Research Paper

Development of a Continuous Quality Improvement Program for Hemodialysis Care in a Healthcare Facility in the Philippines: A Delphi Method Approach

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ABSTRACT

Background: The rising cases of chronic kidney and end-stage renal diseases pose a serious challenge for hemodialysis patients and healthcare teams. However, effective management can be achieved through continuous quality improvement (CQI). Despite medical advancements, gaps in CQI persist, particularly in hemodialysis settings. This study, conducted from August to November 2024, aims to develop a standardized CQI program for dialysis nursing care using the Delphi method to ensure safe, effective, and patient-focused hemodialysis services in the Ilocos region, the Philippines.

Methods: The study employed a Delphi method, involving 15 hemodialysis nurses to understand their experiences. Fifteen nursing experts participated in two rounds of Delphi consultations to refine the program. The methodology integrated findings from the first phase, used two Delphi rounds, and relied on online communication to achieve consensus. The insights gained from the study informed the initial enhancement training program.

Results: During the first round of the Delphi approach, the participants identified 4 themes for the CQI: The need for flexibility, resourcefulness, and commitment; coping mechanisms; aspirations for better CQI; and personal realizations motivating their work. In the second round, a 28-module program was developed, which was further refined to 19 modules after expert validation, achieving over 70% agreement and a Fleiss' kappa of 0.729, indicating strong consensus. The final program was categorized into 3 areas: patient-centered care, skills development, and leadership/management. High content validity index (CVI) scores confirmed the program's relevance and applicability.

Conclusion: Hemodialysis nurses play a critical role in patient care. The CQI enhancement program addresses care gaps through a structured, evidence-based framework, equipping nurses with tools to improve patient outcomes, enhance healthcare quality, and ensure safety for both nurses and patients.

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Highlights

- CQI is essential for maintaining safe, effective, and efficient healthcare services.

- In this study, through two Delphi rounds, hemodialysis nurses and experts identified key CQI gaps (e.g. flexibility, coping mechanisms, patient outcomes). They refined the program, achieving >70% agreement and strong inter-rater reliability (Fleiss' kappa=0.729).

- The validated CQI program addresses critical care gaps, reducing negative impacts on mortality, hospitalization, and treatment efficacy, while empowering nurses with evidence-based strategies for safer, higher-quality hemodialysis services.

Plain Language Summary

This study set out to improve the quality of dialysis care by better supporting the nurses who deliver this life-saving treatment. Through interviews with 15 dialysis nurses, researchers identified 4 key areas needing attention: N daily struggles nurses face, how they cope with stress, their hopes for better training and support, and their strong commitment to patient care despite these difficulties. To address these needs, experts developed a specialized training program using a rigorous two-round consultation process. Nurses and specialists worked together to create 19 focused training modules covering critical areas such as infection control, emergency response, teamwork, and mental wellness. The team intentionally left out less urgent topics to concentrate on changes that would make the biggest immediate difference for both nurses and patients. The final program provides dialysis nurses with practical tools to handle their demanding jobs more effectively, improving patient safety and care quality. By addressing issues such as staffing, skills training, and emotional support, this initiative aims to improve working conditions for nurses and patient outcomes. The approach recognizes that supporting healthcare workers ultimately leads to better care for those who depend on dialysis to survive.

Introduction

Healthcare systems are constantly evolving and integrating processes, organizations, resources, and personnel to ensure the delivery of quality care (Kruk et al., 2018; Lukas et al., 2007). Despite advancements in diagnostics, treatments, and technology, healthcare providers face significant strain due to resource constraints and the complexities inherent in these systems, resulting in inefficient patient outcomes (Al-Worafi, 2024). In the context of hemodialysis, resource limitations, data management issues, resistance to change, and adherence to regulatory standards impede the effective implementation of continuous quality improvement (CQI) (Tseng et al., 2021; Zhianfar & Shaghaghi, 2024; Zhianfar et al., 2024). Overcoming these challenges requires stakeholder engagement, continuous education, investment in infrastructure, and the adoption of data-driven strategies.

