness alone does not determine DFC-related KAP. This finding is consistent with studies emphasizing the greater influence of education, healthcare access, and behavioral motivation on self-care behaviors (Idowu et al., 2022; Aljaouni et al., 2024; Singh et al., 2025; Woo & Cui, 2023). While some studies have linked longer disease duration with improved knowledge and practices, these associations remain inconsistent across populations (Alshammari et al., 2021; Alharbi & Sulaiman, 2022).

From the perspective of KAP Theory (Rogers, 1983), the results suggest that factors beyond age and duration of illness, such as healthcare support, access to information, and personal motivation, may play a more important role in shaping DFC behaviors. Thus, continuous and patient-centered DFC education should be provided to all clients with T2DM regardless of age or duration of illness.

To determine whether the level of KAP regarding DFC differs according to sex, the researchers compared the respondents' KAP scores between male and female participants. As shown in Table 4, the Mann–Whitney U test was used to determine whether there was a statistically significant difference in KAP levels according to the respondents' sex.

Table 4
Mann-Whitney Test for the Significant Difference between the Level of KAP in DFC according to Client's Sex Identity

Test Variable	Mann-Whitney	p-value	Decision
Level of Knowledge and Sex	2207	0.434	Not significant

Level of Attitude and Sex	2332	0.804	Not significant
Level of Practice and Sex	1982	0.052	Not significant

This study contributes to the growing body of evidence demonstrating that the quality of nurse–physician communication is a multidimensional aspect of collaborative clinical practice. Although nurses generally perceived communication positively, important challenges remained in achieving mutual understanding and minimizing frustration during professional interactions. The findings further indicate that communication quality is influenced by organizational context and professional characteristics, highlighting that effective interprofessional communication extends beyond opportunities to communicate and depends on shared understanding, collaborative relationships, and supportive workplace environments. By examining communication quality across two hospitals within the same healthcare organization, this study provides evidence that can guide organizational strategies to strengthen communication practices while informing nursing education and continuing professional development. Strengthening communication competencies through structured interprofessional learning, workplace support, and collaborative practice initiatives may contribute to safer patient care, stronger healthcare teams, and improved quality of care.

The results revealed no statistically significant differences in respondents' KAP regarding DFC when grouped according to sex. Although the practice domain showed a borderline p-value, the result remained statistically non-significant, indicating that sex did not significantly influence DFC-related KAP.

This finding is consistent with Polikandrioti et al. (2021), Sezgunsay et al. (2025), and Ababneh et al. (2023), who likewise reported no significant sex-based differences in DFC behaviors and self-care practices. These studies suggest that factors other than sex may play a greater role in shaping DFC-related KAP among clients with T2DM.

In contrast, Jia et al. (2022) and Alharbi and Sulaiman (2022) found that females demonstrated significantly better DFC knowledge and practices than males. The borderline p-value observed in the present study may indicate a subtle influence of sex on practice behaviors, as previous studies have associated better self-care practices with females and increased diabetic foot risk among males (Hanley et al., 2020; Woo & Cui, 2023). However, the non-significant results suggest that male and female respondents generally exhibited comparable DFC behaviors, possibly due to similar exposure to diabetes education and self-management support.

From the perspective of the KAP Theory (Rogers, 1983), sex may influence the translation of knowledge and attitudes into practice. However, this effect was not evident in the present study, suggesting that sex alone is not a strong determinant of DFC-related KAP. These results support the use of sex-neutral DFC education and interventions while recognizing that lifestyle and

behavioral factors may have a greater influence on self-care practices.

Research Objective 3

To determine whether there is a relationship between the respondents' level of KAP regarding DFC and their risk level for DSPN, the researchers examined the correlation between these variables. As shown in Table 5, Spearman's rho correlation analysis was used to assess the relationship between the respondents' level of KAP regarding DFC and their DSPN severity.

Table 5

Spearman's Rho Correlation Results for a Significant Relationship between the Level of KAP and the Risk Level for DSPN among T2DM Clients

Test Variable	Spearman's Rho	p-value	Decision
Level of Knowledge and Risk Level for DSPN	0.16	0.064	Not significant
Level of Attitude and Risk Level for DSPN	-0.00	0.969	Not significant
Level of Practice and Risk Level of DSPN	0.06	0.482	Not significant

Legend: 0.8 - 1 very strong correlation; 0.6 - 0.79 strong correlation; 0.4 - 0.59 moderate correlation; 0.2 - 0.39 weak correlation; 0.19 very weak correlation

The results revealed no statistically significant relationship between respondents' KAP on DFC and DSPN severity. Although knowledge showed a weak positive correlation, it was not statistically significant, indicating that KAP levels were not associated with DSPN severity among clients with T2DM.

These results are consistent with Hanley et al. (2020) and Akshaya et al. (2025), who reported that neuropathy and diabetic foot complications are more strongly influenced by factors such as disease duration and clinical characteristics than by KAP alone. In contrast, Ababneh et al. (2023), Jia et al. (2022), and Alharbi and Sulaiman (2022) found that better KAP was associated with improved preventive behaviors and lower foot-related risks.

The absence of a significant relationship may be explained by the multifactorial nature of DSPN, which is influenced by factors such as glycemic control, age, comorbidities, medication adherence, and duration of diabetes. These results suggest that while KAP remains important for DFC, it may not be sufficient to predict DSPN severity. Therefore, routine neuropathy screening using validated tools such as the MNSI should be maintained regardless of patients' reported KAP levels.

Limitation of the Study

Several limitations should be considered when interpreting the results of this study. First, the use of purposive and snowball sampling may have introduced selection bias and limits the generalizability of the results, as the respondents may not fully represent the broader population of clients with T2DM. Second, the cross-sectional design assessed respondents' KAP and

DSPN risk at a single point in time, precluding the establishment of causal relationships or changes in KAP over time. Third, the study did not examine other factors that may influence DSPN risk, such as glycemic control, medication adherence, and disease progression, which may have affected the observed relationships. Finally, the KAP assessment relied primarily on self-reported data, making the results susceptible to recall and social desirability bias despite the inclusion of limited observational assessments to validate selected diabetic foot care practices.

IV. CONCLUSION

The study contributes local evidence on diabetic foot care knowledge, attitudes, and practices among clients with T2DM in Baguio City. The results highlight that having SK and FA does not necessarily ensure consistent and appropriate DFC practices, emphasizing the gap between awareness and actual self-care behavior. This suggests that DFC outcomes may be influenced not only by knowledge and attitudes but also by behavioral, clinical, and contextual factors.

The study underscores the importance of strengthening patient-centered DFC education and behavioral interventions in both clinical and community settings. For nursing practice and health policy, the results support the need for more consistent foot care assessment, individualized health teaching, and preventive programs aimed at improving long-term self-care adherence among clients with T2DM.

In nursing education, the study reinforces the importance of integrating preventive DFC and patient empowerment strategies into community health and nursing curricula. Moreover, the results provide baseline data for future nursing and public health research exploring other factors influencing DFC practices and DSPN severity among individuals with T2DM.

V. RECOMMENDATIONS

Based on the results, healthcare facilities and district health centers should strengthen structured and patient-centered DFC education programs that emphasize proper foot inspection, nail care, appropriate footwear selection, early recognition of complications, and consistent self-care practices. Practical demonstrations, individualized counseling, and regular follow-up may further enhance adherence to recommended foot care behaviors.

Healthcare providers should also address barriers to effective DFC, such as limited health literacy, low perceived risk, and economic constraints, through continuous education and behavioral reinforcement strategies. At the community level, local health authorities may integrate routine diabetic foot monitoring into BHW services and home visits to support early detection and prevention of foot complications.

For nursing practice and education, the results support the integration of evidence-based diabetic foot assessment and patient education strategies into staff

development programs and nursing curricula. Future research should employ probability sampling, larger and more diverse study settings, and mixed-method or longitudinal designs.

Additional factors such as glycemic control, socioeconomic status, healthcare access, and comorbidities should also be explored to provide a more comprehensive understanding of DFC behaviors and DSPN risk.

CONTRIBUTION OF AUTHORS

All authors contributed substantially to this study. They collaboratively conceptualized and designed the research, conducted the literature review, developed the methodology and research instruments, collected and analyzed the data, and interpreted the results. The manuscript was jointly drafted, revised, and approved by all authors. All authors accept responsibility for the accuracy, integrity, and content of the work.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this study. They have no financial, commercial, institutional, or personal relationships that could have influenced the design, conduct, analysis, interpretation, or reporting of the research. All results and conclusions were derived independently and reported in accordance with ethical research standards.

DISCLOSURE OF USE OF GENERATIVE AI

The researchers used ChatGPT (GPT-5.5 version, accessed throughout the manuscript writing process in 2026) and Claude to assist in rephrasing sentences, improving grammar, enhancing clarity, and refining the language of the manuscript. The use of these AI-assisted tools was limited to writing and language support.

All AI-generated outputs were reviewed, verified, and revised by the researchers to ensure accuracy, academic integrity, and consistency with the study objectives. AI tools were not used for data collection, analysis, interpretation, or the development of the study results, conclusions, or recommendations.

The researchers take full responsibility for the content of this publication and the ethical use of AI-assisted technologies in its preparation.

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Awareness and Perceptions of Antenatal Care Services Among Pregnant Women in a Rural Municipality in the Philippines

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ABSTRACT

Introduction: Antenatal care (ANC) is a cornerstone of maternal and newborn health, facilitating the early detection and management of pregnancy-related complications. Understanding pregnant women's awareness and perceptions of available antenatal care services is essential for strengthening maternal health programs and promoting informed maternal healthcare-seeking behavior, particularly in rural communities.

Aim: This study assessed the level of awareness and perceptions of pregnant women regarding antenatal care services provided by the Rural Health Unit in the Municipality of Titay, Zamboanga Sibugay.

Methods: A descriptive quantitative cross-sectional design was employed among 93 eligible women with incomplete or underutilized antenatal care services, selected through total enumeration from 210 women identified in Rural Health Unit maternal health records. Data were collected using a validated, researcher-developed questionnaire. Perceptions were assessed using selected constructs of the Health Belief Model (HBM): perceived benefits, perceived barriers, and perceived susceptibility. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to analyze the data.

Results: Respondents demonstrated a very high level of awareness of antenatal care services, with an overall composite mean of 3.95 (SD = 0.23). Awareness was consistently high across all assessed ANC components, led by tetanus toxoid vaccination (Mean = 3.97), followed by biophysical assessment, micronutrient supplementation, and ANC's role in preventing complications (Mean = 3.96). Based on the selected HBM constructs, respondents demonstrated a very high favorable perception of ANC benefits (Mean = 3.42, SD = 0.51), a high level of perceived barriers (Mean = 2.88, SD = 0.72), and a high overall level of perceived susceptibility to pregnancy-related complications after reverse scoring (Mean = 2.58). While respondents recognized the general seriousness of pregnancy complications (Mean = 3.05), personal susceptibility ratings remained relatively low (Mean = 2.10).

Conclusion: Pregnant women in the Municipality of Titay demonstrated a very high level of awareness of antenatal care services and generally favorable perceptions based on the selected constructs of the Health Belief Model. Although respondents recognized the benefits and overall seriousness of pregnancy-related complications, high perceived barriers suggest that awareness and favorable perceptions alone may not be sufficient to ensure consistent utilization of antenatal care services. Maternal health programs should therefore sustain health education and community-based outreach while implementing strategies that address contextual and practical barriers influencing maternal healthcare-seeking behavior.

Keywords: *antenatal care, awareness, health belief model, maternal healthcare utilization, rural health unit*

I. INTRODUCTION

Antenatal care (ANC) is a fundamental component of maternal and newborn healthcare that facilitates the early detection, prevention, and management of pregnancy-related complications, thereby improving maternal and neonatal outcomes (World Health Organization [WHO], 2023). In the Philippines, antenatal care services are integrated into the primary healthcare

system, enabling pregnant women to access routine maternal assessments, laboratory investigations, micronutrient supplementation, immunization, and birth preparedness counselling through government health facilities (Department of Health [DOH], 2023). Regular ANC visits also provide opportunities for the early identification and management of conditions such as hypertensive disorders of pregnancy, gestational diabetes, and maternal anemia, which contribute

substantially to maternal and perinatal morbidity when left untreated (WHO, 2023; Felipe-Dimog et al., 2021).

Despite the availability of these services, preventable maternal morbidity and mortality remain important public health concerns, particularly in underserved rural communities. In Region IX (Zamboanga Peninsula), maternal deaths continue to be associated with preventable complications, including postpartum hemorrhage, eclampsia, and obstructed labor (DOH Regional Office IX, 2022). Within the Municipality of Titay, Zamboanga Sibugay, records from the Field Health Services Information System documented inconsistent utilization of antenatal care services between 2022 and 2024. Completion of the recommended minimum four antenatal care visits increased from 43% in 2022 to 75% in 2023 following intensified community health promotion activities but declined to 66% in 2024, suggesting that sustained utilization remains a continuing challenge despite the availability of free maternal health services.

The fluctuating pattern of antenatal care utilization indicates that the availability of health services alone may not ensure their consistent use. Previous studies have shown that women's knowledge of antenatal care services, perceived benefits, perceived barriers, and perceptions of pregnancy-related risks may influence their decisions to seek timely and regular prenatal care (Ali et al., 2020; Bashir et al., 2023; Kebede et al., 2022; Yoseph et al., 2024). Understanding these factors is therefore essential for designing interventions that strengthen the utilization of maternal healthcare services in rural communities.

The present study is anchored on the Health Belief Model (HBM) proposed by Rosenstock (1974), which explains health-related behavior as a function of individuals' beliefs regarding disease susceptibility, disease severity, the perceived benefits of preventive actions, and perceived barriers to undertaking those actions. Consistent with the objectives of the present study, the HBM was applied selectively by examining pregnant women's awareness of antenatal care services together with three constructs of the model: perceived benefits, perceived barriers, and perceived susceptibility. These constructs were considered the most relevant for understanding women's awareness and perceptions of antenatal care services in the local setting.

The HBM constructs of self-efficacy and cues to action were not included because they assess behavioral confidence and external stimuli that influence health behavior, which were beyond the scope of this descriptive study. Although these constructs are integral components of the HBM, the present investigation was intended to describe awareness and perceptions rather than predict healthcare-seeking behavior. Future studies should incorporate the complete HBM to provide a more comprehensive explanation of antenatal care utilization.

Healthcare utilization is influenced not only by the availability of services but also by women's awareness of those services and their perceptions of the benefits,

barriers, and risks associated with antenatal care. Accordingly, the conceptual framework proposes that maternal demographic characteristics may influence women's level of awareness, which in turn is reflected in selected Health Belief Model constructs related to antenatal care services.

Maternal Demographic Characteristics → Level of ANC Awareness → Selected Health Belief Model Constructs (Perceived Benefits, Perceived Barriers, Perceived Susceptibility)

The findings of this study provide baseline evidence regarding pregnant women's awareness and perceptions of antenatal care services in the Municipality of Titay. The results may assist healthcare providers and local health authorities in strengthening maternal health education, improving community-based interventions, and developing evidence-informed strategies that encourage consistent utilization of antenatal care services.

II. METHODS

Research Design

This study employed a descriptive quantitative cross-sectional research design to assess pregnant women's awareness and perceptions of antenatal care (ANC) services provided by the Rural Health Unit (RHU) in the Municipality of Titay, Zamboanga Sibugay. A descriptive design was considered appropriate because the study sought to describe the existing levels of awareness and perceptions of antenatal care services without manipulating variables or establishing causal relationships. The cross-sectional approach enabled the collection of data at a single point in time, providing a snapshot of respondents' awareness and perceptions during the study period.

The study was conducted in the Municipality of Titay, Zamboanga Sibugay, Philippines. Titay is a predominantly rural municipality served by one Rural Health Unit and several Barangay Health Stations that provide government-supported maternal and child health services. These facilities offer free antenatal care services, including routine maternal assessment, laboratory examinations, nutritional supplementation, immunization, health education, counselling, and birth preparedness services in accordance with the Department of Health's maternal healthcare program. The municipality was selected because local health records indicated inconsistent antenatal care utilization despite the availability of free maternal health services, making it an appropriate setting for examining pregnant women's awareness and perceptions of available antenatal care services.

Participants and Sampling

The study population consisted of pregnant women registered for antenatal care services at the Rural Health Unit and selected Barangay Health Stations in the Municipality of Titay during the study period. Rural Health Unit records identified a total of 210 registered pregnant women. Of these, 93 pregnant women with

incomplete or underutilized antenatal care services met the study eligibility criteria and consented to participate. Total enumeration sampling was employed; thus, all eligible pregnant women were included in the study.

Data Gathering Tool

Data were collected using a researcher-developed questionnaire designed to assess pregnant women's awareness and perceptions of antenatal care services. The instrument consisted of three sections. The first section obtained respondents' demographic characteristics, including age, marital status, educational attainment, and ethnicity. The second section assessed respondents' awareness of antenatal care services through eight statements covering biophysical assessment, tetanus toxoid vaccination, ferrous sulfate and calcium supplementation, deworming, health education and counselling, the availability of free antenatal care services, the role of antenatal care in preventing pregnancy-related complications, and the importance of early antenatal consultation. The third section measured respondents' perceptions of antenatal care services using selected constructs of the Health Belief Model, namely perceived benefits, perceived barriers, and perceived susceptibility.

Data Gathering Procedure

Prior to data collection, ethical approval was obtained from the appropriate ethics review committee, and permission to conduct the study was secured from the Municipal Health Office and the Rural Health Unit of Titay. Eligible respondents were identified through the Rural Health Unit maternal health registry. After explaining the objectives, procedures, and voluntary nature of participation, informed consent was obtained from each respondent before administration of the questionnaire. Data collection was conducted with the assistance of designated Rural Health Unit personnel while ensuring respondents' privacy and confidentiality. Completed questionnaires were reviewed for completeness before data encoding and statistical analysis.

Data Analysis Procedure

Data were analyzed using IBM SPSS Statistics version 27. Frequencies and percentages were used to summarize demographic characteristics, while means and standard deviations were used to describe respondents' awareness and perceptions of antenatal care services. Awareness was interpreted as Very High (3.26–4.00), High (2.51–3.25), Low (1.76–2.50), and Very Low (1.00–1.75). Perceived benefits were interpreted using the same mean ranges as Very High Level of Perception, High Level of Perception, Low Level of Perception, and Very Low Level of Perception, respectively. Perceived barriers were interpreted as Very High, High, Low, and Very Low Level of Barrier Perception, respectively, while perceived susceptibility was interpreted as Very High, High, Low, and Very Low Level of Perceived Susceptibility, respectively.

The negatively worded susceptibility item, “Pregnancy complications are minor issues that resolve naturally,” was reverse scored so that higher scores consistently indicated greater perceived susceptibility. As the study was descriptive in nature, only descriptive statistics were employed.

Ethical Consideration

The study adhered to the ethical principles outlined in the National Ethical Guidelines for Health and Health-Related Research and complied with the provisions of the Data Privacy Act of 2012 (Republic Act No. 10173). Participation was entirely voluntary, and respondents were informed of the purpose of the study, the confidentiality of their responses, and their right to decline participation or withdraw at any stage without consequence. No personally identifiable information was collected, and all completed questionnaires and electronic records were securely stored and made accessible only to the research team.

III. RESULTS AND DISCUSSION

Demographic Profile of the Respondents

Table 1 presents the demographic characteristics of the respondents according to age, marital status, educational attainment, and ethnicity

Table 1
Demographic Profile of the Respondents (N=93)

Variables	Category	F	%
Age	15 – 19	5	5.3
	20 – 29	88	94
Marital Status	Single	51	54.8
	Married	42	45.1
	Widow	0	0
	Primary	14	15
Educational Attainment	Secondary	59	63.4
	Tertiary	20	21.5
Ethnic Identity	Visayan	72	77.4
	Subanen	15	16.1
	Kalibugan	2	2.2
	Ilocano	2	2.2
	Other Christian Denomination	2	2.2

Table 1 shows that the majority of respondents were between 20 and 49 years of age, while a smaller proportion were adolescents aged 15 to 19 years. More than half of the respondents were single, whereas the remainder were married. Most respondents had completed secondary education, followed by tertiary and primary education. In terms of ethnicity, the majority identified as Visayan, followed by Subanen, with smaller proportions belonging to Kalibugan, Ilocano, and other ethnic groups. These demographic characteristics provide context for understanding respondents' awareness and perceptions of antenatal care services in the Municipality of Titay”

Awareness of Antenatal Care Services

Table 2 presents respondents' level of awareness regarding antenatal care services provided by the Rural Health Unit

Table 2

Maternal Awareness of Antenatal Care Services (N = 93)

Core Antenatal Care Service Component	Mean	Interpretation
Biophysical assessment	3.96	Very High Level of Awareness
Tetanus toxoid vaccination	3.97	Very High Level of Awareness
Ferrous sulfate/calcium	3.96	Very High Level of Awareness
Deworming	3.93	Very High Level of Awareness
Health education	3.93	Very High Level of Awareness
Free ANC services	3.95	Very High Level of Awareness
ANC prevents complications	3.96	Very High Level of Awareness
Early consultation	3.95	Very High Level of Awareness
Overall mean	3.95	Very High Level of Awareness

Legend:

Score	Mean range	Description	Interpretation
4	3.26-4.00	Fully Aware	Very High Level of Awareness
3	2.51-3.25	Moderately Aware	High Level of Awareness
2	1.76-2.50	Aware	Low level of Awareness
1	1.00-1.75	Not at All Aware	Very Low Level of Awareness

Table 2 presents respondents' level of awareness regarding antenatal care services offered by the Rural Health Unit in the Municipality of Titay. Respondents demonstrated a very high level of awareness across all eight awareness indicators, with mean scores ranging from 3.93 to 3.97. The highest mean was observed for awareness of tetanus toxoid vaccination (Mean = 3.97), followed by awareness of biophysical assessment, ferrous sulfate and calcium supplementation, and the role of antenatal care in preventing pregnancy complications (Mean = 3.96). Awareness that antenatal care services are provided free of charge and the importance of early consultation during the first trimester both obtained a mean of 3.95, while awareness of deworming and health education and counselling recorded the lowest means (3.93), although these

remained within the Very High Level of Awareness category. Overall, respondents demonstrated a very high level of awareness of antenatal care services provided by the Rural Health Unit, with an overall mean of 3.95 (SD = 0.23).

Perceptions of Antenatal Care Services Based on the Health Belief Model Perceived Benefits

Table 3 shows that respondents demonstrated very high favorable perceptions regarding the benefits of antenatal care services. The statement "Regular prenatal visits protect my baby from health complications" obtained the highest mean (Mean = 3.55, SD = 0.44), followed by "Going to the Rural Health Unit helps identify high-risk conditions early" (Mean = 3.48, SD = 0.51). The statement regarding tetanus vaccination and maternal supplementation for safe delivery obtained the lowest mean (Mean = 3.23, SD = 0.60), although respondents generally agreed with the statement. The overall mean of

3.42 (SD = 0.51) indicates a very high favorable perception of the benefits of antenatal care services.

Perceived Barriers

Table 4 shows that respondents reported a high level of perceived barriers to antenatal care utilization.

The highest-rated barrier was the perception that internal examinations are embarrassing or physically painful (Mean = 3.15, SD = 0.62), followed by the belief that clinic visits are unnecessary when no symptoms are present (Mean = 2.95, SD = 0.71). Confidence in traditional healers rather than healthcare professionals received the lowest mean (Mean = 2.54, SD = 0.83). The overall mean of 2.88 (SD = 0.72) indicates a high level of perceived barriers.