CQI is fundamental to ensuring the effectiveness and efficiency of healthcare services. It encompasses integrating knowledge, skills, and attitudes to meet the ever-changing demands of the healthcare system (Endalamaw et al., 2024). On a global scale, CQI has been shown to improve dialysis care outcomes, as demonstrated by the United States renal data system (Trenkle, 2001). In the Philippines, the Universal Health Care Act (RA 11223) emphasizes the importance of quality care, underscoring the role of CQI in achieving affordable yet high-quality healthcare (Camacho et al., 2023). The Department of Health (DOH) has implemented CQI programs in hospitals, aligning with the Philippine Health Insurance Corporation Benchbook's objective of continuous performance enhancement. Despite these initiatives, challenges such as staff resistance and resource constraints impede the implementation of CQI in hemodialysis units (Brown & Green, 2022). Institutionalized in the Philippines through Administrative Order 2006-0002, CQI requires all DOH hospitals to establish CQI programs and committees (Camacho et al., 2023). By 2018, CQI became a licensing requirement under Department Circular No. 2018-0131, "revised licensing assessment tools for hospitals," and is also included in the dialysis clinic licensing checklist (Ruiz, 2024).

Implementing CQI in hemodialysis requires a systematic approach, leadership commitment, data-driven decision-making, and a culture of continuous learning to ensure standardized healthcare outcomes for patients, especially those with end-stage renal disease (Taylor, 2022), in which hemodialysis nurses play an integral role in life-saving care (Slusaranskaya, 2023). Their expertise, coupled with patient education and emotional support, significantly improves patient outcomes (Lelorain et al., 2019). However, gaps in interdisciplinary collaboration, patient engagement, and regulatory understanding persist, which makes a dedicated focus on CQI in hemodialysis settings imperative (Watnick et al., 2023). Despite the DOH mandate to adopt CQI programs in hospitals, data and standardized tools remain limited for dialysis care (Tamondong-Lachica et al., 2024).

This study aims to address the existing gaps in CQI implementation regarding dialysis nursing care by identifying competencies in the selected private hospitals in Ilocos region, Philippines, and developing a CQI program specifically tailored to hemodialysis settings using the Delphi method, specifically in Ilocos region or region 1, Philippines, where there is a scarcity of data and monitoring tools.

Materials and Methods

Research design

The study employed the Delphi method, a technique designed to gather expert insights on current trends, challenges, and needs among hemodialysis nurses (Brown & Crookes, 2016). This approach utilizes iterative rounds of surveys with selected experts to forecast future developments and establish consensus (Jones, 2018), making it particularly effective for synthesizing perspectives from geographically dispersed individuals with specialized knowledge or experience in each subject (Hsu et al., 2019). Given its capacity to systematically integrate expert opinions while acknowledging individual viewpoints, the Delphi method is well-suited for program development in specialized fields (Smarandache et al., 2020).

In this study, the Delphi method consisted of two rounds. Round 1 focused on identifying initial components of an enhanced training program for quality improvement, as proposed by hemodialysis staff nurses in region 1. At the same time, round 2 refined these findings to finalize the training program. Expertise in nursing, as defined by Benner (1984), refers to practitioners who no longer rely solely on rules or guidelines but instead demonstrate intuitive, experience-based decision-making. Eligible nursing experts who met these criteria were contacted via email and provided with details about the study's purpose and significance. It was explained to them that the study aims to address problems in the standardization of CQI in hemodialysis nursing care.

Study participants

This descriptive study employed a purposive sampling strategy to recruit 15 senior hemodialysis nurses aged 21 to 58 years from private hospitals in region 1, the Philippines. The number of panelists can range from 4 to several thousand. Typically, the number of Delphi panelists ranges from 8 to 20 (Shang, 2023).

The study specifically targeted nursing experts characterized by their advanced proficiency and adaptability in hemodialysis care. The inclusion criteria for participant selection were as follows: Registration as a nurse under the Philippine Regulation Commission with active membership in local or national Renal Nurses Association of the Philippines chapters, aged between 21 and 58 years, no restrictions regarding gender, possession of nephrology nursing certification, demonstrated clinical experience in hemodialysis settings, and capacity to provide informed consent.

Research setting

This study was conducted in the Ilocos region (region 1), located in northwestern Luzon, the Philippines. Three private hospitals equipped with hemodialysis facilities located in the provinces of Pangasinan, San Fernando (La Union), and Ilocos Norte, Philippines, were selected.

Research instruments

For the initial phase of data collection, semi-structured interviews were employed as the primary research instrument to explore quality improvement initiatives within hemodialysis facilities. This qualitative approach used open-ended questions designed to elicit comprehensive responses, enabling participants to articulate their professional experiences and perspectives in depth. The development of the interview protocol followed a rigorous process, beginning with a thorough review of existing literature on quality improvement in hemodialysis settings to establish a theoretical foundation. Subsequently, the preliminary questions underwent critical evaluation and refinement through consultations with academic advisors, ensuring both methodological rigor and relevance to the study objectives. This systematic approach to instrument development enhanced the study's validity

while maintaining the necessary flexibility to capture the nuanced realities of hemodialysis nursing practice. To ensure the questionnaire was unambiguous, we conducted pilot testing with a small group through interviews before the main study. The questions were designed using simple, jargon-free language. We employed neutral wording throughout to eliminate potential bias and maintain objectivity in responses. The combination of evidence-based question formulation and expert validation contributed to the robustness of the data collection process, ultimately supporting the credibility of the research findings.

Data collection

Data were collected between August and September 2024 through in-depth interviews with the participants, who were given the flexibility to choose either face-to-face or virtual (via Zoom) modalities based on their convenience regarding time and location. A total of 15 interviews were completed and subsequently included in the final analysis.

Before data collection, institutional approvals were obtained from relevant hospital authorities. All interview sessions were audio-recorded following participant permission and subsequently transcribed verbatim. The interview process continued through two iterative rounds until theoretical saturation was achieved.

All digital recordings and transcripts were maintained under strict confidentiality protocols, with access restricted to the research team. Recordings were systematically reviewed to ensure data accuracy before analysis.

For the Delphi component, a structured questionnaire was developed in Google Forms, comprising 6 key sections: Program title, strategic design and rationale, learning objectives, content implementation, evaluation framework, and an open commentary section for expert feedback. The Delphi process was conducted from October to November 2024 across two sequential rounds. The initial questionnaire used a dichotomous/binary rating system, which is appropriate for Filipino participants (Suárez et al., 2024; Grassi et al., 2007; Martin et al., 1974; Paulus, 1991), and concluded with open-ended fields for additional expert commentary. According to Keeney et al. (2000), there has been intense discourse regarding the standardization of the Delphi method in nursing research, and they suggested adopting a simplified first-round question, e.g. binary, to reduce ambiguity and attrition. Lastly, preserving anonymity, individualized electronic links were distributed via secure email channels.

Furthermore, participants were given a 2-week response period for each round, with automated reminders issued at 6-day intervals. Consensus thresholds were established a priori, with items requiring ≥70% expert agreement for retention. Non-consensus items (<70% agreement) were systematically excluded, while retained items and qualitative feedback informed subsequent iterations. The second round presented a revised program version, following identical distribution and evaluation protocols. Final program components were derived exclusively from items achieving consensus across both rounds, thereby ensuring content validity through this rigorous expert validation process (see Figure 1 for the summary of the entire Delphi workflow used in the study).

Results

The participants identified different training components as important for enhancing training programs aimed at achieving quality improvement measures in hemodialysis settings.

Round 1

The findings in Table 1 reveal varying levels of agreement among staff regarding different training programs, with some receiving strong support and others indicating room for improvement. Programs such as leadership and management training, infection prevention and control training, and occupational safety and health (OSH) training achieved high agreement levels of 80%, reflecting staff consensus on their importance. Notably, spiritual wellness (86.66%), advanced cardiac life support (ACLS), collaboration and communication training, and adequacy of dialysis also received the highest agreement scores, emphasizing the staff's desire for more training and organizational support in these areas.

Moderate agreement levels (66.66% to 73.33%) were observed for programs such as healthcare workers' protection and vaccination, psychosocial support training, and basic life support (BLS), suggesting these topics may require further refinement or additional engagement with staff to address their concerns. Common focus areas across the programs included limited available resources, the need for more training, and the desire for stronger organizational support, highlighting systemic challenges within the facility.