Table 3

Maternal Perceptions of Antenatal Care According to the Health Belief Model: Perceived Benefits (N = 93)

Perceived Benefits	Mean	SD	Interpretation
Regular prenatal visits protect my baby from health complications.	3.55	0.44	Very High Level of Perception
Going to the RHU helps identify high-risk conditions early.	3.48	0.51	Very High Level of Perception
Tetanus vaccines and supplements are vital for a safe delivery.	3.23	0.60	Very High Level of Perception
Overall Mean	3.42	0.51	Very Highly Favorable Perception

Legend:

Reversed Score	Mean Range	Description	Interpretation
4	3.26-4.00	Strongly Perceived Susceptibility	Very High Level of Perceived Susceptibility
3	2.51-3.25	Perceived Susceptibility	High Level of Perceived Susceptibility
2	1.76-2.50	Less Perceived Susceptibility	Low Level of Perceived Susceptibility
1	1.00-1.75	Not Perceived Susceptibility	Very Low Level of Perceived Susceptibility

Table 4

Maternal Perceptions of Antenatal Care According to the Health Belief Model: Perceived Barriers (N = 93)

Perceived Barriers and Deterrents	Mean	SD	Interpretation
Internal exams (IE) are embarrassing or physically painful.	3.15	0.62	High Level of Barrier Perception
If I feel completely healthy, going to the clinic is unnecessary.	2.95	0.71	High Level of Barrier Perception
Traditional healers (hilots) understand my body better than doctors.	2.54	0.83	High Level of Barrier Perception acknowledgement with the changes then the fram
Overall Mean	2.88	0.72	High Barrier Perception

Legend:

	Score	Mean range	Description	Interpretation
4	3.26-4.00	Strongly Perceived Barrier	Very High	Level of barrier Perception
3	2.51-3.25	Perceived Barrier	High	Level of barrier Perception
2	1.76-2.50	Less Perceived Barrier	Low	Level of barrier Perception
1	1.00-1.75	Not Perceived Barrier	Very	Low Level of barrier Perception

Perceived Susceptibility**Table 5**

Maternal Perceptions of Antenatal Care According to the Health Belief Model: Perceived Susceptibility (N = 93)

Perceived Susceptibility	Original Mean	After Reverse Scoring	SD Interpretation
I am at risk of developing dangerous complications during childbirth.	2.10	2.10	Low level perceived susceptibility
Pregnancy complications are minor issues that are resolved naturally.	1.95	3.05	High level perceived susceptibility
Overall mean	2.02	2.58	High level of Perceived Susceptibility

* The negatively worded item was reverse scored; therefore, higher scores indicate higher perceived susceptibility.

Table 5 shows that respondents demonstrated a high level of perceived susceptibility to pregnancy-related complications after reverse scoring the negatively worded item. The statement “I am at risk of developing dangerous complications during childbirth” obtained a mean of 2.10 (SD = 0.88), indicating a low level of perceived susceptibility. The statement “Pregnancy complications are minor issues that resolve naturally” obtained an original mean of 1.95 (SD = 0.79). After reverse scoring, the mean increased to 3.05, indicating a high level of perceived susceptibility. The composite mean of 2.58 indicates a high level of perceived susceptibility to pregnancy-related complications.

Overall Summary of Health Belief Model Constructs

Table 6 summarizes respondents' perceptions according to the selected Health Belief Model constructs.

Table 6 shows that perceived benefits obtained the highest composite mean (Mean = 3.42), indicating a very high level of perception of the benefits of antenatal care services. Perceived barriers yielded a composite mean of 2.88, indicating a high level of barrier perception, while perceived susceptibility obtained a composite mean of 2.58, indicating a high level of perceived susceptibility.

IV. CONCLUSION

The present study demonstrated that pregnant women in the Municipality of Titay exhibited a very high level of awareness of antenatal care (ANC) services and generally favorable perceptions based on the selected constructs of the Health Belief Model (HBM). Respondents demonstrated a very high level of awareness of the essential antenatal care services provided by the Rural Health Unit, a very high level of perceived benefits, a high level of perceived barriers, and a high overall level of perceived susceptibility after reverse scoring the negatively worded susceptibility item. Collectively, these findings indicate that existing maternal health programs have been effective in promoting awareness of antenatal care services and fostering positive perceptions toward maternal healthcare.

The very high level of awareness observed in the present study is consistent with the findings of Mahay and Coronado (2025), who reported high awareness of antenatal care services among pregnant women attending birthing centers in Butuan City. Similarly, Acosta et al. (2025) found that Filipino mothers demonstrated high awareness of prenatal screening, nutritional supplementation, and birth preparedness. Comparable findings have also been reported internationally. Bashir et al. (2023) observed that

Table 6

Overall Summary of Respondents' Perceptions According to the Selected Health Belief Model Constructs (N = 93)

Health Belief Model Construct	Composite Mean	Interpretation
Perceived Benefits	3.42	Very High Level of Perception
Perceived Barriers	2.88	High level of Barrier Perception
Perceived Susceptibility	2.58	High Level of Perceived Susceptibility

sustained maternal health education, regular interaction with healthcare providers, and community-based health promotion activities significantly improve women's awareness of antenatal care services. The consistently high awareness observed in the present study may reflect the continuing efforts of the Rural Health Unit and barangay health workers in implementing maternal health education and community outreach activities that increase women's knowledge of available antenatal care services.

In addition to strong service awareness, respondents likewise demonstrated a very high level of perception regarding the benefits of antenatal care services. They recognized that regular prenatal consultations contribute to safer pregnancies by facilitating the early detection of maternal and fetal complications and supporting healthy pregnancy outcomes. These findings are consistent with the Health Belief Model, which proposes that individuals are more likely to engage in preventive health behaviors when they perceive clear benefits from the recommended action. Similar findings were reported by Odchigue and Cunanan (2025), who observed favorable perceptions of antenatal care among Filipino mothers. Likewise, Kebede et al. (2022) reported that positive perceptions of antenatal care were associated with greater access to maternal health information, supportive healthcare services, and effective communication between healthcare providers and pregnant women.

Despite recognizing the benefits of antenatal care, respondents also reported a high level of perceived barriers to service utilization. Concerns regarding the discomfort associated with internal examinations and the perception that antenatal visits are unnecessary in the absence of symptoms indicate that practical and personal concerns may continue to influence maternal healthcare decisions. These findings are comparable to those reported by Yoseph et al. (2024), who identified transportation difficulties, limited access to healthcare facilities, and sociocultural influences as persistent barriers to maternal healthcare utilization in underserved communities. Although the present study did not directly investigate structural barriers, the findings suggest that addressing women's concerns through respectful maternity care, individualized counselling, and culturally appropriate communication may further encourage regular antenatal care attendance.

The findings on perceived susceptibility provide a more nuanced picture of maternal perceptions of pregnancy-related risk. Although respondents did not strongly perceive themselves as personally vulnerable to complications, as reflected in the mean of 2.10 for the statement "I am at risk of developing dangerous complications during childbirth," they generally disagreed that pregnancy complications are minor issues that resolve naturally. After reverse scoring, this item obtained a mean of 3.05, suggesting recognition of the seriousness of pregnancy-related complications. Taken together, the findings suggest that respondents may not strongly perceive complications as something likely to happen to them personally, but they recognize

the seriousness of such complications when they occur. This distinction highlights the importance of maternal health education that not only communicates the seriousness of pregnancy-related complications but also strengthens women's understanding of their personal vulnerability and the importance of timely antenatal care. Taken together, the findings indicate that awareness and positive perceptions of the benefits of antenatal care are well established among pregnant women in the Municipality of Titay. However, these findings should be interpreted within the broader maternal health context described in the Introduction, where antenatal care utilization remained inconsistent despite the availability of free maternal health services. This apparent disconnect suggests that awareness and favorable perceptions alone may not be sufficient to ensure consistent utilization of antenatal care services. This interpretation is supported by recent evidence from the Philippines. Choi et al. (2025) reported that women's choice of antenatal care facilities in Eastern Visayas was significantly influenced by educational attainment, socioeconomic status, and geographic location, demonstrating that structural and socioeconomic factors continue to shape maternal healthcare utilization even where antenatal care services are available. Likewise, Cananua-Labid (2017) identified region of residence, educational attainment, wealth status, and religious affiliation as significant predictors of antenatal care utilization in the Philippines, highlighting that access to maternal healthcare is influenced by broader contextual factors beyond awareness alone.

Although these determinants were beyond the scope of the present study, they warrant further investigation to better understand the persistent gap between high awareness, favorable perceptions, and the actual utilization of antenatal care services. The present findings therefore provide baseline evidence to guide future maternal health programs that not only sustain maternal health awareness and positive perceptions but also address the broader structural and contextual barriers influencing antenatal care utilization.

The findings indicate that pregnant women in the Municipality of Titay demonstrated a very high level of awareness of antenatal care services and generally favorable perceptions based on the selected constructs of the Health Belief Model. Existing maternal health programs appear to have been effective in promoting maternal health awareness and reinforcing the perceived benefits of antenatal care. Nevertheless, the persistence of moderate perceived barriers and low perceived susceptibility, together with the inconsistent utilization of antenatal care services documented in the municipality, suggests that awareness alone may not be sufficient to ensure regular use of antenatal care services. Maternal health programs should therefore continue strengthening health education, individualized counselling, and community-based outreach while emphasizing women's personal susceptibility to pregnancy-related complications and addressing practical barriers that may discourage timely antenatal care attendance. In addition, interventions should address socioeconomic and accessibility barriers that

influence maternal healthcare utilization, including transportation, financial constraints, and geographic access to health facilities, through strengthened community partnerships and targeted maternal health outreach programs. This recommendation is consistent with recent Philippine evidence demonstrating that socioeconomic status, educational attainment, and place of residence remain important determinants of antenatal care utilization. Strategies that also improve accessibility, reduce structural barriers, and strengthen community support may further improve antenatal care utilization and contribute to improved maternal and neonatal health outcomes.

V. RECOMMENDATIONS

This study relied on self-reported survey data, which may be subject to recall bias and social desirability bias, potentially resulting in respondents overreporting their awareness and positive perceptions of antenatal care services. The study collected only selected demographic characteristics, limiting the examination of subgroup differences. Consequently, potentially relevant maternal characteristics, including occupation, parity, trimester of pregnancy, household income, and distance from health facilities, were not examined in relation to respondents' awareness and perceptions. Furthermore, inferential analyses examining the relationships between demographic characteristics and respondents' awareness and perceptions were beyond the scope of this descriptive study. Although the study documented respondents' awareness and perceptions of antenatal care services, it did not examine the contextual factors underlying the inconsistent utilization of antenatal care services within the municipality. Future studies should incorporate a broader range of demographic, obstetric, socioeconomic, and health system variables and employ appropriate inferential statistical analyses to identify factors associated with antenatal care awareness, perceptions, and service utilization. In addition, the study was conducted within the context of the four-visit antenatal care framework implemented during the study period and therefore does not reflect the current eight-contact antenatal care model recommended by the World Health Organization.

CONTRIBUTION OF AUTHORS

Glenda M. Matusalem: Conceived and conducted the study, coordinated field data collection, validated the data, performed the initial data analysis, drafted the original thesis, and revised the manuscript in response to the recommendations of the thesis panel.

Ma Christina B. Celdran: Provided academic supervision throughout the study, guided the conceptualization, methodology, and statistical analysis, strengthened the scientific rigor of the study, critically revised and restructured the manuscript for important intellectual content, incorporated revisions for journal publication, and supervised the preparation of the final manuscript for submission.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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This study was self-funded by the researcher and received no external financial support.

CONFLICT OF INTEREST

We, the researchers, may have a pre-formed impression of menopause from the people we grew up with—particularly by observing our mothers and older female relatives. To address this issue, we strictly applied bracketing and reflexivity to maintain rigor and trustworthiness.

DISCLOSURE OF USE OF GENERATIVE AI

Generative artificial intelligence tools were used solely to assist with language editing, grammar refinement, and manuscript organization. The researcher reviewed and verified all AI assisted content and remains responsible for the accuracy and final content of the manuscript.

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Climacteric Period: Seasons of Change Among Women

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ABSTRACT

Introduction: The climacteric period is a complex stage with a range of experiences that affects a woman's quality of life. It consists of stages: perimenopause, menopause, and postmenopause. However, most studies focus on physical symptoms, ignoring the holistic understanding of the transition.

Aim: This study aimed to explore the lived experiences of women in the climacteric period.

Methods: The study used transcendental phenomenology, conducted in selected barangays of Baguio City with 19 participants aged 40-65, selected through purposive and maximal variation sampling. Data were gathered through unstructured interviews and analyzed using Colaizzi's 7-step phenomenological approach. Rigor is ensured by adhering to credibility, dependability, transferability, and confirmability.

Results: The study identified six main themes: The Body in Transition, Navigating the Unknown, Inner Storms, Life Roles in Flux, External Influences, and Paths of Coping and Renewal.

Conclusion: The climacteric period is a complex transition marked by significant physical, emotional, and social changes that affect women's daily lives and self-perception. Women often begin with uncertainty and distress due to unfamiliar symptoms, but gradually move toward coping, self-reinvention, and acceptance. Both personal responses and external factors shape their experiences. Overall, it is a dynamic process of adjustment, highlighting the need for better education, supportive relationships, and holistic care to improve quality of life.

Keywords: *climacteric period, climacteric women, menopause, perimenopause, postmenopausal*

I. INTRODUCTION

Climacteric is the period of transition from the reproductive to the non-reproductive stage of a woman's life. It encompasses the stage of perimenopause, menopause, and postmenopause. According to Harlow et al. (2012), the perimenopausal period is characterized by variability in menstrual cycle length, extreme hormonal level fluctuations, and prevalence of anovulation. The period typically begins as early as age 40 (Gass & Rebar, 2009) lasting about 4-8 years (Cleveland Clinic, 2024a). On the other hand, Santoro (2021) described menopause as the final stage of ovarian physiology when reproductive function is lost due to the complete depletion of ovarian follicle supply. According to Trujillo-Muñoz et al. (2025), it may occur naturally or may be medically/surgically induced. Lastly, postmenopause, or the end of the reproductive period, begins after 12 months of amenorrhea (Cleveland Clinic, 2024b) and continues to the remaining lifespan (Harlow et al., 2012).

In a broader Asian context, a recently concluded study in South Korea disclosed variations in the quality of life (QoL) among women across different climacteric stages. It emphasized that cultural and lifestyle factors strongly influence how women experience and adapt to this reproductive transition (Choi et al., 2025). Due to the complexity that this period brings about, many women report various symptoms, which may interfere with daily functioning and social relationships, ranging from physical, emotional, psychological, and sexual concerns (Abdelaliem et al., 2025). Similarly, a community-based study in Paete, Laguna, Philippines, revealed that although many Filipino women in the perimenopausal period reported a good overall QoL, about a third of them struggled with symptoms that significantly impacted their physical well-being and social relationships (Opulencia-Banayo & Habana, 2024).

Given that, existing research on menopause has focused largely on physical symptoms, while paying less attention to psychological factors (Abdelaliem et

al., 2025; Baral & Kaphle, 2023). This narrow focus restricts the understanding of the climacteric experience as a holistic biopsychosocial experience, missing insights about how women experience the transition and manage ongoing change. Moreover, there is still scarcity of qualitative studies that examine how cultural beliefs, social support systems, and locally embedded coping practices shape how women perceive and respond to menopause within the Filipino sociocultural context. The lack of in-depth exploration of psychological and context-based perspectives resulted in a limited understanding of emotional resilience, identity shifts, and psychological well-being during this phase of life. Addressing this gap, our current study is focused on exploring the lived experiences of women in selected communities in Baguio City during the climacteric period, highlighting context-specific and culturally relevant evidence that can inform holistic nursing care and education.

The significance of this research extends across several domains of healthcare. For nursing practice, this study may increase awareness of the importance of empathy, allowing nurses to create personalized care plans that address psychological and social needs alongside physical symptoms. In nursing education, these findings can be integrated into clinical teaching to help student nurses improve their assessment skills for midlife women. Furthermore, this study serves as a basis for future research to improve both qualitative and quantitative inquiries into the climacteric transition. Finally, for the participants themselves, this study may foster newfound self-awareness, prompting them to seek professional guidance and develop healthier coping strategies to better manage their transition.

II. METHODS

Research Design

This study utilized a phenomenological qualitative design, specifically the transcendental phenomenology of Husserl (1983). It examines experiences as they appear while setting aside assumptions to objectively understand reality by investigating consciousness and subjective realities.

Participants and Sampling

This study was conducted in the top five barangays of Baguio City with the highest population of women aged 40–65 years as noted by the Department of Health (DOH, 2025). With the use of purposive sampling, participants eligible through the inclusion criteria were approached and recruited through voluntary participation. Inclusion criteria were: (a) women aged 40–65 years in any stage of menopause, including those receiving hormone therapy and surgically induced menopause after the age of 40, and (b) willingness to share experiences and provide informed consent. To minimize potential confounding factors, exclusion criteria included women with (a) gynecologic malignancies, (b) preexisting Diabetes Mellitus, Hypertension, and/or

Hyperthyroidism before menopause, and (c) women whose amenorrhea may have been caused by intrauterine device (IUD). Additionally, maximal variation was used to capture diverse experiences among participants with similar characteristics (Nyimbili & Nyimbili, 2024).

A total of 19 participants were included, exceeding the sample size range of 9-17 participants, as suggested by Hennink and Kaiser (2022). Lastly, data saturation was achieved with the 19th participant, as data redundancy and the repetitive emergence of identified codes were observed in 3 consecutive interviews, following the consecutive approach established by Coenen et al. (2012), Francis et al. (2009), and Morse et al. (2014).

Data Gathering Tools

The study utilized unstructured face-to-face interviews without intentionally seeking specific information (Mwita, 2024). Interviews were conducted in five barangays in Baguio City, namely: Barangay Irisan, Camp 7, Bakakeng Norte, Bakakeng Central, and Asin Road. Each began with the initiating question: “Ikuwento mo sa akin ang iyong karanasan sa climacteric period.” Follow-up questions were asked based on participants’ responses to further explore their experiences. Each interview lasted approximately 20 to 45 minutes and was conducted in Tagalog and/or Ilocano, based on the participants’ preferred language.

Data Gathering Procedure

Participants were interviewed in a private setting chosen by participants. A total of 2 interviewers were present in each field with Interviewer 1 being the lead interviewer and Interviewer 2 the note taker and audio recorder. Participants were informed of the roles of both researchers and provided consent to their presence. Interviews were recorded using mobile phones with the participant's consent. These were transcribed immediately after completion. Transcripts were translated into English, peer debriefed, and member checked to ensure linguistic accuracy and preserve participants' intended meanings.

Data Analysis Procedure

The analysis followed a systematic process using Colaizzi's seven-step approach:

1. The process began with organization and transcription of the recordings immediately after the interviews. The transcripts were repeatedly reviewed to familiarize the participants’ lived experiences and perspectives.
2. Significant statements, including nonverbal and paralinguistic cues, were then identified and organized with corresponding initial codes.

3. From these statements, meanings were carefully interpreted and re-coded while applying bracketing to set aside prior knowledge and biases.
4. The formulated meanings were subsequently grouped into sub-themes and main themes through repeated reviewing to identify patterns and remove redundancies.
5. Using the themes and meanings derived from participants' accounts, an exhaustive description was established.
6. From that, a fundamental structure, or concept map, was created to synthesize the meanings into a concise representation of the women's narratives during their climacteric period.
7. Finally, member checking was conducted, wherein participants reviewed the interpreted summaries to verify accuracy, clarify meanings, and strengthen the study's credibility.

Reflexivity

To ensure the reliability and validity of findings, we adhered to Lincoln and Guba's (1985) four fundamental research principles.

1. Credibility: Prolonged engagement was applied through repeated reviews of transcriptions, nonverbal notes, and audio recordings. Correspondingly, peer debriefing was conducted to provide external checks on the research process. Also, as mentioned on the seventh step of Colaizzi's method, member checking was done to validate whether the participant's experiences were accurately represented.
2. Dependability: The research team was divided into separate groups that independently interpreted the same data for stepwise replication. Furthermore, peer examination through regular collaborations and discussions was used to critically review and discuss emerging interpretations, allowing for feedback, clarification, and consensus building.
3. Transferability: Thick description was employed by capturing not only the participants' verbal and non-verbal cues but also providing a comprehensive account of their emotions, narratives, and coping strategies.
4. Confirmability: Bracketing and reflexivity was practiced by consciously setting aside our prior knowledge of menopause and consistently reflecting on our role as researchers. Alongside this, an audit trail was established by documenting the research process in a step-by-step manner to show that the findings are based on the data rather than our personal bias.

Ethical Consideration

Before collecting data, an approval from the Saint Louis University Research Ethics Committee (SLU-REC) was obtained. After which, participants were recruited voluntarily. The informed consent, including the study's objectives and participant rights were discussed. During data analysis, personal identifiers were de-identified, and participants were assigned color-based pseudonyms to ensure anonymity. For data privacy, recordings were stored securely on password-protected phones that had no backup or iCloud enabled. No woman was unfairly burdened or excluded from the study's potential benefits.

III. RESULTS AND DISCUSSION

This section presents the main themes, sub-themes, analysis, and interpretation of data gathered through in-depth, unstructured interviews.

Main Theme A: The Body in Transition

This refers to the comprehensive biological rewiring experienced by women as they transition from their reproductive years to their non-reproductive stage of life.

Subtheme: Manifestations of Systemic Changes

Alterations in Menstrual Flow and Characteristics During the Menopausal Transition

Participant said:

"Initially, the bleeding was very heavy but brief (3 days). Eventually, menstruation became irregular, occurring only every few months with some missed cycles, and the flow gradually decreased."

Participant said:

"My menstruation has become longer and heavier, lasting up to five days instead of two to three. I also pass noticeable blood clots, sometimes with a sensation similar to a miscarriage."

Vasomotor Symptoms (VMS) and Emerging Cardiovascular Concerns

Participant said:

"I experienced persistent nighttime heat sensations, even during cooler early mornings. Particularly during the months when I had no menstruation, which subsided once my period returned."

Consequently, many of the participants reported perspiration and increase in blood pressure (BP) readings.

Participant said:

"At night, I would sweat heavily—enough that it would drip. People would even ask me why I was sweating when it was not even hot."

Participant said:

"Since menopause, I have developed hypertension; my previously normal blood pressure of 110/70–120/80 has risen to 130 and sometimes up to 150/80."

Genitourinary Symptoms of Menopause (GSMs)

Participant said:

"Vaginal dryness sometimes causes pain during intercourse; but I disregard it. The sexual urge is no longer present, and in fact, it is not something I even seek anymore."

As a consequence, a participant has verbalized a unique subjective experience of sexual autonomy violation wherein sexual activity started feeling like it was being forced against her will.

"In terms of sexual relations, there are times when I completely lose the desire for intimacy, and being pressured into it often starts conflict and emotional distress. Sometimes it even feels violating."

Another participant, on the other hand, mentioned the use of sexual aids to facilitate comfort, arousal, and natural sexual responsiveness within marital intimacy.

"To manage vaginal dryness, greater preparation during intimacy becomes necessary, including foreplay to stimulate natural lubrication before penetration. Lubricants and sex toys were also helpful."

Subtheme: Declining Physical Health and Vitality

Participant said:

"After a few months of no longer having menstruation, I became more prone to illness and felt weaker. It affected my sense of well-being, as I no longer felt as energetic or 'alive and kicking' as before."

The Body in Transition narrates women's experiences of the climacteric period as a multidimensional biological process, including a wide range of physiological changes as evidenced by existing literature. At the start of the transition, women noticed alterations in menstrual flow and characteristics which Munro et al. (2011) and Vitale et al. (2022) called "perimenopausal abnormal uterine bleeding" caused by uterine dysfunction secondary to menopause. During that stage, vasomotor symptoms (VMS) such as hot flashes and perspiration along with elevations in BP readings were also commonly reported. Furthermore, women in their postmenopausal period reported a loss of natural lubrication in the perineal area resulting in

dyspareunia and a decrease in sexual drive. Lastly, on the later stage of postmenopause, a decline in physical health and vitality was noted.