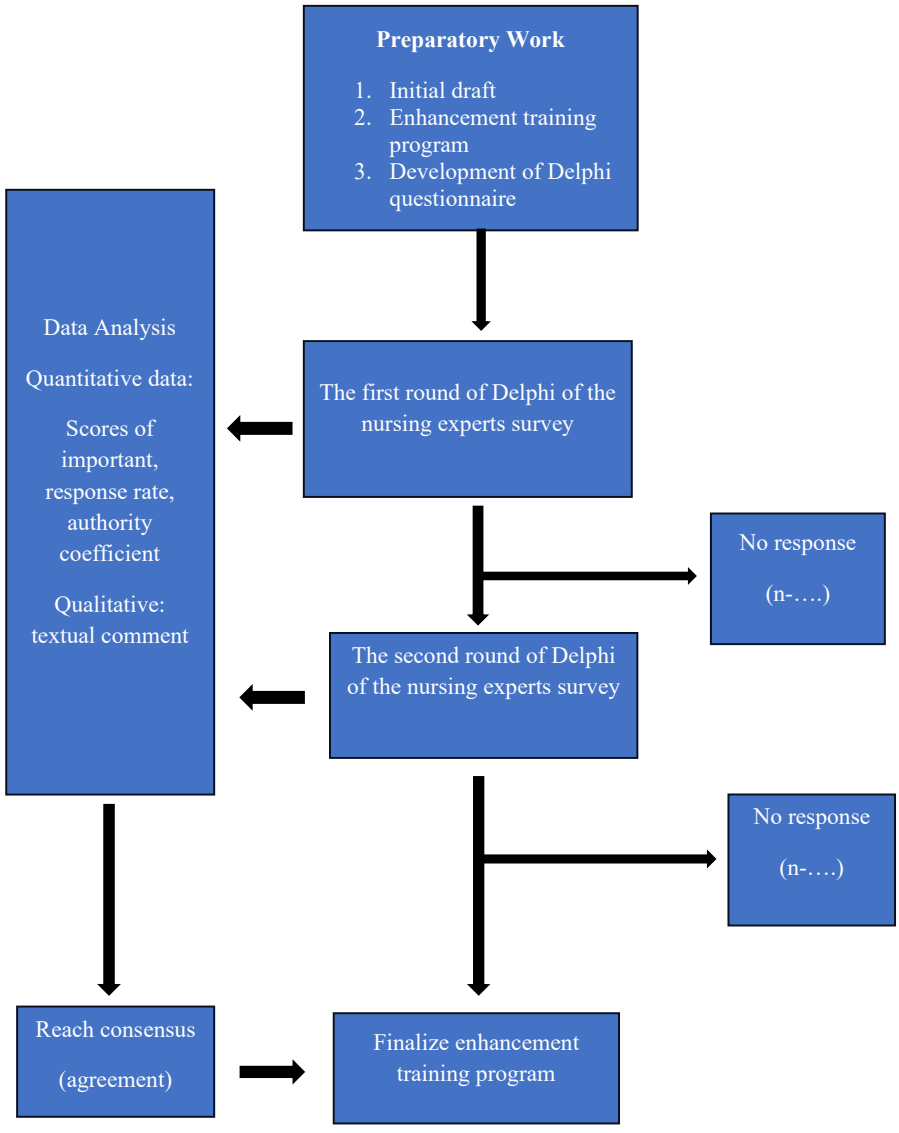

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Figure 1. The workflow of the Delphi process used in the study

The results underscore the importance of prioritizing high-agreement programs (≥70%) for immediate implementation while addressing underlying issues such as resource constraints and institutional support. Engaging staff in discussions about moderate-agreement programs could help tailor these initiatives to meet their needs better. Overall, the findings provide valuable insights for developing targeted quality improvement strategies in the hemodialysis facility, ensuring alignment with staff priorities and enhancing both patient care and workplace conditions.

The statistical analysis of inter-rater agreement among nursing experts regarding the initial program proposal demonstrated substantial reliability (Table 2). Fleiss' kappa (κ=0.679), computed across 19 items evaluated by 15 raters, indicates a significant degree of concordance beyond chance expectations (Landis & Koch, 1977). This level of agreement, classified as substantial per conventional benchmarks (McHugh, 2012), was further corroborated by robust inferential statistics ($z=17.8$, $P<0.001$), which effectively rejected the null hypothesis of random agreement. The exceptionally low probability value ($P<0.001$) provides strong evidence that the observed consensus reflects genuine professional alignment rather than stochastic variation (Sim & Wright, 2005).

These psychometric findings carry important implications for program validation. The substantial inter-rater reliability (κ=0.679; 95% CI, 0.62%, 0.74%) suggests that the program components resonate consistently with expert expectations, a critical indicator of content valid-

Table 1. Initial enhancement training program on quality improvement identified by hemodialysis staff nurses working in 3 hemodialysis facilities in region 1, Philippines

Enhancement Training Program	Round 1 Focus Area	Agree	Disagree	Agreement (%)
Leadership and management training	Staffing and schedule/ additional workload	12	3	80
Stewardship of resources	Limited available resources Challenges: staffing and schedule/ additional workload	11	4	73.33
Healthcare workers protection and vaccination	Limited available resources	10	5	66.66
Infection prevention and control training	Limited available resources	12	3	80
Supplies and equipment training	Limited available resources	10	5	66.66
OSH	Limited available resources/ additional Workload	12	3	80
Vascular access training	Limited available resources	11	4	73.33
Symptoms management training	Limited available resources	12	3	80
Disinfection, waste segregation management	Limited available resources	10	5	66.66
Mental health training	Coping Social support	12	3	80
Spiritual wellness	Coping	13	2	86.66
Psychosocial support training	Fears and worries Coping	10	5	66.66
Self-care and well-being training	Coping	11	4	73.33
BLS	Desire for more training Desire for Organizational Support	10	5	66.66
ACLS	Desire for more training Desire for Organizational Support	13	2	86.66
Renal transplantation training	Desire for more training	10	5	66.66
Bone management training	Desire for more training Desire for organizational support	10	5	66.66
Anemia management training	Desire for more training Desire for organizational support	10	5	66.66
Nutritional assessment	Desire for more training Desire for organizational support	11	4	73.33
Referral system	Desire for organizational support	10	5	66.66
Collaboration and communication training	Desire for more training Desire for organizational support	13	2	86.66
Adequacy of dialysis	Desire for more training Desire for organizational support	13	2	86.66
Patient quality of life	Desire for more training Desire for organizational support	11	4	73.33
Competency assessment of hemodialysis staff nurses training	Desire for more training Desire for organizational support	12	3	80
Training on electronic medical records	Desire for more training Desire for organizational support	12	3	80
Research and quality assurance training	Desire for more training Desire for organizational support	11	4	73.33
Data management and reporting	Desire for more training Desire for organizational support	11	4	73.33
Regulatory requirements training for operating a hemodialysis center	Desire for more training Desire for organizational support Realizations	11	4	73.33

Note: 70-100%: Accepted; 0-69.99%: Not accepted.

Table 2. Significant agreement of nursing experts

Statistical Test	No.	Rater	Statistic	z	P
Fleiss' kappa	19	15	0.679	17.8	<0.001

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ity in nursing education development (Hallgren, 2019). Such consensus is particularly noteworthy given the multidimensional nature of the evaluation criteria, which typically make perfect agreement challenging to achieve.

Round 2

The components accepted during the first round were subject to final quality improvement. According to Table 3, most programs received acceptance, with agreement scores at or above 73.33%, indicating strong staff support. Key areas such as stewardship of resources (80%), vascular access training (80%), spiritual wellness (80%), ACLS (80%), and collaboration and communication training (80%) achieved the highest agreement, emphasizing their perceived importance in improving safety, patient-centered care, and operational efficiency. Programs like leadership and management training (73.33%), infection prevention and control training (73.33%), and OSH training (73.33%) also garnered substantial support, though slightly lower, suggesting their relevance but possibly indicating minor concerns or areas for refinement.

The domains of safety and patient-centered care were frequently associated with high-agreement programs, reinforcing their critical role in hemodialysis nursing. Meanwhile, intervention-focused programs, such as mental health training (73.33%) and self-care and well-being (73.33%), were also accepted, reflecting the staff's recognition of the need for psychosocial and personal wellness support. Additionally, programs tied to timely, efficient, and equitable care, such as dialysis adequacy (80%), were highly endorsed, underscoring the importance of workflow optimization and equitable patient management.

Despite the overall strong agreement, the consistent presence of a minority of dissenters (3–4 "Disagree" responses across most programs) suggests that some staff may have reservations or specific unmet needs. The findings advocate for prioritizing high-agreement programs while addressing potential gaps through targeted feedback or adjustments. The broad acceptance of these training initiatives signals a collective commitment to enhancing both clinical outcomes and workplace conditions in the hemodialysis facility.

Fleiss' kappa (κ=0.729), computed across 19 items evaluated by 15 raters, in Table 4, indicates a significant degree of concordance beyond chance expectations (Landis & Koch, 1977). This level of agreement, classified as substantial per conventional benchmarks (McHugh, 2012), was further corroborated by robust inferential statistics (z=17.8, P<0.028), which effectively rejected the null hypothesis of random agreement. The exceptionally low probability value (P<0.028) provides strong evidence that the observed consensus reflects genuine professional alignment rather than stochastic variation (Sim & Wright, 2005). These findings carry important implications for program validation. The substantial inter-rater reliability (κ=0.729; 95% CI, 0.62%, 0.74%) suggests that the program components resonate consistently with expert expectations, a critical indicator of content validity in nursing education development (Hallgren, 2019).