These findings are consistent with the systematic qualitative review by Wood et al. (2025), which conceptualizes menopause as a complex interconnected transition affecting multiple domains of women's health. Similarly, Santoro et al. (2021) identified menstrual disturbances, VMS, and systemic physiological changes as hallmark features of the menopausal transition, while Monteleone et al. (2018) highlighted the prevalence of genitourinary symptoms of menopause (GSMs).

Unlike many clinical studies that present these symptoms separately, participants in this study experienced them as interconnected changes shaping their bodies, daily lives, and overall well-being as time goes by. This study reveals how some women tolerate or normalize discomfort, at times continuing sexual activity despite pain or diminished sexual desire. That experience not only reflects biological changes but also relational and sociocultural dynamics influencing women's sexual autonomy. Collectively, these findings emphasize the importance of recognizing menopause as a multidimensional transition, underscoring the need for appropriate education, support, and health-promoting interventions for women undergoing this stage of life.

Main Theme B: Navigating the Unknown

This refers to the initial experiences of women undergoing menopausal changes, characterized by uncertainty and anticipation as they encounter unfamiliar changes.

Menopause Anticipation

Participant said:

"For me, there is no problem—I have already accepted it prior to menopause, knowing that it is something everyone eventually experiences."

Unfamiliarity with Menopausal Symptoms Leading to Fear and Catastrophizing Thoughts

Participant said:

"I experienced sudden body heat and felt that my blood pressure had increased, so I went to the hospital. Afterward, I began bleeding continuously for a month, causing significant worry and leading me to seek medical consultation, where I learned that it was already a sign of menopause."

Participant said:

"I felt fearful of the unfamiliar symptoms, worried that they might indicate a serious illness or even death. The fear became more intense

after a lump was detected in my breast, which triggered anxieties about the possibility of cancer.”

Navigating the Unknown describes how women initially responded to the menopausal transition through either preparedness or uncertainty. Participants who anticipated menopause viewed the changes as a natural process. In relation to this, Jalal (2024) established that the QoL of menopausal women are directly linked to preparedness and health conscious behaviors. Likewise, Tariq et al. (2023) found that increased knowledge about menopause is associated with a more positive attitude towards the transition. In contrast, some of the participants viewed the unusual symptoms of menopause as signs of pregnancy or illness. This reflects a knowledge gap that contributes to physiological distress and delayed understanding of menopausal changes. In fact, Monteleone et al. (2018) and McElhany et al. (2026) noted that biological changes during menopause can cause distress when not properly understood, implying that lack of awareness not only intensifies fear but also shapes how women experience their menopausal transition.

While previous studies like Refaei et al. (2022) highlighted education and early information as essential tools for promoting acceptance and reducing unnecessary distress, the present findings show that acceptance of menopause does not necessarily translate into the ability to recognize its early symptoms. Some participants accepted menopause as an inevitable stage of life, yet still struggled to interpret the physiological changes they experienced. With that, it is important to consider emotional preparedness and symptom literacy as complementary factors for menopausal adaptation.

Main Theme C: Inner Storms

This refers to the emotional and psychological challenges experienced by women during the climacteric period.

Emotional Instability

Participant said:

“I became sad and sensitive and could not understand my emotions. There are moments when you are sad then you suddenly cry. Sometimes, I actually feel alright.”

Participant said:

“When there’s something you want to say, even if you know that it could hurt them, you would still end up saying it. And once you see the result of it, you start regretting what you said.”

Inner Storms reflects the participants' experiences of emotional instability during the menopausal transition, characterized by mood swings, sadness, increased sensitivity, and regret following emotional

outbursts. These findings are consistent with Musial et al. (2021) and Turek and Gąsior (2023), who reported that fluctuating hormonal levels during the transition contribute to mood dysregulation, emotional vulnerability, and depressive symptoms. Similar to previous studies, participants expressed unpredictable emotional states. However, the present findings illustrate not only the presence of emotional instability but also the participants' awareness of its interpersonal consequences. Several women recognized that their impulsive emotional reactions were often followed by guilt and regret, demonstrating a process of self-reflection that has received limited attention from previous studies. Within the family-centered Filipino context, emotional instability during interactions is often interpreted in terms of its impact on relationships. Thus, these findings confirm the emotional challenges associated with menopause while highlighting the importance of culturally appropriate interpretation and psychological support, along with interventions that address both emotional well-being and family dynamics.

Main Theme D: Life Roles in Flux

This refers to how changes during the climacteric period reshape women's roles in the family, daily life, and work.

Changes in Family Interaction Pattern

Participant said:

“Even a small question can make me angry, affecting the people around me, especially at home. They would ask why I am so moody. When I am in that mood, they stop talking to me. They refuse to ask me something because they think I am angry. That's why there are times my children do not talk to me.”

Occupational Strain

Participant said:

“When I can no longer control my emotions, I close the store.”

Participant said:

“I became moody at times, which led to conflicts with my boss, affecting our work relationship... My work would pile up because I sometimes could not report to work due to worrying about the recurring bleeding.”

Life Roles in Flux shows how menopausal transition impacts everyday relationships within the household and at work. Participants reported that due to increased sensitivities, they experienced emotional fluctuations, leading to emotional withdrawal and reduced communication among family members. This is similar to the findings of Shankar et al. (2025) that when family members experience the emotional

changes associated with menopause, they adjust their communication, or even reduce it. However, this study emphasizes that the depth of emotional withdrawal experienced by some women may be more pronounced compared to others. That could be influenced by cultural expectations where open communication about emotional expression and family roles is limited.

On the other hand, the findings are consistent with Yoeli et al. (2021) who showed how combined physical demands and emotional fluctuations can reduce productivity and strain professional relationships. Thus, this study further illustrates how recurring health concerns, such as bleeding can directly contribute to work interruptions and absences. These underscore the importance of assessing family communication and promoting workplace awareness and family education to better support women during the menopausal transition.

Main Theme E: External Influences

This refers to how social environment shape women's perceptions and experiences of menopause.

Perceived Understanding and Support from Others

Participant said:

"Of course, my family helps in a way that, if you say you are not feeling well, they will just let you be and comfort you."

Participant said:

"There were times when would I pity myself even after trying to explain that these experiences were part of menopause. Despite this, I felt that men often did not fully understand and instead dismissed them as excuses."

Social Learning and Comparison of Experience

Participant said:

"I'm just normalizing it. Since the people who had their menopause told me that those are the symptoms that indicate you are about to start menopause."

External Influences discusses how understanding and behavioral adjustment from family and peers precipitate a sense of support during menopause. This concept aligns with Cowell et al. (2024), which emphasizes that menopausal mediation is effective socially, with emotional understanding and behavioral adjustments from others helping them cope, and with AlSwayied et al. (2024), which state that peer sharing and perceived social support help normalize experiences and improve emotional adjustment. These findings extend previous literature by highlighting that support is largely family-centered and reinforced through community shared-experiences within the Filipino context. Hence,

making interpersonal relationships a key instruments on women's adaption to the climacteric period. This underscores the importance of culturally-responsive and empathetic interventions underscoring the need to improve family awareness and communication to strengthen relationships during this transition.

Main Theme F: Paths of Coping and Renewal

This refers to the gradual, adaptive development of coping strategies during this life transition to manage changes associated with menopause.

Subtheme A: Coping and Management

Active Coping Through Movement

Participant said:

"What really helped me was walking and Zumba... It has already become a part of my routine to exercise."

Pharmacologic Management and Hormone Therapy

Participant said:

"I used pain relievers then I underwent HRT before my menopause ended."

Alternative Remedies

Participant said:

"Whenever I start feeling itchy, I boil guava leaves."

Subtheme B: Adaptability and Resilience

Participant said:

"You can learn from it, instead of making it seem negative– instead of going through that stage where you dwell on what was lost– you can turn it into something positive."

Participant said:

"When I was often at the hospital, I eventually got used to it, and I learned to live with it."

Paths of Coping and Renewal discusses coping strategies and management women use during the climacteric period. It includes adopting an active lifestyle and using pharmacologic, alternative, and hormonal management to address various menopausal symptoms. Pharmacologic, alternative remedies, and HRT may also help deal with symptoms that cannot be effectively managed solely via lifestyle and behavioral modifications. Consistent with the North American Menopause Society (2022), HRT remains effective in alleviating moderate or severe VMS among climacteric women, thereby improving their QoL. Erdélyi et al. (2023) also noted that women are inclined to use plants and alternative

remedies because these methods appear to be safe, familiar to culture, and accessible.

Likewise, Tariq et al. (2023) suggested that women with positive perceptions of menopause demonstrated better emotional adjustment, as acceptance facilitated effective coping, which is congruent with the findings of this theme, suggesting that adaptability serves as an instrument to promote resilience and help women navigate menopause with confidence and emotional stability. Thus, these findings extend the existing literature, showing that Filipino women not only rely on medical treatments but also integrate culturally familiar practices and gradually develop acceptance as part of healthy aging. This culturally-grounded approach suggests that nursing care should be culturally responsive in a way that protects women's beliefs while promoting safe and evidence-based healthcare.

IV. CONCLUSION

This study concludes that the climacteric period is a continuous biological transition. Women's experiences across stages often overlap, wherein changes in perimenopause and menopause may still be experienced by those who are already in their postmenopausal stages. However, the study reveals that each stage has its own unique highlights, with the perimenopause emerging as the most uncertain and symptomatically unstable stage of the climacteric period. At the same, based on the conclusions, it is recommended that healthcare professionals provide individualized care for women in the climacteric period and strengthen psychosocial support systems to help women feel validated, reduce feelings of isolation, and build their confidence in managing climacteric changes by integrating symptom assessment, health education, counseling, and psychosocial support into maternal and women's health services. Also, for future researchers to expand the study by including a more diverse population from different areas, cultures, and economies to provide a larger base for inference.

CONTRIBUTION OF AUTHORS

The research study was an output of collaboration between the student researchers and their research promoter. Together, they worked for the completion of the manuscript from proposal, data gathering, and the finalization of the paper.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

FUNDING

This study received funding from the researchers' out-of-pocket money. Nonetheless, the funding source did not interfere with any aspects pertaining to the design of the study, the collection and analysis of

data, the way the data were explained, or the choice to publish the article.

CONFLICT OF INTEREST

We, the researchers, may have a pre-formed impression of menopause from the people we grew up with—particularly by observing our mothers and older female relatives. To address this issue, we strictly applied bracketing and reflexivity to maintain rigor and trustworthiness.

DISCLOSURE OF USE OF GENERATIVE AI

We used Grammarly to check grammatical errors and Turnitin was also used for originality reports and AI writing overview. We take full responsibility for the content of this publication..

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Effectiveness of VirtualSim-COVID on Nursing Students' Learning Outcomes Toward COVID-19

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ABSTRACT

Introduction: The COVID-19 pandemic challenged the continuity of education worldwide, particularly in health and nursing education. Thus, web-based virtual simulation seems an appropriate pedagogical strategy to help nursing students continue learning safely during the pandemic and improve their learning outcomes.

Aim: This study sought to improve nursing students' learning outcomes pertaining to COVID-19 among community-dwelling older adults using a web-based virtual simulation for COVID-19 (VirtualSim-COVID).

Methods: Data were collected from September to November 2023 at a single college of nursing in Saudi Arabia. Participants were junior and senior nursing students recruited through convenience sampling. The study was approved by the Princess Nourah University (approval no. IRB log 22-0438, and all participants provided written informed consent. Data were analyzed using descriptive statistics, paired t-tests, and Wilcoxon signed-rank tests. Assumptions for paired t-tests were examined, including normality of difference scores (Shapiro-Wilk test), independence of observations, and absence of outliers. An alpha level of .05 was used for all inferential tests. The VirtualSim-COVID consisted of case scenarios, a general review of COVID-19, practice quizzes on performing hand hygiene, applying personal protective equipment (PPE), and administering the vaccine, and self-debriefing.

Results: A total of 21 junior and senior nursing students were recruited; 23 consented and 2 withdrew after the pretest due to scheduling conflicts. The results showed that students demonstrated significant improvement in knowledge ($t(19) = -3.33$, $p = .004$, Cohen's $d = 0.74$), self-confidence ($t(17) = -4.32$, $p < .001$, Cohen's $d = 1.02$), and satisfaction ($t(17) = -5.06$, $p < .001$, Cohen's $d = 1.19$) after the intervention, as well as descriptive improvement in skill performance. No significant change was observed in the overall critical thinking score ($t(20) = 0.45$, $p = .658$), attitude subscale ($Z = -1.00$, $p = .317$), or practice subscale ($Z = -0.26$, $p = .796$).

Conclusion: The findings revealed significant improvements in participants' knowledge, self-confidence, and satisfaction, as well as descriptive improvement in skill performance, following the VirtualSim-COVID intervention. However, the absence of a comparison group precludes definitive causal attribution of these improvements to the intervention alone. VirtualSim-COVID shows promise as an educational tool for improving nursing students' knowledge, skill performance, self-confidence, and satisfaction. Therefore, incorporating virtual simulation into nursing education programs' curricula is recommended. Further research using randomized controlled designs with larger samples is suggested.

Keywords: *virtual simulation, web-based simulation, learning outcomes, nursing education, nursing students, COVID-19*

I. INTRODUCTION

The COVID-19 pandemic has had a devastating impact on how institutions operate worldwide. Workplaces have had to adapt and implement remote working arrangements with new safety protocols to protect employees (World Health Organization [WHO], 2020). Healthcare facilities have been overwhelmed due to shortages of critical supplies and personnel while rapidly developing solutions to address the needs for treating and preventing the spread of COVID-19 (WHO, 2020). Educationally, schools were also severely affected by widespread closures, leading to an accelerated adoption of virtual learning platforms and hybrid teaching

models (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2020). The pandemic also had negative impacts on professional training for nurses, who require both classroom-based theoretical instruction and clinical practice.

Most undergraduate nursing programs are based in campus classrooms because nursing is a primarily "hands-on" profession. It requires skill lab training, simulated lab training, and actual clinical training far more than most other professional educational programs (Palancia Esposito & Sullivan, 2020). Nursing students had little knowledge of how to address the COVID-19 pandemic appropriately and safely. Thus, they were considered to be at high risk in clinical

placements for themselves as well as their patient populations (Al-Dossary et al., 2020; Elgzar et al., 2020). As such, there is a need for alternative means of training student nurses regarding care for the COVID-19 pandemic due to the lack of available space for traditional clinical experiences.

Simulation is now widely recognized as a core component of academic education in nursing and health sciences (Aebbersold, 2018; Padilha et al., 2019). Recent research has demonstrated that using virtual simulation as an educational tool improves knowledge of undergraduate students in clinical practice (Aebbersold, 2018; Padilha et al., 2019). Virtual simulation is defined as the recreation of reality depicted on a computer screen (Padilha et al., 2019). It provides novice learners with a safe and comfortable environment to practice nursing competencies in real-time nursing skills anywhere and anytime (Foronda et al., 2020; Padilha et al., 2019; Shorey & Ng, 2020). Nonetheless, the COVID-19 pandemic posed significant challenges to students' acquisition of knowledge and clinical skills necessary for practice, partially because of a shift from face-to-face educational modalities to online/distance learning formats (Ilankoon et al., 2020). Likewise, reducing or eliminating clinical rotations during the COVID-19 pandemic further exacerbated the inability of students to develop the cognitive and psychomotor skills necessary to meet the requirements of practice. These problems widened the gaps between what students learned theoretically versus what they could perform clinically (Agu et al., 2021). Several researchers have suggested that virtual simulation should be considered an alternative methodological approach to provide instruction when clinical placements are disrupted (Foronda et al., 2020; Padilha et al., 2019). However, the effectiveness of non-immersive virtual simulation as an instructional tool to train student nurses on COVID-19 pandemic care is currently unknown.

The NLN-Jeffries Nursing Education Simulation Framework (NLN-JSF) (Jeffries, 2005) was utilized to guide this research project. The NLN-JSF encompasses five conceptual constructs: teacher factors, student factors, educational practices, simulation design, and learning outcomes. In this project, the simulation design constructs were utilized to create virtual simulation models to instruct nursing students on educating older adults who are living in their own homes or in social home care settings regarding COVID-19. The NLN-JSF will help researchers develop virtual simulation models and evaluate learning outcomes through its foundational components for the development, implementation, and assessment of simulation as an instructional strategy in nursing education.

Although virtual simulation has become commonplace in nursing education since the COVID-19 pandemic, previous studies have primarily focused on developing clinical skills (i.e., urinary catheterization, tracheostomy care) or developing and testing single modality platforms such as vSim® (Padilha et al., 2019; Foronda et al., 2020). The uniqueness of VirtualSim-COVID can be attributed to

three key attributes. Firstly, it is the first comprehensive desktop-based virtual simulation program designed to provide COVID-19 pandemic education specifically for nursing students in Saudi Arabia. Secondly, while many existing virtual simulations are based on acute care settings in hospitals and address adult populations, VirtualSim-COVID addresses the needs of older adults in social home care. This is a highly vulnerable population often neglected in the design of simulated pandemic experiences. Lastly, VirtualSim-COVID utilizes multiple learning modalities in one platform: case scenario, pathophysiology review, interactive practice quizzes for hand hygiene, PPE application, and vaccine administration, as well as self-debriefing. This provides a holistic learning experience that would not be possible utilizing single modality virtual simulations. This multi-modal approach also corresponds with the NLN-JSF simulation design construct and provides a more inclusive and comprehensive learning experience than single modality virtual simulations.

This research aimed to improve junior and senior nursing students' knowledge, critical thinking abilities, skills competency, confidence level, and satisfaction toward COVID-19 care for community-dwelling older adults using a web-based virtual simulation for COVID-19 ("VirtualSim-COVID"). Specifically, it aimed to accomplish the following objectives: (1) to develop and build VirtualSim-COVID using a case study of COVID-19 transmission and protective measures; and (2) to investigate whether VirtualSim-COVID can enhance students' knowledge, critical thinking abilities, skills competency, confidence levels, and satisfaction toward educating and caring for community-dwelling older adults with COVID-19.

Based on these aims, the researcher hypothesized that: (1) nursing students' knowledge about COVID-19 would improve after receiving VirtualSim-COVID; and (2) students would show improvement in critical thinking skills, skills performance, self-confidence, and satisfaction as a result of the VirtualSim-COVID learning experience.

II. METHODS

Research Design

This pilot study employed a one-group pre-test and post-test design. Participants were recruited through convenience sampling from a single college of nursing in Saudi Arabia. Inclusion criteria were junior or senior nursing students enrolled in the baccalaureate nursing program during the data collection period (September to November 2023) and willingness to provide informed consent. Students who had prior exposure to VirtualSim-COVID or who were not currently enrolled in clinical nursing courses were excluded.

Of the 23 students who consented to participate, 21 completed the post-intervention assessment. Two participants withdrew after the pretest due to scheduling conflicts.

Participants and Sampling

COVID-19 Knowledge, Attitude, and Practice (KAP) Questionnaire. Student knowledge, attitude, and practice regarding COVID-19 were measured using a researcher-adapted questionnaire based on the instrument developed by Albaqawi et al. (2020) for Saudi nursing students. The instrument included three subscales: Knowledge, Attitude, and Practice. The Knowledge subscale consisted of 12 items scored as correct (1) or incorrect (0), yielding a possible range of 0–12. Content validity was established through expert review by a geriatric nurse practitioner, dissertation committee members, and a nurse working in a social home in Saudi Arabia, who confirmed the cultural relevance and clinical accuracy of the items. Internal consistency reliability in the current sample was 0.85.

California Critical Thinking Skills Test (CCTST). Critical thinking was measured using the CCTST–College Level (Facione, 1990b; Insight Assessment, 2017). The CCTST yields an overall score and five subscale scores: Analysis, Evaluation, Inference, Deductive Reasoning, and Inductive Reasoning. Higher scores indicate stronger critical thinking skills. Overall internal consistency reliability in the current sample was 0.79.

Self-confidence and satisfaction were measured using the National League for Nursing (NLN) Student Satisfaction and Self-Confidence in Learning Scale (Franklin et al., 2014). The scale consists of two subscales: Satisfaction (5 items; possible range 5–25) and Self-Confidence (8 items; possible range 8–40). Items are rated on a 5-point Likert scale, with higher scores indicating greater satisfaction and self-confidence. Internal consistency reliability in the current sample was $\alpha = 0.81$ for the Satisfaction subscale and $\alpha = 0.72$ for the Self-Confidence subscale.

Skill Performance Checklists. Skill performance was assessed using three researcher-developed checklists for hand hygiene, PPE application, and vaccine administration. Each checklist consisted of 10 procedural steps scored as correct (1) or incorrect (0), yielding a possible score of 0–10 per skill. Content validity was established through expert review by a geriatric nurse practitioner, dissertation committee members, and a nurse working in a social home in Saudi Arabia, who confirmed the cultural relevance and clinical accuracy of the items. However, validated observational checklists (e.g., the WHO Hand Hygiene Self-Assessment Framework or standardized OSCE checklists) were not used, owing to the unavailability of Arabic-validated versions at the time of instrument selection.

The VirtualSim-COVID Intervention

A three-dimensional (3D) VirtualSim-COVID case scenario was developed. The researcher developed a script for the COVID-19 scenario to assist nursing students in caring for and educating patients about protective and preventive measures (Verkuyl et al., 2019). The scenario involved an elderly woman admitted for high blood pressure who developed

COVID-19, recovered, and was transferred to social home care. The nurse avatar conducted an education session in the garden of the social home. It covered transmission, symptoms, and protective measures including hand hygiene, masks, social distancing, and vaccines. All information used in the scenario met the guidelines of the Saudi Centers for Disease Control and Prevention and the Saudi Ministry of Health (MOH). To increase realism, the script was reviewed by a geriatric nurse practitioner, dissertation committee members, and a nurse working in a social home in Saudi Arabia. They confirmed it was culturally relevant to Saudi Arabia's healthcare culture and practices.

Intervention Development and Data Collection

Unreal Engine 5 (UE5) was used to design and develop the VirtualSim-COVID software. It is a real-time 3D creation tool for graphic visual and immersive experiences (Wiesing et al., 2020). The programming language used was Blueprint Visual Scripting, a node-based interface system within Unreal Editor. Avatars represented a nurse, an elderly woman, and a paramedic. Human-like voices were generated using Audacity and Murf.AI. The VirtualSim-COVID interface consists of three basic buttons: start, about, and quit. The simulation includes a case scenario, a review of COVID-19 pathophysiology, a practice multiple-choice game for clinical procedures (hand hygiene, PPE application, and vaccine administration), a self-debriefing, and a results screen. Users navigate the 3D environment using a computer mouse and keyboard. They utilize an inventory system to collect needed PPE such as disposable gloves, masks, and contactless thermometers.

Participants completed the VirtualSim-COVID module at their own pace over a two-week period. The post-test was administered during the students' final examination period. Skill performance checklists were completed through a self-report.

Intervention Development and Data Collection

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Table 1*Types of Simulation in which Students Previously Participated (N = 21)*

Simulation Type	<i>f</i>	%	Valid Percent	Cumulative Percent
Valid				
Task trainer	5	23.8	29.4	29.4
Low-fidelity manikin simulator	2	9.5	11.8	41.2
High-fidelity simulator	2	9.5	11.8	52.9
Standardized patient simulation	8	38.1	47.1	100.0
Total valid responses	17	81.0	100.0	
Missing				
No previous simulation experience	4	19.0	—	—
Total	21	100.0	—	—

Data Analysis Procedure

Data were analyzed using SPSS version 27. Descriptive statistics (means, standard deviations, frequencies, and percentages) were used to summarize demographic and outcome variables. Paired t-tests were used to compare pre- and post-intervention scores for normally distributed difference scores, and Wilcoxon signed-rank tests were used for non-normally distributed difference scores. Assumptions for paired t-tests were examined, including normality of difference scores using the Shapiro–Wilk test, independence of observations, and absence of outliers. An alpha level of .05 was set for statistical significance. Effect sizes were calculated using Cohen's *d* for paired t-tests, with values of 0.2, 0.5, and 0.8 interpreted as small, medium, and large, respectively (Cohen, 1988). Missing data were not imputed; pairwise deletion was used for each analysis.

Ethical Consideration

This research has with the approval of the Institutional Review Board of the Princess Nourah University IRB Log number 22-0438.

III. RESULTS AND DISCUSSION

Participant Demographics

Of the 23 students who consented to participate, 21 completed the post-intervention assessment. Two participants withdrew after the pretest due to scheduling conflicts. For the knowledge questionnaire, one participant had incomplete data and was excluded from the paired analysis (*n* = 20). For the self-confidence and satisfaction scales, three participants had incomplete

data and were excluded from those analyses (*n* = 18). For the CCTST, all 21 participants provided complete data. Missing data were not imputed; pairwise deletion was used for each analysis.

Table 1 presents the types of simulation in which students previously participated. The students' ages were between 19 and 23 years old. All participants were female (100%). The mean age of the students was 20.57 (*SD* = 0.98) years. Juniors represented 76.2% (*n* = 16) of the participants, whereas seniors represented 23.8% (*n* = 5).

Seventeen students (*n* = 17, 81%) reported previous clinical simulation experience. Four students (*n* = 4, 19%) reported no clinical simulation experience. However, no students had previous virtual simulation experience. They had experience in other simulation types, such as task trainer simulation (*n* = 5, 23.8%) or standardized patient simulation (*n* = 8, 38.1%). Two students had used a low-fidelity simulator. Two other students had used a high-fidelity simulator.

Knowledge and Critical Thinking

The knowledge scores for the pre-test ranged between 6 and 12, with a mean score of 10.33 (*SD* = 1.62). After the intervention, the scores on the post-test ranged between 9 and 12, and the mean score increased to 11.24 (*SD* = 0.94). One participant had incomplete knowledge questionnaire data and was excluded from this analysis (Table 2).

Regarding the COVID-19 knowledge questionnaire's Attitude and Practice subscales, no significant differences were found between pre- and post-intervention scores. The Attitude subscale scores did not change significantly (*Z* = -1.00, *p* = .317), and the Practice subscale scores also showed no significant change (*Z* = -0.26, *p* = .796).

Table 2*Pre- and Post-Intervention Knowledge Score and CCTST*

Measure	Mean	SD	Paired <i>t</i>	df	<i>p</i>	Cohen's <i>d</i>	95% CI (Mean Diff)
Before intervention	10.33	1.62	-3.33	19	.004	0.74	[0.34, 1.47]
After intervention	11.24	0.94	—	—	—	—	—

Note. One participant with incomplete knowledge questionnaire data was excluded from this analysis (*n* = 20). CI = confidence interval.

Table 3
Pre- and Post-Intervention Self-Confidence and Satisfaction Scores

Measure	Mean	SD	Paired <i>t</i>	df	<i>p</i>	Cohen's <i>d</i>	95% CI (Mean Diff)
Self-Confidence							
Before intervention	32.33	6.55	-4.32	17	< .001	1.02	[1.73, 5.03]
After intervention	35.71	4.26	—	—	—	—	—
Satisfaction							
Before intervention	21.05	3.71	-5.06	17	< .001	1.19	[1.03, 2.50]
After intervention	22.81	1.94	—	—	—	—	—

Note. Three participants with incomplete self-confidence and satisfaction scale data were excluded from these analyses (*n* = 18). Exact *p*-values: self-confidence *p* = .0005; satisfaction *p* = .0001. CI = confidence interval.

Pre- and Post-Intervention Scores for the CCTST and the Subscales

Subscale	Pretest: M (SD)	Posttest: M (SD)	<i>t</i> (df = 20)	<i>p</i>	Cohen's <i>d</i>
Overall score	10.52 (3.23)	10.19 (3.11)	-0.45	.658	0.10
Analysis	3.14 (1.68)	2.95 (1.40)	-0.65	.521	0.14
Evaluation	5.00 (1.52)	4.76 (2.05)	-0.12	.901	0.03
Inference	2.38 (1.56)	2.43 (1.16)	+0.37	.708	0.08
Deductive reasoning	5.95 (2.04)	5.62 (1.96)	-0.07	.939	0.02
Inductive reasoning	4.57 (1.72)	4.52 (2.02)	-0.79	.438	0.17

Note. The post-intervention overall score (10.19) reflects the original computed total and differs slightly from the sum of subscales (10.14) due to independent rounding of each subscale mean.

Self-Confidence and Satisfaction

The self-confidence pre-test scores ranged between 13 and 40, with a mean of 32.33 (SD = 6.55). After the intervention, the scores ranged between 26 and 40, and the average score increased to 35.71 (SD = 4.26). For student satisfaction, the pre-test scores ranged between 13 and 25, with a mean of 21.05 (SD = 3.71). After the intervention, the scores ranged between 19 and 25, and the average score increased to 22.81 (SD = 1.94). Three participants had incomplete self-confidence and satisfaction scale data and were excluded from this analysis (Table 3).

Skills Performance

The skill performance checklists included three skills: hand hygiene, PPE application, and vaccine administration. The hand-hygiene scores for the pre-test ranged between 7 and 10 (70%–100%), with a mean score of 8.86 (SD = 1.15), and the average score increased to 10.00 (SD = 0.00) after the intervention. Regarding the application of PPE, the pre-test scores ranged between 5 and 10, with a mean of 8.10 (SD = 1.61). The dispersion of scores decreased in the post-test to a range of 8–10, and the average score increased to 9.33 (SD = 0.97).

Finally, for administering vaccines, the pre-test scores ranged between 5 and 10, with a mean of 7.76 (SD = 1.41). The dispersion of scores decreased in the post-test to a range of 8–10, and the average score increased to 9.43 (SD = 0.93). The percentage of correct answers for the hand-hygiene skills before the intervention increased from 70%–100% to 100% after the intervention. The correct answer rate for applying PPE increased from 50%–100% to 80%–100% after the intervention, and similarly for administering vaccine skills, indicating improvement after using VirtualSim-COVID (Table 4).

Descriptive analyses indicated improvement in all three skill areas from pre- to post-intervention. Inferential statistical tests were not conducted for skill

Table 4
Skills Performance of the Participants Pre- and Post-Intervention

Skill Performance Item	Pre-test Mean (SD)	Post-test Mean (SD)	Pre-test Range (%)	Post-test Range (%)
Hand Hygiene	8.86 (1.15)	10.00 (0.00)	70% – 100%	100%
PPE Application	8.10 (1.61)	9.33 (0.97)	50% – 100%	80% – 100%
Vaccine Administration	7.76 (1.41)	9.43 (0.93)	50% – 100%	80% – 100%

Note. Inferential statistical tests were not conducted for skill performance data because each skill area was measured by a single-item checklist. These improvements should be interpreted with caution.

performance data because each skill area was measured by a single item. Therefore, these improvements should be interpreted with caution.

Discussion

The purpose of this pilot study was to assess the effectiveness of VirtualSim-COVID. It aimed to improve nursing students' knowledge, critical thinking skills, skill performance, satisfaction, and self-confidence in dealing with patients with COVID-19 in Saudi Arabia. The first hypothesis was that nursing students' knowledge about COVID-19 would improve after receiving VirtualSim-COVID. The second hypothesis was that students would show improvement in critical thinking skills, skills performance, self-confidence, and satisfaction as a result of the VirtualSim-COVID learning experience.

The findings revealed a significant improvement in the Knowledge subscale ($p = .004$, Cohen's $d = 0.74$). COVID-19 restrictions prevented nursing students from learning and practicing in clinical settings. Consequently, students lacked sufficient knowledge about COVID-19. The VirtualSim-COVID provided comprehensive information supported by CDC and MOH guidelines. It also replicated a real-life scenario relevant to the pandemic. These findings echo previous research demonstrating that simulation-based learning contributes to increased nursing students' knowledge (Tawalbeh, 2020; Zulkosky et al., 2021).

While the Knowledge subscale showed significant improvement, the Attitude and Practice subscales did not ($Z = -1.00$, $p = .317$; $Z = -0.26$, $p = .796$). Although the Attitude subscale improvement was not statistically significant, there was a meaningful change. Before the intervention, 86% of students agreed that COVID-19 will finally be successfully controlled. After the intervention, 95% agreed. No significant change in Practice subscale scores was noted. Several factors may explain this. One is the small sample size ($N = 21$). Another potential reason may be the time frame of the subscale's items, which focus on assessing practices applied during the pandemic.

Ceiling effects may have limited the detection of improvement. Post-intervention, knowledge scores approached the maximum possible score ($M = 11.24$, $SD = 0.94$, $\max = 12$; 93.7% of maximum), with 75% of participants scoring at or near the ceiling. Similarly, self-confidence ($M = 35.71$, 89.3% of maximum) and satisfaction ($M = 22.81$, 91.2% of maximum) showed high post-intervention means with limited room for upward movement. For skill performance, hand hygiene reached 100% correct post-intervention, while PPE (93.3%) and vaccine administration (94.3%) approached ceiling. These ceiling effects may have contributed to the non-significant findings for the attitude and practice subscales.

The study findings also revealed an improvement in students' skills performance after VirtualSim-COVID training. These findings are consistent with Zulkosky et al. (2021), who demonstrated that repeating simulation scenarios improved clinical performance. The observed improvement can be explained by the VirtualSim-

COVID's capability of allowing participants to apply their abstract knowledge in practice. Additionally, its benefits of repeatability and self-directed learning offer students the convenience of using this tool at their chosen time and place. They also provide the opportunity to practice as much as they want at home (Zulkosky et al., 2021). The virtual simulation allows students to perform activities as in real clinical settings and offers feedback on their performance. Students may make mistakes in a safe learning environment and learn from them, enhancing their performance through deliberate practice (Zulkosky et al., 2021).

The current study also demonstrated significant improvements in self-confidence and satisfaction after the VirtualSim-COVID intervention. These findings are in line with previous systematic reviews showing that simulation-based learning improves nursing students' self-confidence and satisfaction (Shorey & Ng, 2020; Zulkosky et al., 2021). The structure of the VirtualSim-COVID, including different modalities of learning such as simulation scenario, general review, practice quiz, and self-debriefing, likely contributed to this improvement. Immediate self-debriefing allows students to reflect on their experiences and learn from their mistakes, which may boost satisfaction (Kim & Kim 2015). Another explanation is the safe learning environment that VirtualSim-COVID provides, in contrast to the stressful environment of real-world clinical placement. Factors such as fear of making mistakes, poor performance, or lack of knowledge negatively impact self-confidence and satisfaction (Ching et al., 2020; So et al., 2019). VirtualSim-COVID offers a safe environment where students can repeat the simulation until they master the requisite knowledge and skills.

Beyond statistical significance, the observed improvements carry educational significance. The Cohen's d effect sizes for knowledge ($d = 0.74$), self-confidence ($d = 1.02$), and satisfaction ($d = 1.19$) exceed Cohen's (1988) threshold for medium to large effects. For knowledge, the mean increase of 0.90 points represents a 7.5% absolute improvement and a 31% reduction in the distance to perfect knowledge. For self-confidence, the 3.38-point increase moves students from 80.8% to 89.3% of maximum possible confidence. These effect sizes suggest that VirtualSim-COVID produces educationally meaningful changes, even if the one-group design precludes causal attribution.

In contrast, no significant difference was observed in students' critical thinking skills after the intervention. Notably, four of the five CCTST subscales (Analysis, Evaluation, Deductive Reasoning, and Inductive Reasoning) showed slight declines, though none were statistically significant. These results are consistent with Kang et al. (2020), who found no statistically significant differences in critical thinking after virtual simulation. The sensitivity of the CCTST to detect change over a brief intervention period should be considered. The CCTST assesses general critical thinking abilities that may require sustained instructional exposure to produce measurable change (Abrami et al., 2015; Insight Assessment, 2017). The

two-week intervention may have been insufficient for this complex construct. The small sample size and timing of data collection during final exams may also explain the insignificant change. The post-test was administered during final exams; students might not have had sufficient time to respond. Longer intervention periods (e.g., 4–8 weeks) may be necessary to produce measurable changes in these complex outcomes (Abrami et al., 2015).

It is of note that confounding variables might have played a large part. Junior students, who represented 76.2% of the sample, had much less experience in developing critical thinking than seniors. The university typically offers a critical thinking course only at the senior level. Therefore, further studies with an RCT design are needed to identify and control confounding variables and examine the true effect of VirtualSim-COVID on critical thinking (Zabor et al., 2020).

It is important to emphasize that the one-group pretest-posttest design substantially limits causal inference. Without a comparison group, observed improvements cannot be confidently attributed to VirtualSim-COVID alone. Alternative explanations such as maturation, historical events, repeated testing, or regression to the mean may have contributed (Shadish et al., 2002). Readers should interpret the findings as preliminary evidence of association rather than causal effect. Future research employing RCT designs with active control groups is necessary to establish causal efficacy.

Implications of Virtual Simulation for Nursing Education

In unpredictable, challenging situations such as the COVID-19 pandemic, virtual simulation offers a teaching strategy. It provides a safe learning environment for nursing students to practice clinical skills without exposure to infectious diseases (Foronda et al., 2020; Padilha et al., 2019). The availability of such a tool ensures the continuity of education. This is in spite of restrictions on in-person clinical experiences. Although VirtualSim-COVID may not fully replace clinical practice, it serves as a significant teaching approach. It could be an effective tool for nursing education. It helps bridge the gap between classroom learning (abstract) and clinical practice (concrete). This is particularly important in the absence of in-person clinical practice (i.e., COVID-19 pandemic). Additionally, VirtualSim-COVID offers flexibility in scheduling and accessibility. This permits nursing students to engage in distance learning at a time that suits them (Foronda et al., 2020; Shorey & Ng, 2020). Such flexibility is particularly significant during times when traditional clinical practice might be limited or unavailable. This is due to pandemic restrictions. VirtualSim-COVID could ensure the continuity of nursing education regardless of circumstances.

By involving technology such as VirtualSim-COVID in nursing education, nursing educators can adjust learning approaches. They can fulfill their students' needs while sustaining educational standards during

unpredictable circumstances, such as the COVID-19 pandemic. Furthermore, the COVID-19 pandemic highlighted the significance of preparedness among healthcare practitioners, particularly nurses, for public health crises. VirtualSim-COVID focused on pandemic response preparedness. It could help nursing students improve their knowledge, skill performance, satisfaction, and self-confidence. This is while managing, caring for, and educating older adults during infectious disease outbreaks. VirtualSim-COVID can be considered an innovative solution in the face of challenges. These include the COVID-19 pandemic. Such challenges might restrict hands-on clinical training in nursing education. The integration of virtual simulations into nursing curricula might allow educators to enhance their students' learning experiences. It might foster their clinical experience. It might also prepare them as future nurses to effectively respond to public health crises such as COVID-19.

Implications for Nursing Academic Administrators

Within the academic setting, it is imperative for those in positions of authority and responsibility to work together. This includes the dean or vice dean of a nursing program. They need to reach a decision regarding the incorporation of VirtualSim-COVID technologies into the nursing curriculum. This will prepare students for critical healthcare crises. VirtualSim-COVID will advance a nursing program curriculum. It provides an easily available and gamified clinical learning environment for students. In terms of financial matters, academic nursing administrators are responsible for managing a designated budget. They may also secure grants. These funds are to develop, administer, and assess the effectiveness of using VirtualSim-COVID. Thus, they can provide faculty members and nursing students with potential resources. They can also provide assistance and training programs. These are necessary for preparing a VirtualSim-COVID platform as an educational tool.

Administrators must take many factors into account when integrating virtual simulations into a nursing curriculum. They should establish a contractual agreement with a professional virtual simulation developer. This developer will design and construct virtual simulation software. Equipment is another consideration. It mandates a computer laboratory furnished with high-performance computers or laptops. These operate on the Windows or Mac operating system. In addition, employing proficient virtual simulation instructors and engineering technicians is crucial. These individuals must possess the ability to (a) proficiently create and design virtual simulation case scenarios; (b) demonstrate a comprehensive understanding of the learning objectives for each virtual simulation topic/course; (c) adeptly navigate computer usage, operate software, and provide effective management; (d) diligently monitor and assess learners' performance; and (e) mentor and guide clinical instructors and students while using virtual simulation (Gordon, 2018, pp. 32–35; McGonigle & Gordon, 2018, p. 264). To effectively implement virtual

simulation, individuals need proficiency in scenario creation, understanding learning objectives, technology navigation, performance monitoring, and mentoring (Gordon, 2018; McGonigle & Gordon, 2018). This comprehensive skill set is pivotal for optimizing virtual learning experiences.

IV. CONCLUSION

This pilot study sought to assess the effectiveness of VirtualSim-COVID in improving nursing students' knowledge, critical thinking skills, and skill performance in the context of COVID-19, as well as satisfaction and self-confidence. The findings revealed significant improvements in participants' knowledge ($p = .004$), self-confidence, and satisfaction, as well as improvement in skill performance, following the VirtualSim-COVID intervention. However, the absence of a comparison group precludes definitive causal attribution of these improvements to the intervention alone. The VirtualSim-COVID provided students with comprehensive information supported by CDC and MOH guidelines and replicated a real-life scenario to train students in a safe learning environment.

While the improvement in critical thinking was not significant likely due to the small sample size, the limited sensitivity of the CCTST to brief interventions, and the complex nature of developing such skills the study demonstrated that virtual simulation can bridge the gap between abstract classroom learning and concrete clinical practice. Overall, VirtualSim-COVID is an innovative teaching-learning method that fosters the nursing students' learning experience and prepares them as future nurses to effectively respond to public health crises.

V. RECOMMENDATIONS

The following recommendations were developed based on the findings and limitations of this pilot study.

Future research studies using a randomized controlled trial (RCT) will need to include both active and inactive comparison groups in order to demonstrate the causal effectiveness of VirtualSim-COVID and also to account for potential confounding variables including maturation, repeated testing and previous critical thinking coursework completed by students.

In addition to establishing a causal relationship between VirtualSim-COVID and student outcomes, future studies are needed that utilize larger sample sizes than what was utilized in the present pilot study. Larger sample sizes would allow for greater diversity within samples, specifically males, multiple nursing colleges, etc. Additionally, the generalizability of results would improve and would provide adequate statistical power for subgroup analysis based upon academic year.

A longer duration of time for the intervention (i.e. 4-8 weeks) and/or repeated exposures to the VirtualSim-COVID simulation will be important factors to investigate, especially for more complex learning outcomes, such as critical thinking, which may require

prolonged educational exposure before significant improvements in the outcome measure are evident.

In addition to collecting subjective data through surveys, future researchers are encouraged to utilize objective measures of learning, including the collection of standardized, valid and when possible Arabically-translated data. Examples of data sources could include skill performance check lists (such as the World Health Organization's Hand Hygiene Self-Assessment Tool) or standardized Objective Structured Clinical Examination (OSCE) tools. This approach will increase the reliability and comparability of data collected regarding skill-based learning outcomes.

Moreover, researchers are encouraged to incorporate objective measures of learning in addition to subjectively reported learning. These objective measures could include blind assessment of student skills performed by trained observers, knowledge retention assessments conducted at varying times after completion of the intervention (for example 1-3 months post-intervention) and utilization of learning analytics obtained from the virtual simulation software.

Researchers are encouraged to identify other moderating factors that may impact student learning outcomes including but limited to students' level of digital literacy, their past experience with simulation technology and learning style preference. Researchers are also encouraged to conduct mediation analyses to determine the specific mechanisms through which virtual simulations contribute to enhanced student learning outcomes.

Finally, researchers are encouraged to complete a cost-benefit and usability assessment of VirtualSim-COVID to assist faculty members with making informed decisions related to utilizing VirtualSim-COVID in nursing curricula on a broader scale.

CONTRIBUTION OF AUTHORS

Reem Humaidi Alalawi is the sole author of this article. The author was responsible for all phases of the work, including conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, writing—original draft preparation, writing—review and editing, visualization, supervision, and project administration.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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CONFLICT OF INTEREST

The author declares that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

DISCLOSURE OF USE OF GENERATIVE AI

During the preparation of this work, the author used Google Gemini to assist with language polishing / grammar checking / structuring the manuscript]. After using this tool, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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Reframing Perioperative Clinical Competence in Nursing Education: toward a Systems-Integrated and Experience-Driven Paradigm

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ABSTRACT

Introduction: Perioperative nursing competence is fundamental to ensuring patient safety, high-quality surgical care, and effective interprofessional collaboration. However, undergraduate nursing education continues to rely heavily on reductionist competency frameworks that emphasize checklist-based performance and self-reported readiness. While these approaches provide standardized assessment, they inadequately capture the dynamic, contextual, and relational nature of perioperative clinical competence. Consequently, there is a growing need to reconceptualize competence beyond isolated technical skills toward an integrated understanding that reflects authentic clinical practice.

Aim: xxxxx.

Methods: This study employed an integrative critical narrative review guided by the Scale for the Assessment of Narrative Review Articles (SANRA) to ensure methodological rigor and transparency. Electronic searches were conducted in PubMed, Scopus, CINAHL, Web of Science, and Google Scholar for literature published between January 2010 and May 2026, supplemented by seminal theoretical works published before 2010. Database searches initially identified 842 records, of which 176 duplicates were removed. Following title and abstract screening, 214 full-text articles were assessed for eligibility. After applying predefined inclusion and exclusion criteria, 67 publications were included in the final synthesis. Data were analyzed using an iterative thematic synthesis that identified recurrent conceptual patterns across theoretical, empirical, systematic review, and policy literature.

Results: Five interconnected themes emerged from the synthesis: (1) limitations of reductionist competency assessment and self-evaluation; (2) contributions and limitations of simulation-based education; (3) sociocultural influences and the hidden curriculum; (4) experiential learning and reflective practice; and (5) competence as a complex adaptive system. Collectively, the evidence demonstrates that perioperative competence is not a static achievement but an evolving capability arising through authentic clinical engagement, interdisciplinary collaboration, contextual learning, and continuous reflection.

Conclusion: This review proposes a Systems-Integrated and Experience-Driven Framework for Perioperative Clinical Competence, which extends existing competency models by integrating experiential learning, systems thinking, sociocultural theory, and authentic assessment into a unified conceptual model. Unlike traditional competency frameworks that primarily evaluate observable task performance, the proposed framework conceptualizes competence as an emergent, adaptive, and relational phenomenon. The framework provides a theoretical foundation for curriculum innovation, authentic competency assessment, and future empirical validation within undergraduate nursing education

Keywords: *perioperative nursing; clinical competence; competency-based education; systems thinking; experiential learning; hidden curriculum; authentic assessment; nursing education*

I. INTRODUCTION

Perioperative nursing has evolved into one of the most technically demanding and cognitively complex domains of contemporary healthcare. Advances in minimally invasive surgery, robotic-assisted procedures, digital operating rooms, artificial intelligence-assisted decision support, and increasingly complex patient conditions require nurses to integrate sophisticated technical expertise with clinical judgment, communication, teamwork, adaptability, and systems awareness (Frenk et al., 2010). Consequently, perioperative competence

extends well beyond procedural proficiency and encompasses the coordinated application of cognitive, psychomotor, affective, ethical, and relational capabilities within rapidly changing clinical environments.

Despite these increasing expectations, competency development in undergraduate nursing education continues to be dominated by competency-based educational models that frequently operationalize competence through standardized checklists, procedural verification, and learner self-assessment (Benner et al., 2010). Although these approaches

provide consistency and facilitate educational accountability, they often reduce clinical competence into fragmented observable behaviors while inadequately capturing the adaptive reasoning, contextual decision-making, and professional identity formation required during authentic perioperative practice.

A growing body of educational research has questioned the validity of self-reported competence as an indicator of clinical readiness. Numerous studies demonstrate that novice nursing students frequently overestimate or underestimate their clinical abilities because they lack sufficient experiential reference points necessary for accurate self-evaluation (Kajander-Unkuri et al., 2016; Kajander-Unkuri et al., 2016). This discrepancy between perceived and actual competence becomes particularly concerning within perioperative environments, where clinical errors may directly compromise patient safety and surgical outcomes.

To address limitations in clinical placement availability and patient safety concerns, nursing education has increasingly adopted simulation-based learning, virtual reality, augmented reality, and immersive educational technologies. Meta-analyses consistently demonstrate significant improvements in learners' confidence, procedural performance, and clinical reasoning following simulation-based education (Cho & Kim, 2024; Park et al., 2024; Cho & Kim, 2024). Nevertheless, simulation remains a representation rather than a replication of authentic clinical practice. The dynamic interpersonal interactions, organizational culture, time pressures, uncertainty, and sociocultural influences that characterize perioperative environments cannot be fully reproduced within simulated settings.

Recent scholarship further emphasizes that competence develops through participation in complex social systems rather than through isolated acquisition of technical skills. Experiential learning theory (Kolb, 1984), hidden curriculum theory (Hafferty & O'Donnell, 2014), systems thinking, and actor-network theory collectively suggest that competence emerges through continuous interaction among learners, educators, technologies, institutional cultures, interdisciplinary teams, and authentic clinical experiences. These perspectives challenge reductionist educational paradigms by recognizing competence as a dynamic, context-dependent, and adaptive capability.

Although previous frameworks have significantly advanced competency-based nursing education, they predominantly focus on developmental progression (Benner), experiential cycles (Kolb), sociocultural influences (hidden curriculum), or systems interactions independently. Few conceptual models integrate these complementary perspectives into a comprehensive framework specifically addressing perioperative clinical competence within undergraduate nursing education. Consequently, important dimensions of competence—including contextual adaptation, organizational culture, authentic assessment, and systems integration—remain insufficiently conceptualized.

Therefore, the primary objective of this review is to synthesize contemporary theoretical and empirical evidence to develop a Systems-Integrated and Experience-Driven Framework for Perioperative Clinical Competence. Specifically, this paper aims to (1) critically examine limitations of existing competency assessment approaches; (2) synthesize evidence regarding experiential, sociocultural, and systems-oriented influences on competence development; (3) articulate the novel conceptual contribution of an integrated framework that extends existing competency models; and (4) propose measurable indicators to facilitate future empirical validation and curriculum innovation.

By reconceptualizing perioperative competence as an emergent property of interconnected educational and clinical systems, this paper seeks to contribute a more comprehensive theoretical foundation for nursing education, competency assessment, and perioperative workforce preparation.

II. METHODS

Research Design

This study employed an integrative critical narrative review guided by the Scale for the Assessment of Narrative Review Articles (SANRA) (Baethge et al., 2019). The narrative review methodology was selected because the objective was theory development and conceptual synthesis rather than quantitative effect estimation. Unlike systematic reviews, which primarily aggregate empirical evidence addressing narrowly defined research questions, narrative reviews permit integration of empirical research, theoretical perspectives, conceptual models, policy documents, and seminal literature to generate new theoretical understanding.

To enhance methodological transparency and scholarly rigor, the review adhered to SANRA recommendations, including explicit justification of the review's importance, transparent literature searching, comprehensive referencing, balanced interpretation of evidence, and logical presentation of findings.

Literature Sources and Search Strategy

A comprehensive literature search was conducted across five electronic databases: PubMed, Scopus, CINAHL, Web of Science, and Google Scholar. The search covered publications from January 2010 through May 2024, while allowing inclusion of seminal theoretical works published before 2010 (e.g., Kolb, Benner, Latour) that remain foundational to contemporary conceptualizations of competence.

Search terms were developed using Boolean operators and included combinations of the following keywords: perioperative nursing; operating room nursing; clinical competence; competency assessment; nursing education; experiential learning; simulation-based learning; virtual reality; hidden curriculum; systems thinking; actor-network theory; clinical judgment; authentic assessment; and reflective learning. Reference lists of eligible publications were

manually searched to identify additional relevant studies.

Literature Screening and Selection Process

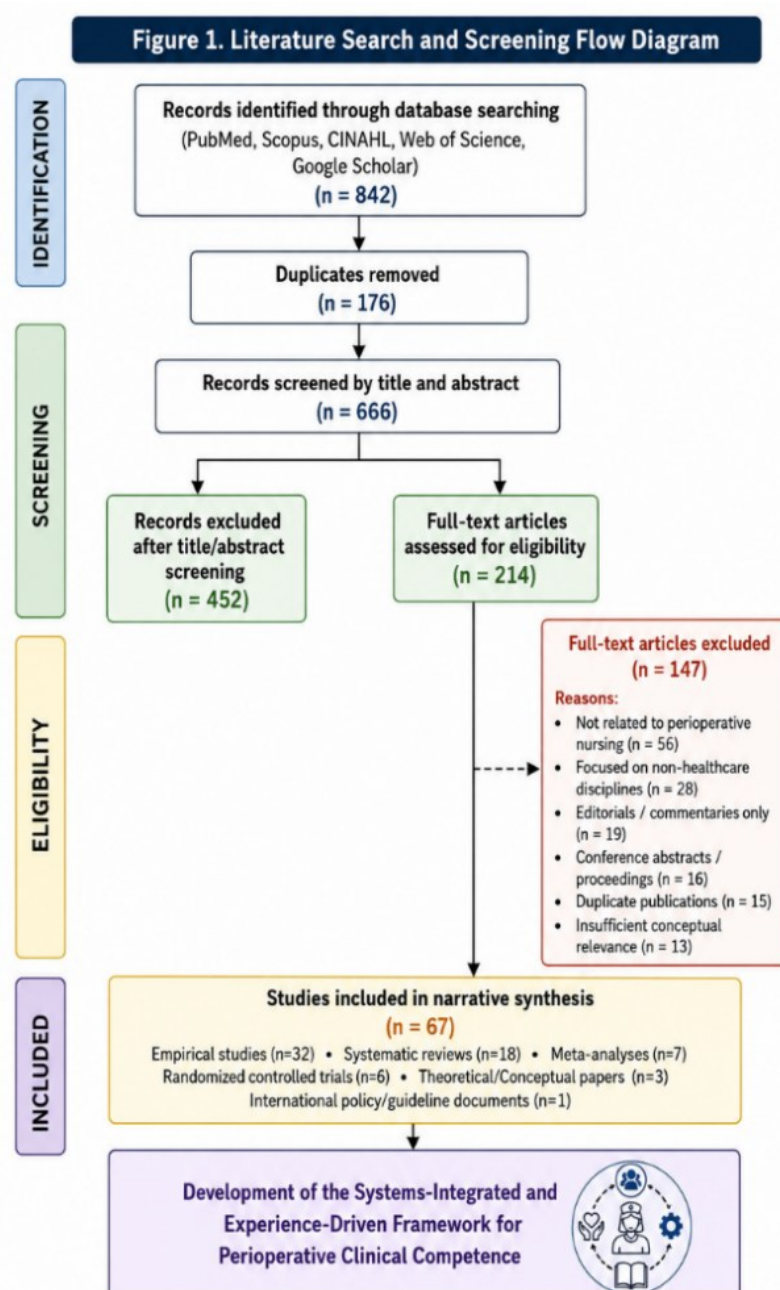
The database search yielded 842 records. After removing 176 duplicate publications, 666 titles and abstracts were screened for relevance. Subsequently, 214 full-text articles underwent detailed eligibility assessment. Following application of inclusion and exclusion criteria, 67 publications were retained for the final narrative synthesis. The literature selection process emphasized conceptual relevance rather than methodological hierarchy because the review sought theoretical integration across diverse evidence sources.

Data Gathering Procedure

Inclusion and Exclusion Criteria

Studies were eligible for inclusion if they: 1.) were published in English; 2.) focused on perioperative nursing, clinical competence, nursing education, competency assessment, simulation-based learning, experiential learning, hidden curriculum, or systems-oriented educational perspectives; 3.) consisted of original empirical studies, systematic reviews, meta-analyses, theoretical papers, or international policy reports; and 4.) contributed conceptually to understanding competence development within healthcare education.

Studies were excluded if they: 1.) focused exclusively on non-healthcare disciplines; 2.) lacked scholarly peer review; 3.) consisted primarily of opinion papers or editorials without substantive



Note. The literature search was conducted in PubMed, Scopus, CINAHL, Web of Science, and Google Scholar for studies published between January 2010 and May 2026, supplemented by seminal theoretical works published before 2010. The review followed the Scale for the Assessment of Narrative Review Articles (SANRA).

conceptual discussion; and 4.) demonstrated limited relevance to perioperative competence or nursing education.

Data Extraction and Thematic Synthesis

Eligible publications underwent iterative thematic analysis. Information extracted included: study characteristics; theoretical framework; educational context; principal findings; and implications for competence development. Themes were inductively refined through repeated comparison across studies until conceptual saturation was achieved. Five overarching domains emerged: 1.) Reductionist competency assessment; 2.) Simulation-based education; 3.) Hidden curriculum; 4.) Experiential learning and 5.) Systems-integrated competence. These themes subsequently informed development of the proposed conceptual framework.

Conceptual Framework Development

Rather than merely summarizing literature, this review synthesized complementary theoretical traditions to construct a Systems-Integrated and Experience-Driven Framework. Framework development followed an iterative process involving evidence comparison, conceptual abstraction, integration of recurring themes, and theoretical refinement.

The resulting framework conceptualizes perioperative competence as an adaptive capability emerging through interactions among learners, educators, clinical mentors, healthcare organizations, simulation technologies, and authentic clinical environments.

Conceptual Foundations of Perioperative Clinical Competence

The proposed Systems-Integrated and Experience-Driven Framework is grounded in multiple complementary theoretical traditions that collectively explain how perioperative competence develops within authentic clinical environments. Rather than relying on a single educational paradigm, the framework synthesizes developmental, experiential, sociocultural, and systems-oriented perspectives to conceptualize competence as an emergent capability shaped through continuous interaction among learners, educators, technologies, clinical teams, and organizational contexts.

This integrative perspective acknowledges that perioperative competence extends beyond procedural proficiency. It encompasses the learner's ability to interpret complex clinical situations, adapt to changing conditions, communicate effectively within interdisciplinary teams, exercise sound clinical judgment, and continuously refine practice through reflection and experience. Competence therefore represents an evolving process rather than a fixed endpoint achieved upon mastery of isolated psychomotor skills.

Experiential Learning as the Foundation of Competence Development

Kolb's Experiential Learning Theory (1984) provides the foundational educational lens for understanding competence development in perioperative nursing. According to Kolb, learning occurs through a recurring cycle consisting of concrete experience, reflective observation, abstract conceptualization, and active experimentation. Within perioperative education, students repeatedly encounter authentic clinical situations, critically reflect upon these experiences, integrate theoretical knowledge with practice, and subsequently apply newly acquired understanding during future patient encounters.

Evidence consistently demonstrates that repeated authentic exposure to perioperative environments promotes higher-order clinical reasoning, situational awareness, and adaptive expertise than classroom instruction alone. Clinical immersion allows students to recognize subtle patient cues, appreciate procedural variability, anticipate complications, and develop confidence grounded in authentic practice rather than perceived readiness. Nevertheless, experiential learning alone does not sufficiently explain the complexity of competence development because learning is simultaneously influenced by organizational culture, interpersonal relationships, institutional structures, and technological resources.

Situated Learning and Sociocultural Perspectives

Situated learning theory proposes that knowledge is constructed within authentic communities of practice rather than transferred passively from educators to learners. In perioperative settings, competence develops through legitimate participation in operating room activities where students gradually assume increasing responsibility under expert supervision.

Learning therefore occurs not only through direct instruction but also through observation, collaboration, communication, and participation within interdisciplinary surgical teams. Students acquire tacit knowledge regarding operating room etiquette, sterile practices, interprofessional communication, and professional expectations that cannot be fully conveyed through lectures or simulation exercises.

Consequently, competence is inseparable from the context in which it is developed. Educational experiences lacking authentic clinical participation may produce technically proficient learners who nevertheless struggle to adapt within actual operating room environments.

Hidden Curriculum and Professional Identity Formation

The hidden curriculum represents another essential dimension of competence development. Beyond formal curricula, students internalize professional values, communication styles, ethical behaviors, authority structures, and organizational norms through everyday interactions with educators, preceptors, surgeons,

nurses, and other healthcare professionals (Hafferty & O'Donnell, 2014).

Within perioperative environments, hidden curriculum influences are particularly pronounced because operating rooms function within highly structured interdisciplinary teams characterized by established hierarchies, rapid decision-making, and high patient safety expectations. Positive hidden curricula foster psychological safety, mentorship, teamwork, and professional identity formation.

Conversely, unsupportive clinical cultures may inhibit questioning, reduce learner engagement, and perpetuate unsafe communication practices.

Recent evidence suggests that supportive mentorship and psychologically safe learning environments significantly enhance students' willingness to participate actively in perioperative care, thereby facilitating deeper competence development (Hosseini et al., 2023; Hosseini et al., 2023).

Developmental Competence Theory

The manuscript also draws upon Benner's Novice-to-Expert model, which conceptualizes competence as progressive development occurring through accumulated clinical experience rather than through completion of educational milestones alone (Benner et al., 2010). Benner emphasizes that learners gradually transition from reliance on context-free rules toward intuitive, experience-based clinical reasoning.

Although highly influential, Benner's framework primarily describes developmental progression of individual practitioners and provides limited explanation of how educational systems, institutional culture, simulation technologies, or organizational environments collectively shape competence acquisition. Accordingly, while Benner's developmental model remains foundational, contemporary perioperative education requires broader theoretical integration capable of accounting for multiple interacting determinants of competence.

Systems Thinking and Complex Adaptive Systems

Healthcare organizations increasingly recognize that clinical competence develops within complex adaptive systems characterized by continuous interaction among multiple human and organizational components. Systems thinking conceptualizes healthcare not as isolated tasks but as interconnected networks involving clinicians, patients, educators, technology, institutional policies, communication systems, and organizational culture.

From this perspective, perioperative competence cannot be attributed solely to individual learner characteristics. Instead, competence emerges from dynamic interactions among educational experiences, mentorship, simulation, authentic clinical exposure, institutional support, interdisciplinary teamwork, and reflective practice. Actor-network theory further reinforces this systems perspective by recognizing that both human actors (students, educators, surgeons,

nurses) and non-human actors (simulation technologies, electronic health records, operating room equipment, institutional policies) collectively shape clinical learning experiences. Consequently, competence represents an adaptive property of the educational-clinical ecosystem rather than merely an attribute possessed by individual learners.

Novel Contribution of the Proposed Framework

One of the principal contributions of this manuscript is the development of a unified conceptual framework that integrates previously independent theoretical perspectives into a comprehensive explanation of perioperative competence development. Although numerous competency models have informed nursing education over the past several decades, each address only selected dimensions of competence.

Benner's Novice-to-Expert model emphasizes developmental progression but gives comparatively limited attention to organizational culture, systems interactions, and educational structures. Kolb's Experiential Learning Theory explains learning cycles but does not explicitly incorporate interdisciplinary collaboration, hidden curriculum influences, or authentic competency assessment. Hidden curriculum theory focuses on sociocultural influences shaping professional identity but provides little guidance regarding measurable competency development. Similarly, systems thinking conceptualizes healthcare complexity without offering specific educational mechanisms through which competence evolves.

The proposed Systems-Integrated and Experience-Driven Framework advances beyond these existing perspectives by integrating developmental learning, experiential education, sociocultural influences, authentic assessment, and systems thinking into a single conceptual model specifically designed for perioperative nursing education.

Unlike traditional competency models that primarily evaluate observable technical performance, the proposed framework conceptualizes competence as an emergent adaptive capability generated through continuous interaction among: authentic clinical experience; reflective learning; interdisciplinary collaboration; mentorship; organizational culture; simulation technologies; systems thinking; and authentic competency assessment.

This integrated perspective recognizes competence as simultaneously cognitive, technical, behavioral, relational, ethical, and organizational. Such conceptualization better reflects the realities of contemporary perioperative nursing practice, where effective performance depends upon adaptation to rapidly changing clinical circumstances rather than execution of isolated technical procedures.

Furthermore, the framework extends competency-based education by proposing measurable pathways through which educational interventions can be evaluated empirically, thereby providing a foundation for future longitudinal validation studies.

Thematic Synthesis and Conceptual Discussion

Theme 1. Limitations of Reductionist Competency Assessment

Across the reviewed literature, one of the most consistent findings concerns the limitations of traditional competency assessment approaches. Contemporary nursing education frequently operationalizes competence through standardized checklists, objective structured clinical examinations (OSCEs), skills demonstrations, and learner self-assessment. Although these methods improve consistency and facilitate educational accountability, they often reduce complex clinical performance into discrete observable behaviors.

Several studies indicate that novice learners frequently overestimate or underestimate their competence because they lack sufficient experiential benchmarks for accurate self-evaluation (Kajander-Unkuri et al., 2016; Kajander-Unkuri et al., 2016). Consequently, self-reported confidence should not be interpreted as synonymous with actual clinical readiness.

Checklist-driven evaluations similarly prioritize procedural completion while overlooking critical dimensions such as clinical judgment, situational awareness, adaptability, ethical reasoning, communication, and teamwork. Students may successfully perform individual psychomotor tasks during assessment yet struggle to integrate these competencies within unpredictable perioperative environments characterized by time constraints, evolving patient conditions, and interdisciplinary collaboration.

This phenomenon may be conceptualized as performative competence, wherein learners demonstrate observable procedural proficiency without fully developing the contextual reasoning and adaptive expertise necessary for safe independent practice. The literature therefore supports a shift toward authentic assessment strategies capable of evaluating competence within complex clinical contexts rather than isolated technical performances.

Theme 2. Contributions and Constraints of Simulation-Based Education

Simulation-based education has transformed contemporary nursing curricula by providing safe environments for deliberate practice, immediate feedback, and repeated skills rehearsal. Systematic reviews consistently report improvements in psychomotor performance, clinical reasoning, learner confidence, and knowledge acquisition following simulation-based educational interventions.

Immersive technologies including virtual reality, augmented reality, and high-fidelity simulation have further enhanced opportunities to expose students to complex perioperative scenarios that may be infrequently encountered during clinical placements. These innovations facilitate deliberate practice while minimizing risks to patient safety.

Nevertheless, the literature consistently emphasizes that simulation should complement rather than replace authentic clinical experience. Simulated environments inevitably simplify the uncertainty, interpersonal dynamics, organizational complexity, emotional pressures, and contextual variability that characterize actual operating room practice. Consequently, successful simulation performance does not invariably predict effective clinical performance.

Evidence further indicates that transfer of learning from simulation to authentic practice depends heavily upon structured debriefing, reflective learning, faculty expertise, and subsequent opportunities for supervised clinical application. Therefore, simulation achieves maximal educational value when integrated within broader experiential learning pathways rather than functioning as an isolated instructional strategy.

Theme 3. The Hidden Curriculum and Sociocultural Dimensions of Perioperative Learning

A consistent finding across the reviewed literature is that competence development extends beyond formal curricula and structured instruction. Much of perioperative learning occurs through the hidden curriculum, defined as the implicit values, professional norms, communication patterns, and behavioral expectations that students acquire during clinical immersion (Hafferty & O'Donnell, 2014).

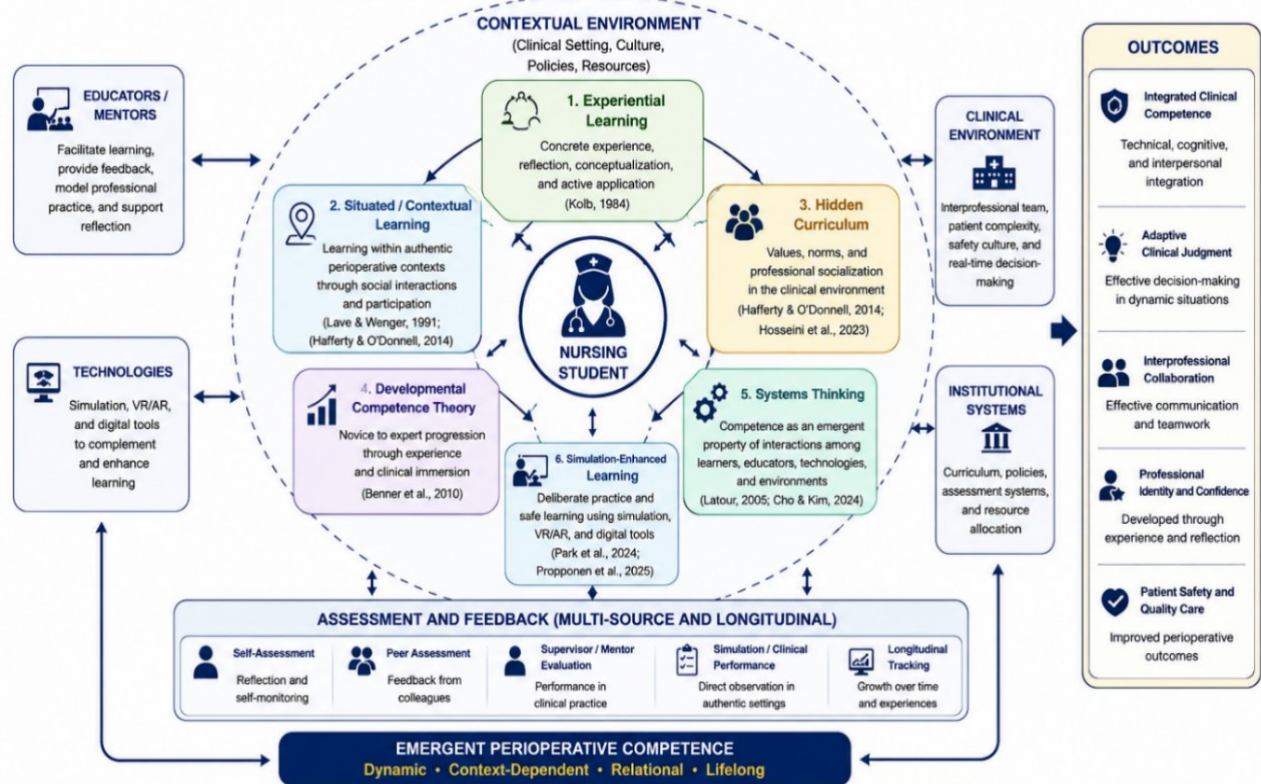
Within the operating room, learners are introduced to a highly structured culture characterized by multidisciplinary teamwork, professional hierarchies, strict infection prevention protocols, rapid clinical decision-making, and patient safety priorities. Although these characteristics are rarely described explicitly in course syllabi, they substantially influence how students understand professional nursing roles.

Students continuously observe how experienced perioperative nurses prioritize patient advocacy, anticipate surgeons' needs, communicate under pressure, resolve conflicts, and coordinate care across disciplines. These observations shape professional identity and clinical judgment as profoundly as formal classroom instruction.

Conversely, negative hidden curricula including intimidation, incivility, hierarchical communication, exclusion from learning opportunities, or poor mentorship may inhibit students' confidence and willingness to participate actively in-patient care. Such environments restrict experiential learning and may normalize undesirable professional behaviors.

Recent studies further demonstrate that psychologically safe learning environments encourage questioning, reflective dialogue, and active participation, thereby facilitating deeper competence development (Hosseini et al., 2023; Hosseini et al., 2023). Accordingly, perioperative competence should

Figure 2. A Systems-Integrated and Experience-Driven Framework for Perioperative Nursing Competence Development



Note. This framework illustrates how multiple theoretical perspectives and system elements interact to shape the development of perioperative nursing competence.

be understood as both an educational and organizational outcome requiring supportive institutional cultures.

Theme 4. Experiential Learning, Reflection, And Mentorship

Experiential learning emerged as one of the strongest determinants of perioperative competence throughout the reviewed literature. Although simulation prepares students for clinical encounters, authentic competence develops primarily through repeated engagement with real patients, interdisciplinary teams, and unpredictable clinical situations.

Clinical exposure enables learners to integrate theoretical knowledge with procedural performance while simultaneously developing clinical reasoning, situational awareness, prioritization, and adaptive decision-making. Repeated encounters with increasingly complex perioperative cases gradually transform declarative knowledge into tacit clinical expertise.

However, experience alone is insufficient for competence development. Reflection serves as the cognitive mechanism through which learners interpret clinical experiences, identify knowledge gaps, evaluate decision-making processes, and integrate lessons into future practice. Structured debriefing sessions, reflective journals, case conferences, and guided questioning enhance metacognitive awareness and accelerate professional growth.

Mentorship likewise emerged as an essential facilitator of competence development. Expert perioperative nurses provide individualized feedback, model professional behaviors, scaffold increasingly complex clinical responsibilities, and promote reflective thinking. Effective mentorship not only improves technical performance but also strengthens learners' confidence, resilience, communication, and professional identity.

Collectively, the evidence indicates that competence develops through an iterative cycle of authentic experience, guided reflection, mentorship, and progressively increasing clinical responsibility rather than through isolated acquisition of procedural skills.

Theme 5. Perioperative Competence as a Complex Adaptive System

Perhaps the most important finding of this review is that perioperative competence cannot be adequately conceptualized as a stable collection of individual attributes. Rather, competence emerges through continuous interaction among numerous educational, organizational, technological, interpersonal, and environmental factors.

Complex adaptive systems theory provides a useful framework for understanding this phenomenon. Healthcare organizations operate as dynamic systems in which multiple agents continuously influence one another. Students, educators, surgeons, nurses, anesthesiologists, patients, technologies, institutional

policies, and organizational cultures interact simultaneously to shape clinical learning.

Within such systems, competence is characterized by several defining properties:

- **Dynamic:** competence evolves continuously throughout professional development rather than remaining static.
- **Context-dependent:** performance varies according to patient complexity, available resources, team dynamics, and organizational conditions.
- **Emergent:** competence arises through interaction among multiple system components rather than existing independently within individual learners.
- **Adaptive:** competent practitioners modify their clinical reasoning and behaviors in response to changing clinical circumstances.
- **Relational:** effective perioperative practice depends upon communication, teamwork, leadership, and collaborative decision-making.

This systems-oriented perspective challenges reductionist competency frameworks that evaluate learners independently of their educational environments. Instead, competence should be viewed as a property emerging from interactions across the entire educational-clinical ecosystem.

Reimagining Perioperative Competency Assessment

The findings of this review suggest that traditional competency assessment approaches require substantial reconsideration. Although checklists and standardized

clinical evaluations remain valuable for assessing procedural performance, they inadequately capture contextual reasoning, adaptability, collaboration, ethical decision-making, and systems awareness.

A more authentic assessment model should integrate multiple complementary evaluation strategies, including:

- Objective Structured Clinical Examinations (OSCEs)
- Direct observation of procedural skills (DOPS)
- Clinical judgment rubrics
- Multi-source (360-degree) feedback
- Reflective portfolios
- Structured mentor evaluations
- Longitudinal competency tracking
- Workplace-based assessment
- Simulation performance integrated with clinical evaluation

Such multimodal assessment provides a richer representation of competence by evaluating both observable performance and underlying cognitive processes.

Ethical Consideration

Because this review synthesized previously published literature and involved no human participants, institutional ethics approval was not required. Nevertheless, the review adhered to accepted principles of scholarly integrity, transparent reporting, accurate citation, and responsible interpretation of published evidence.

Table 1
Proposed Indicators for Empirical Validation of the Systems-Integrated and Experience-Driven Framework

Framework Component	Operational Definition	Suggested Measurement
Authentic Clinical Exposure	Participation in actual perioperative patient care	Clinical case logs; OR exposure hours
Experiential Learning	Learning derived from direct patient encounters	Reflective journals; debriefing evaluations
Clinical Judgment	Ability to prioritize and respond appropriately	Lasater Clinical Judgment Rubric (LCJR); OSCE
Technical Competence	Safe execution of perioperative procedures	DOPS; standardized competency checklist
Reflective Practice	Critical analysis of clinical experiences	Reflection rubric; learning portfolio
Mentorship	Quality of clinical supervision	Mentor evaluation scale; student satisfaction survey
Interprofessional Collaboration	Team communication and collaborative practice	TeamSTEPPS Team Performance Observation Tool
Psychological Safety	Perceived support within learning environment	Edmondson Psychological Safety Scale
Systems Thinking	Recognition of interactions among clinical systems	Systems Thinking Scale; case analysis
Professional Identity	Internalization of professional values	Professional Identity Scale for Nursing Students

III. RESULTS AND DISCUSSION

Operationalization of the Proposed Framework

To facilitate future empirical validation, the Systems-Integrated and Experience-Driven Framework can be operationalized using measurable educational indicators.

The operational indicators presented above provide measurable constructs that may be evaluated through

longitudinal, quasi-experimental, mixed-methods, or multicenter research designs.

Toward A Systems-Integrated and Experience-Driven Framework

Synthesizing the evidence reviewed in this manuscript, perioperative competence is conceptualized as an emergent adaptive capability generated through continuous interaction among six interconnected educational domains:

- 1. Authentic Clinical Experience
- 2. Experiential Reflection
- 3. Mentorship and Clinical Coaching
- 4. Simulation-Enhanced Learning
- 5. Hidden Curriculum and Organizational Culture
- 6. Systems Integration and Authentic Competency Assessment.

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Psychological Safety	Perceived support within learning environment	Edmondson Psychological Safety Scale
Systems Thinking	Recognition of interactions among clinical systems	Systems Thinking Scale; case analysis
Professional Identity	Internalization of professional values	Professional Identity Scale for Nursing Students

Unlike traditional competency models that primarily assess technical performance, the proposed framework recognizes competence as simultaneously cognitive, psychomotor, affective, relational, ethical, and organizational. The framework therefore positions authentic clinical experience as the central mechanism through which learners integrate knowledge, reflection, mentorship, teamwork, and systems awareness into professional competence. Future empirical research should examine the relationships among these six domains to determine their relative contribution to perioperative competency development.

Table 2
Summary Of Reviewed Literature

Author	Study Design	Key Findings	Contribution to Framework
Benner et al. (2010)	Theoretical	Competence develops progressively through experience	Developmental competence
Kajander-Unkuri et al. (2016)	Cross-sectional	Self-assessment poorly predicts actual competence	Authentic assessment
Cho & Kim (2024)	Meta-analysis	VR improves confidence and competence	Simulation
Park et al. (2024)	Systematic review	Immersive technology enhances clinical reasoning	Educational innovation
Alharbi et al. (2024)	Systematic review	Simulation improves psychomotor skills	Skills development
Tong et al. (2024)	Randomized trial	Simulation enhances competence	Simulation effectiveness
Hosseini et al. (2023)	Scoping review	Hidden curriculum shapes professional identity	Sociocultural learning
Frenk et al. (2010)	Commission report	Systems-based education improves workforce preparedness	Systems thinking

Implications For Education, Practice, Research, And Policy

The proposed Systems-Integrated and Experience-Driven Framework has important implications for nursing education, clinical practice, healthcare organizations, and nursing policy. By conceptualizing competence as a dynamic, adaptive, and context-dependent capability, the framework encourages a shift from reductionist competency models toward more authentic, systems-oriented educational approaches.

Implications for Nursing Education

Contemporary nursing curricula should move beyond competency verification through isolated skills checklists toward educational models that integrate authentic clinical experiences, structured reflection, mentorship, simulation, and systems thinking. While simulation-based education remains valuable for developing psychomotor skills and confidence, it should complement—not replace meaningful clinical immersion within perioperative environments.

Curriculum developers should intentionally integrate opportunities for reflective practice, interprofessional learning, workplace-based assessment, and progressive clinical responsibility. Assessment strategies should likewise evolve from episodic competency testing toward longitudinal evaluation of clinical reasoning, adaptability, communication, teamwork, and professional identity formation.

Faculty development represents another critical educational priority. Nurse educators require ongoing preparation in competency-based curriculum design, authentic assessment methodologies, simulation facilitation, structured debriefing, and reflective coaching to effectively implement integrated competency models.

Implications for Clinical Practice

Healthcare organizations serve as active partners in competence development rather than passive clinical placement sites. Hospitals and perioperative departments should cultivate psychologically safe learning environments where students are encouraged to participate actively, ask questions, receive constructive feedback, and engage in reflective dialogue.

Clinical preceptors should receive formal preparation in educational supervision, coaching, competency assessment, and mentorship. Standardized preceptor development programs can improve consistency in student learning experiences while strengthening collaboration between academic institutions and healthcare organizations.

Interprofessional education should likewise become a routine component of perioperative clinical training. Structured opportunities for collaboration with surgeons, anesthesiologists, perioperative nurses, and allied health professionals promote communication, teamwork, and systems awareness that are essential for contemporary surgical care.

Implications for Research

The proposed framework provides a foundation for future empirical investigation into perioperative competence development. Because the framework remains conceptual, rigorous validation is necessary before widespread implementation. Future studies should employ longitudinal, mixed-methods, multicenter, and quasi-experimental designs to examine the relationships among authentic clinical exposure, mentorship, reflective practice, simulation, organizational culture, and competency outcomes.

Structural equation modeling may be particularly useful for examining causal pathways among framework components, while qualitative inquiry could further explore learners' lived experiences within perioperative environments. Cross-cultural validation studies are also recommended to determine the framework's applicability across diverse healthcare systems, educational institutions, and resource settings.

Implications for Nursing Policy

Professional regulatory bodies, accreditation agencies, and nursing education organizations may benefit from incorporating systems-oriented competency frameworks into future educational standards. Competency standards should recognize that clinical competence encompasses not only technical performance but also communication, teamwork, ethical reasoning, systems thinking, adaptability, leadership, and continuous professional development. Policy initiatives supporting stronger academic-clinical partnerships, protected preceptor time, simulation infrastructure, faculty development, and authentic competency assessment may substantially improve preparation of future perioperative nurses.

Implementation Challenges of the Proposed Framework

Although the proposed framework offers a comprehensive approach to perioperative competence development, several practical challenges should be considered during implementation.

Faculty Readiness

Successful implementation requires substantial faculty development. Many nurse educators were trained within traditional competency-based educational models emphasizing procedural performance and checklist evaluation. Transitioning toward systems-oriented educational approaches requires additional expertise in authentic assessment, reflective facilitation, systems thinking, workplace-based evaluation, and educational coaching. Institutions should therefore invest in continuing professional development programs that prepare faculty members to implement integrated competency frameworks effectively.

Clinical Placement Limitations

Increasing enrollment in nursing programs, limited operating room capacity, patient safety requirements, and competing educational demands frequently restrict opportunities for authentic perioperative learning. Consequently, students may experience insufficient exposure to diverse surgical procedures or interdisciplinary teamwork before graduation. Strengthening partnerships between academic institutions and healthcare organizations may improve access to meaningful clinical experiences while ensuring patient safety and educational quality.

Resource Constraints

Implementation of integrated competency models requires considerable institutional investment. High-fidelity simulation laboratories, virtual reality technologies, faculty development programs, competency management systems, and structured mentorship initiatives involve significant financial and human resource commitments. These challenges may be particularly pronounced in low- and middle-income countries or institutions with limited educational infrastructure. Accordingly, implementation strategies should remain adaptable and scalable according to institutional resources while preserving the core principles of authentic clinical learning and systems integration.

Curriculum Redesign

Transitioning from traditional competency-based curricula toward systems-integrated educational models requires comprehensive curriculum revision rather than isolated course modifications. Curriculum mapping should ensure alignment among learning outcomes, teaching strategies, simulation experiences, clinical placements, competency assessments, and graduate attributes. Successful curriculum redesign likewise requires sustained collaboration among faculty members, clinical partners, accreditation agencies, regulatory organizations, and healthcare administrators.

Limitations

Several limitations should be acknowledged when interpreting the findings of this review.

First, this manuscript is conceptual in nature and does not include primary empirical data. Consequently, the proposed framework is derived from interpretive synthesis of existing literature rather than direct observation or experimental investigation. Although conceptual integration provides valuable theoretical insights, causal relationships among framework components cannot be established.

Second, although the review followed SANRA recommendations to improve methodological transparency, it remains a narrative review rather than a protocol-driven systematic review. Consequently, study selection relied on conceptual relevance in addition to methodological quality, introducing the possibility of publication and selection bias.

Third, the reviewed literature represents diverse educational systems, healthcare organizations, and sociocultural contexts. Differences in perioperative practice, educational resources, faculty expertise, and institutional policies may influence the transferability of the proposed framework across countries and healthcare settings.

Fourth, the literature search was restricted to English-language publications. Relevant evidence published in other languages may therefore not have been included.

Finally, the Systems-Integrated and Experience-Driven Framework has not yet undergone empirical validation. Future research should examine its reliability, construct validity, educational effectiveness, feasibility, and implementation across diverse nursing education programs.

IV. CONCLUSION

Perioperative clinical competence is considerably more complex than the acquisition of isolated technical skills or successful completion of procedural checklists. The synthesis presented in this review demonstrates that competence develops through sustained interaction among authentic clinical experiences, reflective learning, mentorship, interdisciplinary collaboration, organizational culture, simulation-enhanced education, and systems-oriented thinking.

The proposed Systems-Integrated and Experience-Driven Framework extends existing competency models by integrating developmental learning, experiential education, sociocultural influences, authentic assessment, and systems theory into a unified conceptual paradigm specifically designed for perioperative nursing education. Unlike traditional approaches that primarily evaluate observable technical performance, the framework conceptualizes competence as an emergent, adaptive, relational, and context-dependent capability that evolves continuously throughout professional development.

By emphasizing authentic clinical engagement and multidimensional assessment, the framework offers a comprehensive theoretical foundation for curriculum innovation, faculty development, competency assessment, and academic-clinical collaboration.

Future empirical studies should validate the framework using longitudinal, multicenter, mixed-methods, and intervention research designs to determine its educational effectiveness, psychometric properties, and applicability across diverse healthcare and educational contexts.

V. RECOMMENDATIONS

Based on the findings of this review, the following recommendations are proposed:

1. Curriculum Enhancement: Nursing programs should integrate authentic clinical immersion, reflective learning, mentorship, simulation, and systems thinking into perioperative education to promote holistic competence development.

2. **Assessment Reform:** Competency assessment should move beyond checklist-based evaluation by incorporating workplace-based assessment, multi-source feedback, clinical judgment rubrics, reflective portfolios, and longitudinal competency tracking.
3. **Faculty Development:** Institutions should implement continuing professional development initiatives that strengthen educators' competencies in authentic assessment, competency coaching, simulation facilitation, and systems-oriented educational strategies.
4. **Clinical Partnerships:** Academic institutions and healthcare organizations should strengthen collaborative partnerships to increase meaningful perioperative clinical placements, support structured mentorship, and enhance integration between educational and clinical learning environments.
5. **Policy Development:** Nursing accreditation and regulatory bodies should consider adopting multidimensional competency frameworks that recognize competence as a dynamic interaction among technical, cognitive, relational, ethical, and organizational domains.
6. **Future Research:** Researchers should undertake longitudinal, mixed-methods, and multicenter investigations to empirically validate the Systems-Integrated and Experience-Driven Framework, examine causal relationships among its components, and evaluate its effectiveness across different educational and healthcare settings.

CONTRIBUTION OF AUTHORS

The author solely conceptualized the study, conducted the literature review, synthesized the evidence, developed the conceptual framework, and prepared the manuscript.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

FUNDING

No external funding was received for this study.

CONFLICT OF INTEREST

The author declares no conflicts of interest.

DISCLOSURE OF USE OF GENERATIVE AI

Artificial intelligence (ChatGPT, OpenAI) was used to assist with language refinement, grammar editing, and improvement of manuscript clarity. All conceptual development, interpretation of evidence, critical analysis, and final manuscript preparation were

performed by the author, who assumes full responsibility for the content.

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Determinants of Nursing Licensure Examination Performance among Nursing Graduates of Notre Dame of Jolo College

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ABSTRACT

Introduction: Nursing licensure examinations are important indicators of graduates' readiness for professional nursing practice and the quality of nursing education programs. Philippine Nurse Licensure Examination (PNLE) outcomes vary across nursing schools. Existing evidence indicates that examination performance is influenced by academic, institutional, psychological, and review-related factors.

Aim: This study was set to examine the determinants of PNLE performance among nursing graduates of Notre Dame of Jolo College (NDJC) and explored how these variables cluster into broader dimensions of licensure readiness.

Methods: A descriptive-correlational design was employed involving 265 nursing graduates selected through stratified random sampling, with graduation batch as the stratification variable. Data were collected using a researcher-developed questionnaire based on related literature and institutional indicators. Exploratory Factor Analysis (EFA) using Principal Axis Factoring with Promax rotation was conducted to identify the underlying dimensions of licensure readiness. Logistic regression and multiple linear regression analyses were subsequently performed to determine the predictors of PNLE outcome and PNLE performance level.

Results: EFA extracted six dimensions of licensure readiness, namely academic and cognitive foundations, instructional and institutional support, language-based clinical reasoning, disciplined study behaviors, psychological regulation, and review and practice strategies. Thereafter, reliability analysis of the extracted dimensions yielded Cronbach's alpha coefficients ranging from .721 to .919. Logistic regression analysis identified general weighted average and nursing aptitude test scores as significant predictors of PNLE outcome. Multiple linear regression analysis identified GWA, NAT score, and psychological regulation as significant predictors of PNLE performance level, with psychological regulation contributing beyond academic indicators.

Conclusion: PNLE performance reflects interacting academic, psychological, institutional, behavioral, and review-related dimensions. Academic competence was strongly associated with examination success, while psychological regulation contributed to variations in performance level. The findings may provide institution-based evidence for strengthening licensure preparation and psychological readiness initiatives in nursing education.

Keywords: nursing licensure examination; PNLE performance; psychological readiness; institutional support; nursing education

I. INTRODUCTION

The Philippine Nurse Licensure Examination (PNLE) is an essential requirement for nursing graduates because it determines entry into professional nursing practice and reflects the quality of nursing education provided by higher education institutions. Passing the examination signifies readiness for safe and competent nursing care, while institutional passing rates are often used as indicators of program effectiveness and educational quality. Despite improvements in nursing education,

many graduates continue to experience difficulties in passing the licensure examination. Differences in passing rates across schools indicate that licensure performance is influenced by several interconnected academic, institutional, psychological, and review-related factors. In Notre Dame of Jolo College (NDJC), PNLE passing rates increased from 70.27% in May 2022 to 78.13% in May 2023 and 89.04% in November 2024, which necessitates a better understanding of the determinants associated with examination performance.

Research consistently identifies academic preparation as a major predictor of licensure examination success. Studies from the Philippines and other countries found that prior academic performance, measured through GPA or its equivalent GWA in the Philippine setting, science grades, pre-board examination scores, and mastery of nursing competencies significantly influence licensure outcomes (Oatme et al., 2021; Butcon et al., 2021; Bokan et al., 2022; Flowers et al., 2022; Mahmoud et al., 2024). Recent studies further emphasized that standardized examinations, clinical exposure, academic progression, and clinical hours significantly contribute to NCLEX-RN and nursing licensure outcomes (Collins et al., 2024; Cummings et al., 2024; Schmitz & Abbott, 2025). Other studies emphasized the importance of study habits, time management, and self-directed learning in sustaining examination readiness (Visiers-Jiménez et al., 2022; Hawkins et al., 2022). English proficiency and communication competence were also associated with stronger academic and clinical performance among nursing students (Oducado et al., 2020; Gillin & Smith, 2021; Haroen et al., 2024). Licensure readiness extends beyond academic grades and encompasses broader learning behaviors, communication skills, and competency development.

Institutional support likewise contributes to licensure examination performance. Accredited programs, qualified faculty, effective curricula, simulation-based instruction, supportive clinical environments, mentoring, and review support improve competence and examination readiness among nursing students and graduates (Spector et al., 2020; Hutapea et al., 2021; Moloney et al., 2022; Yu et al., 2021; Thompson et al., 2023). Institutional readiness programs and academic enhancement initiatives were also associated with improved preparedness and confidence during the transition to professional practice (Chicca & Shellenbarger, 2024; Fangonil-Gagalang et al., 2024). However, differences in institutional resources, instructional quality, and clinical opportunities may contribute to variations in licensure outcomes among graduates.

Moreover, psychological readiness also contributes significantly to licensure examination performance. Anxiety management, self-efficacy, resilience, mindfulness, emotional coping, and social support influence how nursing students manage examination stress and maintain engagement in review activities (Gulley et al., 2021; Berdida et al., 2023; Torné-Ruiz et al., 2023; Liu et al., 2024; Labrague et al., 2025). Mentorship programs, relaxation activities, and simulation-based exercises were likewise associated with improved confidence and examination preparedness (Ozturk & Toruner, 2022; Arab & Saeedi, 2024). Self-efficacy was further associated with competence, persistence, and readiness for professional practice (Innab et al., 2024; Cao et al., 2025). This indicates the interaction between psychological readiness and academic and institutional factors in influencing licensure outcomes and overall preparedness.

Review engagement is another important determinant of licensure readiness. Attendance in review sessions, repeated practice examinations, structured feedback, coaching, simulation-supported learning, and guided clinical judgment activities were associated with improved competence, confidence, and examination preparedness among nursing students (Khalafi et al., 2024; Hall et al., 2024; Saghafi et al., 2024; Camp-Spivey et al., 2024). Clinical exposure and internship intensity also contributed to stronger licensure outcomes when supported by effective supervision and reflective debriefing activities (Lai et al., 2023; Shahzeydi et al., 2024). Conversely, inadequate coaching and limited clinical exposure weakened examination readiness and confidence among examinees.

Although many studies identified predictors of nursing licensure examination performance, much of the literature examined these determinants separately rather than as interconnected dimensions. Most studies focused mainly on academic indicators, while fewer explored how academic preparation, institutional support, psychological readiness, and review engagement collectively influence licensure outcomes. Limited evidence has also been generated from smaller higher education institutions in geographically distinct areas such as Sulu, where institutional and contextual conditions may differ from those of large urban institutions. Existing Philippine studies rarely used factor analytic approaches to explain how multiple determinants cluster into broader dimensions of licensure readiness. These gaps limit understanding of the multidimensional nature of PNLE performance.

Against this backdrop, the present study examined the determinants of PNLE performance among nursing graduates of Notre Dame of Jolo College. Specifically, the study explored how academic preparation, institutional support, psychological readiness, and review engagement relate to PNLE outcomes and how these variables cluster into broader dimensions of licensure readiness through factor analysis. The findings may provide institution-based evidence to guide nursing educators, review programs, and academic administrators in Notre Dame of Jolo College and other nursing schools in geographically similar and underserved settings.

II. METHODS

Research Design

This study employed a quantitative, non-experimental, cross-sectional correlational research design incorporating exploratory, comparative, and predictive analyses. Exploratory Factor Analysis (EFA) was initially conducted to identify the underlying dimensions and thematic groupings related to nursing licensure examination performance. The extracted factors were then used in correlational and predictive analyses to examine the relationships among academic preparation, institutional support, psychological readiness, review engagement, and licensure examination outcomes. Logistic regression and

multiple linear regression were utilized to determine factors that significantly influenced licensure outcomes and examination performance. This methodological approach is consistent with quantitative research designs commonly used in nursing and educational research (Creswell & Creswell, 2018; Polit & Beck, 2021).

Participants and Sampling

The study involved 265 nursing graduates of Notre Dame of Jolo College drawn from a total population of 420 graduates from the 2023, 2024, and 2025 graduation batches. Respondents included nursing graduates who had taken the Philippine Nurse Licensure Examination (PNLE) and voluntarily participated in the study. Stratified random sampling was employed to ensure proportional representation and reduce sampling bias (Polit & Beck, 2021). The three graduation batches served as strata, and participants were randomly selected from each stratum based on proportional allocation. This sampling approach strengthened sample representativeness and supported the requirements of factor analytic procedures.

Data Gathering Tools

Data were collected using a researcher-developed questionnaire constructed from focus group discussion (FGD) inputs and related literature on nursing licensure examination performance, particularly studies on academic preparation, institutional support, psychological readiness, and review engagement (Gulley et al., 2021; Lai et al., 2023; Oatme et al., 2021; Visiers-Jiménez et al., 2022; Yu et al., 2021). The instrument measured determinants related to academic preparation, institutional support, psychological readiness, and review engagement. The first part gathered respondents' demographic and academic information, while the second part consisted of Likert-scale statements assessing the identified domains and subdomains.

To establish content validity, the instrument was evaluated by experts in nursing education, psychometrics, and research methodology, and revisions were incorporated based on their recommendations. Pilot testing involving 10 nursing graduates from a comparable group was conducted to assess clarity, reliability, and usability. The 78-item instrument yielded an overall Cronbach's alpha of .969. Item-total statistics were also examined to identify items requiring further review. Minor revisions were made before final administration.

Data Analysis Procedure

Prior to data collection, permission to conduct the study was secured from the appropriate institutional authorities. An online focus group discussion involving recent nursing graduates was initially conducted to refine and contextualize the questionnaire items. After expert validation and pilot testing, the finalized questionnaire was administered during the September to December 2025 data collection period. The November 2025 PNLE represented the final

examination group included under the 2025 graduation batch, and data collection was completed in December 2025 following the release of the PNLE results.

Primary data were gathered through survey responses, while secondary data such as licensure examination results, general weighted average (GWA), attendance records, and other relevant institutional records were obtained to support the analysis. All data were organized, coded, tabulated, and prepared for statistical analysis.

Data Analysis Procedure

Data were analyzed using a statistical software package. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize respondents' characteristics and describe patterns in the study variables. Exploratory factor analysis (EFA) was employed to identify underlying dimensions and thematic groupings related to nursing licensure examination performance. Measures of sampling adequacy and factorability were assessed prior to factor extraction. Inferential analyses were subsequently conducted to examine relationships and predictive effects among variables. Binary logistic regression was used to determine predictors of licensure examination outcomes based on pass or fail status, while multiple linear regression examined the influence of academic, institutional, psychological, and review-related factors on licensure examination performance using continuous performance indicators.

Ethical Consideration

The study adhered to the ethical principles outlined in the Declaration of Helsinki throughout the research process. Before data collection, the study underwent the institutional approval process of Notre Dame of Jolo College. The College currently has no formally constituted Institutional Review Board (IRB) or Ethics Review Board (ERB). The President's Cabinet designated the Vice President for Academic Affairs, Research Director, and Dean of the Graduate School.

III. RESULTS AND DISCUSSION

Exploratory Factor Analysis of Determinants Influencing Licensure Examination Performance

Exploratory Factor Analysis (EFA) was conducted to identify the underlying dimensions influencing nursing graduates' licensure examination performance. Prior to factor extraction, the suitability of the data for factor analysis was assessed. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy yielded a value of .949, indicating excellent shared variance among the variables, while Bartlett's Test of Sphericity was statistically significant, $\chi^2 = 15105.68$, $p < .001$. This statistical evidence confirmed that the correlation matrix was appropriate for factor analysis.

Table 1

Extracted Factors Influencing Nursing Graduates' Licensure Examination Performance

Factor	Factor Label	Item Codes ($\lambda \geq .40$)
1	Review and Practice Strategies	Q41, Q49, Q51, Q53, Q54, Q55, Q56, Q57, Q58, Q60, Q61, Q68, Q69, Q70, Q71, Q72, Q74, Q75, Q76, Q77, Q78
2	Instructional and Institutional Support	Q25, Q26, Q27, Q28, Q29, Q30, Q31, Q32, Q33, Q34, Q35, Q36, Q37, Q38, Q39, Q40, Q42
3	English Comprehension and Clinical Reasoning	Q13, Q14, Q15, Q16, Q17, Q18, Q19, Q20, Q21, Q22, Q23, Q24
4	Study Discipline and Time Management	Q7, Q10, Q11, Q62, Q63, Q64, Q65, Q66
5	Psychological Regulation	Q43, Q45, Q46, Q47, Q48
6	Academic Achievement and Cognitive Foundation	Q1, Q2, Q3, Q5, Q6

Note. Factors were extracted using Principal Axis Factoring with Promax rotation. Only items with factor loadings $\geq .40$ were retained.

Using Principal Axis Factoring with Promax rotation, seven factors were initially extracted based on eigenvalues greater than 1, scree plot inspection, and conceptual interpretability. The seventh factor was not retained because it lacked sufficient item support and conceptual distinctiveness. Related items were incorporated into factors with stronger statistical and conceptual alignment, resulting in a final six-factor solution. Only items with pattern loadings $\geq .40$ were retained. The six retained factors were Review and Practice Strategies, Instructional and Institutional Support, English Comprehension and Clinical Reasoning, Study Discipline and Time Management, Psychological Regulation, and Academic Achievement and Cognitive Foundation. Reliability analysis showed acceptable to excellent internal consistency, with Cronbach's alpha coefficients ranging from .721 to .919.

The extracted factors support the multidimensional nature of nursing licensure examination readiness and demonstrate that examination performance is influenced by academic, behavioral, institutional, and psychological dimensions rather than by academic indicators alone. These findings are consistent with previous literature emphasizing academic preparation (Oatme et al., 2021), institutional support (Yu et al., 2021), psychological readiness (Gulley et al., 2021), and review engagement (Lai et al., 2023).

Thematic Domains of Licensure Readiness

The six retained factors were organized into four broader thematic domains based on their conceptual relationships: Academic and Cognitive Domain,

Learning Behavior and Preparation Domain, Institutional Support Domain, and Psychological and Social Domain. The factor numbers were retained from the EFA extraction, while Table 2 presents them in conceptual rather than numerical order.

The Academic and Cognitive Domain comprised Academic Achievement and Cognitive Foundation (Factor 6) and English Comprehension and Clinical Reasoning (Factor 3), representing academic preparation, language comprehension, and reasoning skills. The Learning Behavior and Preparation Domain comprised Study Discipline and Time Management (Factor 4) and Review and Practice Strategies (Factor 1), representing sustained study and review behaviors that support examination readiness.

The Institutional Support Domain consisted of Instructional and Institutional Support (Factor 2), covering instruction, curriculum, learning resources, clinical exposure, and school-based support. The Psychological and Social Domain included Psychological Regulation (Factor 5), together with the related component of Social Support and Resilience, representing emotional regulation, resilience, and support during examination preparation.

Overall, the thematic grouping shows that licensure readiness involves interacting academic, behavioral, institutional, psychological, and social conditions. This multidimensional structure supports prior evidence on the roles of cognitive competence, learning behaviors, institutional environments, and emotional regulation in nursing examination preparedness (Button et al., 2023; Loureiro et al., 2024; Visiers-Jiménez et al., 2022).

Table 2

Thematic Domains and Related Factors and Components of Licensure Readiness

Thematic Domain	Factor/Component	Factor Description
Academic and Cognitive Domain	Factor 6	Academic Achievement and Cognitive Foundation
	Factor 3	English Comprehension and Clinical Reasoning
Learning Behavior and Preparation Domain	Factor 4	Study Discipline and Time Management
	Factor 1	Review and Practice Strategies
Institutional Support Domain	Factor 2	Instructional and Institutional Support
Psychological and Social Domain	Factor 5	Psychological Regulation
	Related Component	Social Support and Resilience

Table 3
Binary Logistic Regression Predicting PNLE Outcome (Pass/Fail)

Predictor	B	SE	Wald χ^2	df	p	Odds Ratio (Exp[B])	95% CI for Exp(B)
General Weighted Average (GWA)	-0.528	0.210	6.312	1	.012	0.590	.391–.890
Nursing Aptitude Test (NAT)	0.080	0.040	4.062	1	.044	1.083	1.002–1.171
Academic Achievement	0.516	0.935	0.305	1	.581	1.676	.095–3.734
Cognitive Competence	–0.653	1.273	0.263	1	.608	0.521	.158–23.286
Study Discipline	0.138	0.995	0.019	1	.890	1.148	.124–6.124
Review and Practice Strategies	–0.190	1.469	0.017	1	.897	0.827	.068–21.557
Institutional Support	0.176	1.254	0.020	1	.888	1.193	.072–9.790
Psychological Regulation	–0.756	0.832	0.825	1	.364	0.470	.416–10.889
Social Support	0.686	1.469	0.218	1	.641	1.986	.028–8.985

Note. N = 197. Model $\chi^2(9) = 22.924$, $p = .006$. –2 Log Likelihood = 61.927. Cox & Snell $R^2 = .110$; Nagelkerke $R^2 = .314$. Hosmer-Lemeshow $\chi^2(8) = 8.899$, $p = .351$. Overall classification accuracy = 94.9%. The dependent variable was internally coded as Pass = 1 and Fail = 0.

Predictors of Licensure Examination Outcomes

Binary logistic regression was conducted to determine whether the extracted domains and academic indicators significantly predicted licensure examination outcome classified as pass or fail. Of the 265 cases, 197 had complete data across all variables and were included in the logistic regression. The reduction was primarily due to missing NAT and GWA scores, which were available for 209 and 253 graduates, respectively. Cases with incomplete data were excluded from the analysis. The dependent variable was coded as Pass = 1 and Fail = 0; thus, the model estimated the odds of passing the examination. GWA was rescaled so that one unit represented a 0.10-point change for a more meaningful interpretation of its odds ratio. The overall model was statistically significant, $\chi^2(9) = 22.924$, $p = .006$. This result shows that the set of predictors significantly distinguished between graduates who passed and those who failed the licensure examination. Model fit indices showed acceptable explanatory power (Cox & Snell $R^2 = .110$; Nagelkerke $R^2 = .314$). The Hosmer-Lemeshow test was non-significant, $\chi^2(8) = 9.644$, $p = .291$, supporting acceptable model fit. Regression results are summarized in Table 3.

Predictors of Licensure Examination Performance Level

The preceding logistic regression focused on predicting pass-fail outcome. In contrast, the multiple linear regression examined the extent to which academic, institutional, psychological, and review-related factors predicted licensure examination performance based on the composite of the graduates' actual PNLE component scores. Higher composite scores represented better examination performance. The regression model was statistically significant, $F(9, 255) = 23.90$, $p < .001$. This result demonstrates that the combined predictors explained a significant proportion of the variance in licensure examination performance.

General weighted average (GWA) remained the strongest predictor of examination performance ($\beta = -.593$, $p < .001$), while NAT score also demonstrated a statistically significant effect ($\beta = .129$, $p = .015$). The negative GWA coefficient indicates that a higher numerical GWA was associated with a lower PNLE composite score. In contrast, higher NAT scores were associated with higher PNLE composite scores. Among the EFA-derived domains, only psychological regulation significantly predicted licensure examination performance ($\beta = .141$, $p = .047$), as shown

Table 4
Multiple Linear Regression Predicting Licensure Examination Performance Level

Predictor	B	SE B	β	t	p	95% CI for B
Constant	86.435	5.200	—	16.623	< .001	69.444, 102.389
General Weighted Average (GWA)	–21.220	1.958	–.593	–10.838	< .001	–29.288, –17.251
Nursing Aptitude Test (NAT)	0.056	0.023	.129	2.460	.015	.050, .200
Academic Achievement	0.610	0.867	.050	0.704	.482	–1.139, 4.657
Cognitive Competence	0.141	1.028	.011	0.137	.891	–3.597, 2.698
Study Discipline	–0.306	0.802	–.027	–0.382	.703	–2.933, 1.723
Review and Practice Strategies	–1.535	1.236	–.120	–1.241	.216	–5.145, 2.161
Institutional Support	1.048	1.119	.082	0.936	.350	–2.270, 4.348
Psychological Regulation	1.445	0.723	.141	1.999	.047	–.137, 4.033
Social Support	–1.170	1.259	–.094	–0.930	.353	–5.012, 2.372

Note. N = 197. Model $\chi^2(9) = 22.924$, $p = .006$. –2 Log Likelihood = 61.927. Cox & Snell $R^2 = .110$; Nagelkerke $R^2 = .314$. Hosmer-Lemeshow $\chi^2(8) = 9.644$, $p = .291$. Overall classification accuracy = 94.9%. Pass = 1, Fail = 0. ¹GWA was rescaled so that one unit represents a 0.10-point increase in the original GWA.

in Table 4. Academic achievement, cognitive competence, study discipline, review and practice strategies, institutional support, and social support did not demonstrate statistically significant direct effects when stronger academic and psychological predictors were included in the model.

Supported by statistical evidence, licensure examination performance appears to be primarily

Overall, licensure examination readiness is best explained through the interaction of academic competence and psychological regulation supported by broader institutional and preparatory conditions. This pattern highlights the importance of strengthening both academic foundations and psychological preparedness in nursing licensure preparation programs. These relationships are presented in Figure 1.

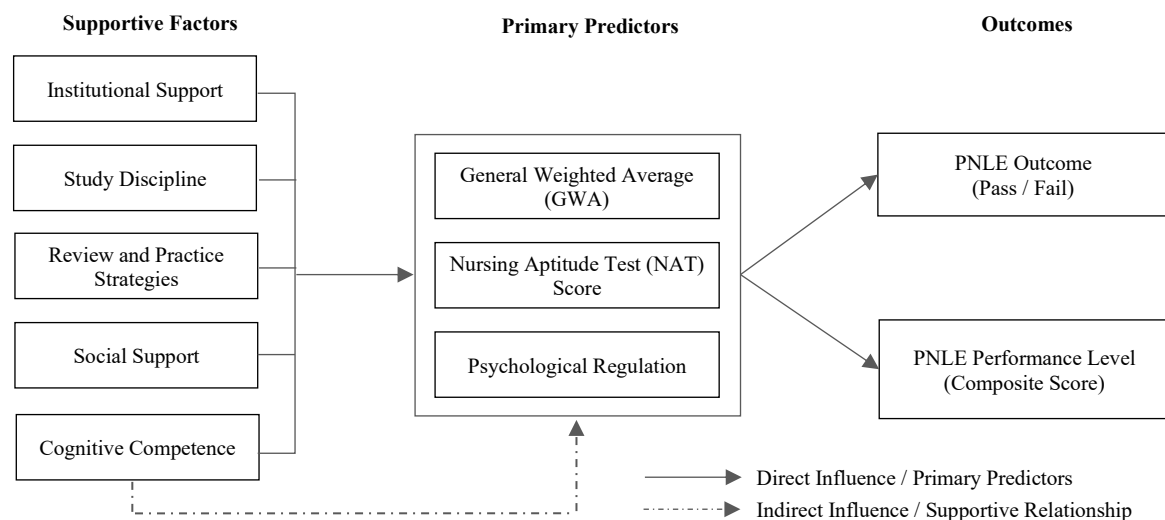


Figure 1. Final Academic–Psychological Model of Factors Influencing Nursing Licensure Examination Performance

academically driven, while psychological regulation functions as an important complementary factor. The significant contribution of psychological regulation underscores the importance of managing stress, sustaining focus, and regulating emotional responses in optimizing performance beyond prior academic preparation. This finding supports previous evidence emphasizing psychological readiness (Amro et al., 2024), anxiety management (Mojarrab et al., 2020), and emotional regulation in high-stakes nursing examinations (Torné-Ruiz et al., 2023).

Integrated Structural Interpretation of Licensure Examination Performance

Taken together, the logistic and multiple regression analyses indicate that nursing licensure examination performance follows a layered academic–psychological process. Academic indicators, particularly general weighted average and nursing aptitude test scores, serve as the primary determinants of examination success and passing outcome. Psychological regulation, meanwhile, contributes to differences in performance level among graduates with similar academic backgrounds.

The remaining preparatory, institutional, behavioral, and social factors appear to operate indirectly by influencing the overall learning and review environment rather than independently determining examination outcome. Institutional support, study discipline, review engagement, and social support may strengthen readiness by improving academic preparation and psychological stability rather than directly predicting examination success.

The final academic–psychological model presents the structural relationships among the factors influencing nursing licensure examination performance. The model consists of supportive factors, core predictors, and examination outcomes.

The supportive factors include institutional support, study discipline, review and practice strategies, social support, and cognitive competence. These factors contribute to examination readiness by improving the learning and review environment and strengthening academic and psychological preparation. Although important in the preparatory process, these variables did not demonstrate statistically significant direct effects on examination outcomes when stronger academic and psychological predictors were included in the regression analyses.

The core predictors include general weighted average (GWA), nursing aptitude test (NAT) score, and psychological regulation. These variables represent the strongest determinants identified in the analyses. GWA and NAT score function as primary academic indicators associated with examination success and PNLE performance level. Psychological regulation, which includes stress management, emotional control, and sustained focus, contributes to differences in performance among graduates with similar academic backgrounds.

The examination outcomes include PNLE outcome (pass or fail) and PNLE performance level. The model indicates that academic indicators directly influence examination success and overall performance, while

psychological regulation mainly contributes to variations in performance level.

Overall, the model demonstrates that nursing licensure examination performance is best explained through the interaction of academic competence and psychological regulation, supported by broader institutional, behavioral, and social conditions that enhance examination readiness. Within the context of Notre Dame of Jolo College in Sulu, these findings provide empirical evidence to strengthen institution-specific licensure preparation strategies. They also contribute to the limited body of evidence on nursing licensure examination performance in geographically distinct areas of the region.

Limitations of the Study

The study recognized several limitations. Its cross-sectional design limits causal interpretation of the relationships among the variables. The study was conducted in a single institution, which may limit the generalizability of the findings to other nursing schools. Some data were based on self-reported responses and may be affected by response bias. Recall bias may also be present among graduates from earlier batches who reported past experiences. Moreover, other factors that may influence licensure examination performance were not included in the model.

IV. CONCLUSION

The study demonstrated that PNLE performance is influenced by interacting academic, psychological, institutional, behavioral, and social factors. Nursing licensure examination readiness reflects a multidimensional process that extends beyond academic indicators alone and includes broader learning behaviors, institutional conditions, and psychological preparedness.

Academic indicators, particularly general weighted average and nursing aptitude test scores, remained the strongest determinants of PNLE outcome and performance level. Psychological regulation also contributed significantly to PNLE performance level beyond prior academic preparation, highlighting the importance of stress management, emotional control, and sustained focus during high-stakes examinations. Institutional support, study discipline, review and practice strategies, cognitive competence, and social support primarily functioned as supportive conditions that enhanced examination readiness indirectly rather than serving as independent predictors of examination success.

Taken together, the study supports an academic-psychological model of nursing licensure examination performance in which academic competence functions as the primary foundation of examination success, while psychological regulation optimizes performance among graduates with comparable academic backgrounds. These results emphasize the importance of strengthening both academic preparation and psychological readiness in nursing licensure preparation programs and contribute to the limited body

of evidence from geographically distinct areas of the region, particularly Sulu.

V. RECOMMENDATIONS

Nursing schools may strengthen academic support mechanisms that enhance foundational nursing competencies, examination-oriented learning, and sustained academic performance, particularly in areas related to general weighted average and nursing aptitude preparation. Structured review activities, formative assessments, and competency-based interventions may further support licensure readiness among nursing graduates.

Programs that promote psychological readiness, stress management, emotional regulation, and examination confidence may also be integrated into nursing licensure preparation initiatives. Institutional support systems, including faculty mentoring, guided review strategies, and student support services, may contribute to improving the overall learning and review environment.

Future studies may further examine the indirect pathways through which institutional, behavioral, and psychosocial factors influence PNLE performance across different nursing schools and educational contexts.

CONTRIBUTION OF AUTHORS

The first author (SSP) was responsible for conceptualization, data collection, and initial manuscript preparation. The second author (APH) supervised the study, provided academic guidance, and reviewed the manuscript. The third author (EJA) contributed to the statistical analysis, interpretation of findings, methodological refinement, and manuscript editing. All authors reviewed and approved the final version of the manuscript.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this study.

DISCLOSURE OF USE OF GENERATIVE AI

Generative artificial intelligence (AI) tools were used as cognitive support partners for language refinement, organization, and manuscript structuring. However, the conceptual direction, interpretation of findings, analytical decisions, and scholarly narrative of the study remained the intellectual work and responsibility of the

authors. All statistical analyses, interpretations, and final manuscript content were reviewed and approved by the authors.

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Level of Professional Identity Among Student Nurses

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ABSTRACT

Introduction: Professional identity is the professional self-concept of a nurse, which shapes how nurses and student nurses perceive their profession and the values and beliefs that guide their careers. Understanding and strengthening professional identity is considered essential for workforce retention, quality patient care, and the advancement of the nursing profession.

Aim: To determine the level of professional identity among student nurses across the following dimensions: personal, social, historical, and interpersonal. It also aimed to determine whether there was a significant difference in professional identity levels when student nurses were grouped by year level, cultural affiliation, educational program choice, and family educational background.

Methods: A quantitative descriptive design was employed among 180 student nurses selected through proportionate random sampling. Data were gathered using the Professional Identity Scale for Nursing Students (PISNS) with Cronbach's alpha of 0.83 and split-half reliability of 0.84. Average scores, independent-sample t-tests, and one-way ANOVA were used for data analysis.

Results: Findings revealed a high overall level of professional identity (average = 4.13), with the highest score in the Social and Historical dimension (4.26), followed by the Interpersonal (4.09) and Personal dimensions (4.05). Significant differences in professional identity were observed across year levels ($p = 0.003$) and educational program of choice ($p < 0.001$). However, no significant differences were found in cultural affiliation ($p = 0.30$) or family educational background ($p = 0.56$).

Conclusion: The study found that the professional identity of student nurses was dynamic and closely connected to the nursing profession, with year level and choice of educational program influencing its development. It indicated that different factors influenced the professional identity of student nurses. It is recommended that nursing schools implement regular annual professional identity assessments and strengthen support programs, such as peer tutoring and career orientation, to monitor and further develop student nurses' professional identity throughout the nursing curriculum.

Keywords: professional identity of student nurses, year level, educational program choice, cultural affiliation, educational background of the family

I. INTRODUCTION

Professional identity (PI) is a nurse's professional self-concept, shaped by the norms, values, and characteristics of the nursing profession. It influences how nurses and students perceive the nursing profession and the values and beliefs that guide their thoughts, actions, and interactions with patients (International Society for Professional Identity in Nursing [ISPIN], 2025). Through academic learning and clinical exposure, student nurses developed a sense of belonging and came to understand nursing as more than the mere acquisition of skills and knowledge. In this study, PI was defined as the extent to which student nurses internalized and manifested the values, beliefs, attitudes, competencies,

and commitment associated with the nursing profession.

Student nurses developed PI through professional socialization, acquiring essential skills and ethical standards to embody their role. PI formed through formal education and clinical exposure, specifically Related Learning Experience (RLE) interactions with healthcare staff, patients, and peers. Student nurses used role models through observing, imitating, and adopting their behavior. Additionally, student nurses gained competence and subconsciously learned the profession's unwritten rules and culture by reflecting on their experiences. A positive learning environment and supportive clinical educators were important in strengthening PI (Güner et al., 2021).

PI involved three interconnected dimensions: personal, interpersonal, and social-historical dimensions (Güner et al., 2021). The personal dimension included self-image, self-confidence, and self-knowledge, fostering motivation, commitment, and successful performance in clinical settings (Hao et al., 2014; Vabo et al., 2022). A critical factor reported in this dimension is self-esteem, which serves as a foundational element in maintaining professional commitment (Hao et al., 2014). Recent research further highlights that self-efficacy in the clinical learning environment is a strong predictor of both practice readiness and a robust professional identity (Biala, 2026).

The social and historical aspects revealed the influence of family, peers, public perceptions, and the gap between professional ideals and clinical realities on an individual's career choice, autonomy, and job retention. Positive social perceptions could enhance pride and retention within the profession. Conversely, stereotypes, myths, biases, and reality shocks could decrease the perceived status of the nursing profession and create additional barriers to the individual's development of PI (Hao et al., 2014; Hoeve et al., 2014; Marriott et al., 2024).

The interpersonal dimension involved the use of self-regulation, reflection, and peer support to help student nurses maintain balance between their ideals and the realities of being a nurse, learn how to manage their emotions in clinical settings, and collaboratively develop learning experiences with peers and role models (Hao et al., 2014; Miao et al., 2024). The inclusion of a robust support system — comprising clinical instructors, peers, and mentors — is essential for helping students manage emotions and collaboratively develop learning experiences (Hao et al., 2015). Studies emphasize that structured orientation and supportive supervision are particularly vital in facilitating identity formation during high-stress clinical rotations (Pineda, 2025).

In student nurses, pre-professional identity (PPI) is formed during academic years and refers to students' understanding of skills, culture, and conduct of their intended profession (Clanchy et al., 2021). Developing a robust PPI during the academic years enhanced students' motivation, academic achievement, and employability. PPI formation was influenced by personal values, social influences, prior experiences, and career goals. RLE clinical exposure bridged classroom learning and professional practice, strengthening students' sense of purpose and belonging in nursing.

RLE clinical rotations shaped how nursing students viewed themselves as future professionals and varied across year levels (Ho, 2025). While clinical rotations strengthened Professional Identity (PI), senior students could face lower levels due to stress and work realities (Zhao et al., 2021). Nursing education helped students build competence, critical thinking, and reflect on their practice through culturally relevant ways of caring for patients (ATI Nursing Education, 2025; Mbalinda et al., 2023; Amin et al., 2025), but students could find

barriers to developing their PI because of the lack of nursing education support, low self-esteem, unclear roles, lack of collaboration, and receiving negative media coverage about the nursing profession (Keshmiri et al., 2020; Mbalinda et al., 2024). A high PI was associated with higher professional satisfaction, retention, and quality of care (Gong et al., 2025; Hanum et al., 2022; Salameh et al., 2025; Heyrati et al., 2024; Hu et al., 2024). Conversely, lower PI increased the likelihood of leaving the nursing profession (Gusar et al., 2021; Zhang et al., 2025; Gong et al., 2025).

Few studies examined PI among Filipino student nurses. This was notable given the country's unique cultural, educational, and healthcare context, as well as its role as a global provider of nursing care. The effects of factors such as year level, cultural background, educational program choice, and family educational background remained under-researched, and few cross-cultural comparisons were made. Beyond these demographics, there is a notable gap regarding how unique Filipino campus culture and values orientation—such as benevolence and universalism—interact to shape professional self-concept (Bontog et al., 2025). Furthermore, while variables such as self-esteem and support systems are reported in the global literature, there is a clear gap in understanding how these factors and cultural beliefs—such as societal stereotypes and biases—manifest among Filipino nursing students (Hao et al., 2014; Marriott et al., 2024). Finally, recent literature highlights a need to explore the link between PI levels and migration intent among Filipino nursing students (Valencia et al., 2024). This study aimed to fill these gaps because PI is important for nursing practice, workforce retention, and quality care. This led to the following research questions:

1. What was the level of professional identity among student nurses along the following dimensions:
 - a. Personal dimension
 - b. Social and historical aspects
 - c. Interpersonal dimension
2. Was there a significant difference in the level of professional identity of student nurses when they were grouped according to:
 - a. Year level
 - b. Cultural Affiliation
 - c. Educational Program Choice
 - d. Educational background of the family

The findings could assist nurses and clinical instructors in developing mentoring strategies, role-modeling practices, and supportive learning environments that strengthen student nurses' professional identity. This study could improve nursing education by enhancing instructional and clinical teaching methods that promote the development of professional identity. For nursing research, this study provided foundational Philippine data on professional identity among student nurses and contributed to the

limited literature on professional identity in underrepresented contexts. Additionally, the findings could help student nurses recognize factors that affect professional growth, strengthen their commitment to nursing, and guide future professional development and research.

II. METHODS

Research Design

The research study employed a quantitative survey descriptive design. Polit and Beck (2021) explained that this type of design employs questionnaires to describe the attitudes, behaviors, and attributes of a particular group of individuals without manipulating any variables. The design was appropriate for measuring professional identity (PI) among student nurses and allowed objective measurement, statistical comparison, and efficient data collection from a large population.

Participants and Sampling

The study was conducted among BSN students at School X (AY 2025–2026) aged 18 and above who were willing to participate. Students showing signs of psychological or emotional distress were excluded for safety and data integrity. A total of 180 respondents were selected using G*Power and proportionate random sampling from a population of 1,159 (Level 1 = 49, Level 2 = 49, Level 3 = 42, Level 4 = 40). Department heads assisted in randomly selecting participants from enrollment lists, ensuring equal opportunity across year levels.

Data Gathering Tools

The study assessed nursing students' professional identity using the Professional Identity Scale for Nursing Students (PISNS), developed by Hao et al. (2014). This instrument has good reliability, with a Cronbach's alpha of 0.83 and a split-half reliability of 0.84 in previous studies. A pretest administered to 30 student nurses at a site not associated with the school yielded a Cronbach's alpha of 0.86. There were 17 items on the questionnaire, divided into three dimensions, measured on a five-point Likert scale, and demographic information was also collected. The Patient Health Questionnaire-9 (PHQ-9), which assessed well-being, was administered, and responses were screened so only those who scored 0 - 7 could participate.

Data Gathering Procedure

Prior to data collection, ethical and institutional approval was obtained under Protocol No. SLU-REC 2026-406, in addition to obtaining permission from both the Dean and the Associate Dean. The department heads were also assisted by randomly selecting respondents per year level. On January 28, 2026, the researchers completed psychosocial assessment training and a seminar on managing distress with a psychiatric nursing expert. The pre-test involved thirty (30) students from local schools and had a Cronbach's Alpha of 0.86. Each year level researcher worked in four subgroups in order to facilitate a successful

process. The respondents were screened using the PHQ-9, and only those who scored between 0 and 7 were included in the study. The data collection occurred from March to April 2026; after collection, the data were checked for completeness, and those who were excluded received appropriate referrals and support services.

Data Analysis Procedure

To answer objective number one, average scores were computed and interpreted using the established score ranges of the Professional Identity Scale for Nursing Students (PISNS). The table below shows the score ranges, their interpretations, and meanings.

Table 1
Interpretation and Meaning of PISNS Score Ranges

Score	Interpretation	Qualitative Meaning
1.00–1.79	Very Low	Significant weakness or absence of a developed sense of self as a student nurse.
1.80–2.59	Low	Weak sense of self as a student nurse.
2.60–3.39	Moderate	Developing a sense of self as a student nurse.
3.40–4.19	High	Well-developed and positive sense of self as a student nurse.
4.20–5.00	Very High	Strong, well-integrated, and positive sense of self as a student nurse.

To answer objective two, an independent-samples t-test was performed to detect differences between PI across (1) cultural affiliation, (2) education program, and (3) family education background, while ANOVA was employed to detect differences across year-level. Following the analysis, Tukey's post hoc test was used to specify which groups differed. All analyses were based on a .05 level of significance ($\alpha = .05$), such that $p < .05$ indicated a statistically significant difference, whereas $p > .05$ indicated no statistically significant difference.

The data was analyzed using Jamovi software to ensure the accuracy of the results. This enabled efficient computation of statistical results provided an effective means of graphical presentation and aided in interpreting the data.

Ethical Consideration

Data Privacy Act (R.A. 10173) and ethical standards as set forth in School X's Research Ethics Committee were adhered to throughout the research study. All individuals voluntarily participated in the research and provided informed consent prior to engaging in the study. The researchers recognized that the involvement of Department Heads in participant selection may have created power relations due to their academic authority. To address this, their role was limited to facilitating participant selection, without pressuring students to participate. Respondents were assured that participation or withdrawal would not affect their academic standing. Confidentiality was ensured by not collecting identifying information and securely maintaining all information for at least three [3] years before disposal. Respondents could withdraw at any time without academic penalties. Students with PHQ-9 scores of 8 or higher were provided with mental health hotline contacts and/or referrals. The researchers upheld beneficence, non-maleficence, honesty, integrity, and professionalism.

III. RESULTS AND DISCUSSION

Profile of the Respondents

Table 2 presents the profile of the student nurse respondents. Level 1 and Level 2 students reflected the highest number of respondents, as there were 49 respondents from each of those levels. Level 3 and Level 4, on the other hand, had 42 and 40 respondents respectively. Majority of the student nurses were non-Cordilleran (117, 65%) and the minority were Cordilleran (63, 35%). Furthermore, more respondents chose nursing as their first choice (113, 62.8%) than as another choice (67, 37.2%). Lastly, most of the respondents had a family member in the healthcare profession (116, 64.4%), while others did not (64, 35.6%). Overall, the student nurse respondents came from different levels, cultural backgrounds, and family backgrounds but were predominantly from Level 1 and

2, non-Cordilleran, had Nursing as their first educational program choice, and had a family member in the healthcare field satisfied at the population level, so that the reported significance values should be interpreted as descriptive of the participating sample rather than as estimates generalizable to the wider nursing population, communication quality was assessed solely from nurses' perspectives without corresponding physician data, the study was confined to a single healthcare organization in Saudi Arabia, and the two-item mutual understanding subdomain, although reliable, may have limited the breadth of this construct. These limitations should be considered when interpreting and generalizing the findings.

Three Dimensions of Professional Identity

Table 3

Level of Professional Identity Among Student Nurses (N=180)

Dimension	Average Score
Personal Dimension	4.05 (High)
Social and Historical Aspect	4.26 (Very High)
Interpersonal Dimension	4.09 (High)
Total	4.13 (High)

Legend: 1.00–1.80 (Very Low), 1.81–2.60 (Low), 2.61–3.40 (Moderate), 3.41–4.20 (High), and 4.21–5.00 (Very High)

Table 3 displays that student nurses have a high overall PI (Average = 4.13); thus, there exists a strong, dynamic bond existing between student nurses and nursing. This may be due to the training environment at School X, where emphasis is placed upon forming of values, academic rigor, and early exposure to clinical practice, which helps students connect theory with practice (Saint Louis University, n.d.). In addition, School X is a Center for Excellence in Nursing, which aids to further enrich PI by providing high-quality educational instruction as well as clinical training (Saint Louis University, n.d.). Magpantay-Monroe et al. (2020) and Ewertsson et al. (2017) both suggest that PI emerges through an ongoing clinical exposure, reflection, and a nurturing learning environment(s). The

Table 2

Profile of Respondents (N=180)

Year Level	Cultural Affiliation		Education Program Choice		Educational Background		N
	Non-cordilleran	Cordilleran	Student Nurse Choice	Others Choice	With family members in the healthcare field	No family member in the healthcare field	
Level 1	33	16	33	16	27	22	49
Level 2	31	18	31	18	29	20	49
Level 3	27	15	21	21	31	11	42
Level 4	26	14	28	12	29	11	40
Total	117	63	113	67	116	64	180

high level of social and historical dimension indicates students have an increased understanding of the professional and social role that nurses play in society. Clinical instructors and structured experiences enhance professional socialisation (Teskereci et al., 2020). These results are in alignment with Rogers Theory of Personality and Tajfel's Social Identity Theory; evidence indicates that mentorship, feeling of belonging to a group and immersion in clinical nursing practice all contribute to enhanced levels of PI and, therefore, increased readiness for practice.

The highest average score for the Social and Historical Aspect (4.26) suggests a strong overall PI, which could be partially based on the number of respondents who reported having family members that are health care providers, as 116 out of 180 respondents indicated that they had a family member in the health care field, thus supporting their interest in pursuing a career in nursing (Diampuan, 2026; Mao et al., 2021). Furthermore, being part of an esteemed organization instils feelings of pride and social validation; positive connections to a group, or multiple groups, assist in developing one's professional identity (King, 2021). Collectively, family and institutional influences may help to establish a sense of belonging, therefore further influencing an individual's professional self-concept.

The Interpersonal Dimension (Mean=4.09) provides an indication of how nurse students navigate both social and clinical complexities through balancing their ideals with real-world practice. The development of a robust commitment and sense of professionalism is fostered by supportive practice-academic partnerships, role models and mentorship (Vabo et al., 2022; Met et al., 2022; Patel et al., 2024). The provision of adequate clinical exposure assists students in managing their levels of stress and bridging the gap between theory and practice (Rakkarn et al., 2023; Ho et al., 2025), which in turn enhances their professional identity (De La Fosse, 2023; Gong et al., 2025; Zeng et al., 2021). Based on Rogers' Theory of Personality and Tajfel's Social Identity Theory, professional identity develops through the processes of reflection, feeling part of a group, and socialised interaction (Rakkarn et al., 2023; Ho et al., 2025). The further development of professional identity at School X through peer organizations and increased number of RLE hours reinforces feelings of competence and confidence, leading to an increased sense of professional identity.

The Personal Dimension (M = 4.05) reflects self-esteem and high levels of confidence experienced by the student nurses. Educators who provide support to nursing students also increase student confidence as demonstrated by Serafin et al. (2022) while Guerrero et al. (2022) identified high-fidelity simulation as a critical component in developing nursing students' competencies and encouraging their self-confidence. These two components contribute to the strengthening of the professional identity of student nurses through the acquisition of positive learning experiences and realistic training opportunities. As a nationally designated Center of Excellence (Saint Louis University, n.d.), School X provides quality education

and clinical experience that strengthens nursing students' sense of self and knowledge. High-fidelity simulation (Apollo mannequin) and Program Learning Outcomes contribute further to the establishment of student nurses' confidence, professional values, and a strong positive self-concept.

Level of Professional Identity when grouped according to year level, cultural affiliation, educational program choice, and family educational background

Table 4

One-way ANOVA (Welch's) Result of Level of Professional Identity Among Student Nurses when Grouped According to their Year Level

F	df1	Df2	p
5.07	3	95.3	0.003

Interpretation: P-value <0.05 = Significant Difference

Table 4.1

Tukey Post Hoc Test Results on the Average Score of Different Year Levels

		Level 2	Level 3	Level 4
Level 1	Mean difference	-0.0660	0.242	0.114
	p-value	0.863	0.033	0.574
Level 2	Mean difference	-	-0.3083	0.181
	p-value	-	0.003	0.183
Level 3	Mean difference		-	-0.128
	p-value		-	0.512

ANOVA results demonstrated that the level of Professional Identity (PI) for nursing students varies from year to year during their time in nursing school (Ho, 2025). Tukey post hoc tests found that there were significant differences between the PI of Level 1 students versus Level 3 students ($p = 0.033$) and between Level 2 students versus Level 3 students ($p = 0.003$). The likely cause for this is the disparity in clinical exposure and professional socialization, whereby Level 3 nursing students have far greater hours of intensive practical experience than Level 1 nursing students, and in doing so integrate theory and practice into their development of the nursing profession (Wu et al., 2020).

The difference between Level 2 and Level 3 also reflects the nonlinear nature of PI development; Level 2 students may demonstrate greater levels of PI because they had significant early clinical exposure and therefore a high level of confidence (Mukherjee et al., 2024). In contrast, Level 3 students may possess a lower PI because they have considerably more academic and clinical demands (including Required Learning Experiences - RLE and Nursing Research) that contribute to increased stress and reduced confidence (Mohamed et al., 2024; Zhao et al., 2021; Zhao et al., 2024). Conversely, Level 4 nursing students had a high

degree of PI due to the predominance of clinical learning in addition to clinical leadership and the

program selected. Those who had selected nursing as their first exhibited higher levels of professional

Table 5

Level of Professional Identity Among Student Nurses when Grouped According to Cultural Affiliation, Educational Program Choice, and Family Educational Background

		Statistic	df	p	Mean difference	SE difference		Effect size
Cultural Affiliation	Welch's t	1.05	118	0.30	0.0725	0.0692	Cohen's d	0.166
Educational Program Choice	Welch's t	5.17	129	<0.001	0.328	0.0635	Cohen's d	0.806
Educational Background of the Family	Welch's t	-0.582	135	0.56	-0.0386	0.0663	Cohen's d	-0.0900

Interpretation: p-value >0.05 = no significant difference

absence of transition shock, thereby positioning them to have higher levels of competency and readiness for practice (Estudillo et al., 2024).

The findings support Rogers' Theory of Personality and Tajfel's Social Identity Theory which posit that PI develops progressively through experience, reflection, and increasing identification with the nursing profession.

It addresses the research gap concerning the non-linear development of professional identity across different year levels in a nursing program. By identifying a significant dip in PI during the third year, the results clarify how increased clinical and academic stressors specifically impact the professional socialization of students in a Philippine setting. These findings provide evidence-based insights into developmental pathways that were previously identified as under-researched in existing longitudinal nursing literature.

In this study, we found no statistically significant difference between PI scores of Cordilleran and non-Cordilleran participants ($p = 0.30$, greater than .05). This means that being from different cultural backgrounds does not affect an individual's PI. From these findings, we can conclude that School X offers students a standardized clinical education where every student experiences the same methodology for socialization and the same opportunities to socialize through the structure of curriculum, clinical exposure, and ethical standards. Aside from the factors mentioned above, it is important to recognize that culture is also a factor in PI development. According to Amin et al. (2025), when individuals have cultural awareness, they have a positive self-image and provide culturally competent care. Therefore, even though the majority of student PI development comes from standardized training and experiences provided by instructors (Sun et al., 2022), there are still cultural values that are included in the practice. Therefore, in regulated healthcare education, PI is primarily developed based on following universal ethical standards (Norouzi et al., 2025), which creates a consistent professional identity while allowing for culturally competent patient care.

On the other hand, a p-value less than 0.001 indicates a statistically significant difference in the professional identity of nursing students based on the educational

identity than other students. Zeng et al. (2022) also found that first-choice nursing students have greater professional identity due to their high interest and expectations of being a nurse. This supports the idea that self-motivation and commitment associated with the decision to select nursing contribute to increased levels of professional identity among nursing students.

This addresses the research gap concerning the influence of educational program choice on professional identity, particularly among Filipino student nurses. By demonstrating that students who selected nursing as their first choice had significantly higher PI, the results clarify how self-motivation and commitment contribute to the development of professional identity within the Philippine nursing education context. These findings provide evidence-based insights into a relationship previously identified as under-researched in the nursing literature.

Furthermore, family educational background did not significantly impact professional identity ($p=0.56 > 0.05$), demonstrating that family members working in health care do not contribute to developing PI. This corresponds with results from the Mbalinda et al. (2024) and Zeng et al. (2021) studies where they concluded that family exposure primarily affects choosing an initial career but not developing PI over time. While both Hao et al. (2014) or Clanchy et al. (2021) indicated that family exposure might allow an early introduction to nursing, this does not equate to continued development of your professional internalization. Also, the findings challenge Tajfel's Social Identity Theory in that family-relatedness alone does not provide a stronger basis for establishing professional identification. In summary, professional identification is predominantly influenced by education and clinical placements rather than the influence of family background.

It tackles the significant research gap regarding the influence of cultural affiliation and family educational background on professional identity. The results address this gap by demonstrating that a standardized clinical curriculum can create consistent professional identity regardless of diverse cultural backgrounds like Cordilleran affiliation. Additionally, the findings clarify conflicting literature by showing that while family exposure might influence initial career choice, it

does not significantly impact on the long-term internal development of a nurse's professional identity.

Limitations of the Study

The following are the limitations of the study:

1. The involvement of Department Heads in participant selection may have introduced power relations due to their academic authority, which could have influenced students' willingness to participate.
2. The study was conducted in a single nursing school, which may limit the generalizability of the findings and pose a threat to external validity. Including nursing schools from other institutions within the Cordillera Region would improve the generalizability and external validity of future studies.
3. The study focused on determining differences in professional identity across selected demographic variables. Employing descriptive-correlational or other advanced statistical tests, such as correlation or regression analysis, in future research may provide a more comprehensive understanding of the factors that significantly influence professional identity beyond tests of differences.

IV. CONCLUSION

The study concluded that student nurses showed a high degree of PI, suggesting they also show a generally strong dynamic relationship to the nursing profession overall. Year level and educational program choice have significantly influenced PI levels. Those students selecting nursing as their first choice tend to have higher levels of PI compared to others. These findings demonstrate further that as students become more academically successful and aligned with their chosen educational program the result has been a greater sense of clinical accountability, professional resilience and commitment to ethical nursing standards. While there was no statistically significant difference for PI based upon the cultural affiliation and family educational background of the student nurse. This indicated that the PI of the student nurses were influenced by various factors such as year level and educational program choice. Other factors, such as support systems, social media exposure, and access to technological resources, may also influence the development of professional identity. For nursing practice, the findings imply that nursing students should develop a preceptorship initiative to foster the PI development of their peers. As for nursing education, clinical instructors should develop better teaching strategies for developing PI with their students.

V. RECOMMENDATIONS

Future research may consist of several different Nursing Schools located in the Cordillera Region and incorporate variables that include sex, academic success, quality of mentorship, and involvement in extracurricular activities. Future studies should also examine variables such as support systems, social media use, and access to technological resources to better understand their influence on professional identity. In addition, support programs such as peer tutoring and career orientation programs need to be improved to promote PI among nursing students. Nursing schools should also utilize digital learning resources and professional social media platforms to further strengthen students' professional identity. Longer-term, mixed-methods or longitudinal and triangulated types of research design (i.e., interviews, reflective journals, or assessments) are recommended for obtaining an in-depth review of PI development. Regular yearly assessments of PI should be completed to provide a mechanism for tracking PI development as well as identification of areas needing improvement.

CONTRIBUTION OF AUTHORS

All researchers contributed to the conceptualization, data collection, analysis, and manuscript preparation of this research paper.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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CONFLICT OF INTEREST

The Research was done in a singular area of a university nursing program which could limit the generalizability of the results to other environments that have different curriculums and clinical exposures. The researchers were previously familiar with the university, which may have influenced interpretation but not their efforts to maintain neutrality; however, they adhered to academic integrity and thus there was no bias introduced into the validity of the research.

DISCLOSURE OF USE OF GENERATIVE AI

The researchers of this study have acknowledged the use of AI based tools such as Chat GPT (version 5.5), Gemini (version 3 Flash), and Grammarly to correct their grammar and enhance their clarity. However, none of the AI tools were used to generate, analyze, or interpret data. The authors of this manuscript assume total responsibility for the contents of this publication as well as ensuring the manuscript meets the standards of Academic Integrity.

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JOURNAL POLICIES AND ETHICS

Peer Review Process

NEPJ strives to achieve the highest level of ethical scholarly practice in the science and art of nursing by ensuring a robust and transparent peer review. All manuscripts submitted to the journal undergo a double-blind peer review by field specialists with expertise in the relevant subject areas. This guarantees scientific, article quality, and nursing education and practice advancement articles are relevant and their significance is consequential.

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The manuscripts are evaluated based on the following criteria:

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- Soundness and assurance of the design
- Degree of true understanding of the subject
- Clarity and coherence of the writing
- Appropriateness to the journal
- Ethical considerations
- Strength of the argument and conclusions drawn.

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5. **Manuscripts** must be submitted in [Microsoft Word (doc or .docx)] format. Tables must be editable and preferably in word doc. The figures must be submitted as separate files in jpg, .png or .tiff format.
6. Automatic emails will be sent to authors along with the acknowledgement message after a successful submission.

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All authors contributed to the work and should be submitted in terms of their significance with respect to the following:

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The author(s) should provide an informative structured abstract, following the introduction, aim(s), methods, results, and conclusions of the research. The author(s) need to make sure to limit the abstract to 200-300 words]. As much as possible, citation(s) should be avoided.

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Discuss the findings in light of existing literature and their study implications.

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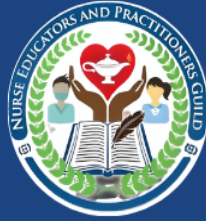
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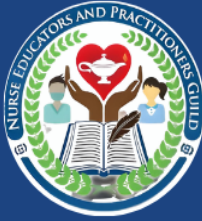
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