Content validity index (CVI) score

The evaluation of the enhancement training program on quality improvement for hemodialysis nursing practice yielded robust content validity metrics, as shown in Table 5. Quantitative analysis revealed exceptional CVI scores across all program components, with 9 of 19 domains achieving perfect unanimity (CVI=1) among the 10-member expert panel. These domains, unanimously endorsed by the panel, are leadership and management; vascular access training; spiritual wellness; interprofessional collaboration; dialysis adequacy monitoring; clinical competency assessment; electronic health records proficiency; regulatory compliance; and provider well-being. They collectively represent essential competencies for contemporary hemodialysis practice.

The remaining 10 program elements demonstrated near-perfect validity (CVI=0.9), indicating consensus among 90% of evaluators. These components encompass critical operational and clinical dimensions, including resource utilization efficiency, infection prevention protocols, occupational safety standards, symptom management strategies, mental health integration, advanced cardiac life support, nutritional status evaluation, quality-of-life considerations, research & quality assurance, and data management and reporting. The consistently high validity coefficients across all measured domains (Mean±SD 0.95±0.05) provide strong empirical evi-

Table 3. Final quality improvement enhancement training programs for hemodialysis nurses, categorized by domains and levels of agreement

Enhancement Training Program	Domains	Agree	Disagree	Agreement (%)
Leadership and management training	Timely, efficient, and equitable	11	4	73.33
Stewardship of resources	Safety	12	3	80
Infection prevention and control training	Safety Patient centered	11	4	73.33
OSH	Safety Patient centered	11	4	73.33
Vascular access training	Safety Patient centered	12	3	80
Symptoms management training	Safety Patient centered	11	4	73.33
Mental health training	Intervention	11	4	73.33
Spiritual wellness	Intervention	12	3	80
Self-care and well-being	Interventions	11	4	73.33
ACLS	Safety Patient centered	12	3	80
Nutritional assessment	Safety Patient centered	11	4	73.33
Collaboration and communication training	Timely, efficient, and equitable	12	3	80
Adequacy of dialysis	Timely, efficient, and equitable	12	3	80
Patient quality of life	Timely, efficient, and equitable	11	4	73.33
Competency assessment of hemodialysis staff nurses training	Assessment safety	12	3	80
Training on electronic medical records	Assessment	11	4	73.33
Research and quality assurance training	Interventions	11	4	73.33
Data management and reporting	Interventions	11	4	73.33
Regulatory requirements training for operating a hemodialysis center	Interventions	11	4	73.33

Note: 70-100%: Accepted; 0-69%: Not accepted.

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dence for the program's comprehensive coverage of the requisite knowledge and skills (Polit & Beck, 2006).

Furthermore, this validity profile suggests the program successfully balances evidence-based standards with innovative practice elements, addressing both core clinical requirements and contemporary holistic care paradigms (Choi et al., 2022). These findings collectively support the program's potential to enhance both technical proficiency and organizational outcomes in hemodialysis settings.

Discussion

The systematic refinement process from initial to final training program iterations demonstrates substantive modifications informed by expert consensus metrics. The Delphi methodology facilitated a 32.14% reduction in training domains (from 28 initial to 19 final components), with exclusions primarily affecting lower-agreement areas (below 70% threshold), including healthcare worker vaccination protocols (62%), renal transplanta-

Table 4. Significant agreement of nursing experts on the final quality improvement enhancement training program for hemodialysis nurses

Statistical Test	No.	Rater	Statistic	z	P
Fleiss' kappa	19	15	0.729	17.8	<0.028

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Table 5. CVI table of the quality improvement enhancement training program for hemodialysis nurses

Key Areas	No. of Agree	CVI
Leadership and management	10	1
Stewardship of resources	9	0.9
Infection prevention and control	9	0.9
OSH	9	0.9
Vascular access training	10	1
Symptoms management training	9	0.9
Mental health training	9	0.9
Spiritual wellness	10	1
Advanced cardiac life support	9	0.9
Nutritional assessment	9	0.9
Collaboration and communication	10	1
Adequacy of dialysis	10	1
Patient quality of life	9	0.9
Competency assessment	10	1
Training on electronic records	10	1
Research & quality assurance	9	0.9
Data management and reporting	9	0.9
Regulatory requirements	10	1
Self-care and well-being	9	0.9

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tion education (65%), and anemia management training (68%). This strategic prioritization reflects a deliberate focus on high-impact competencies while maintaining comprehensive coverage of essential hemodialysis nursing domains, consistent with contemporary competency frameworks in specialized nursing practice.

The final program architecture reveals 3 dominant competency clusters: Clinical-technical proficiencies (vascular access management, ACLS), safety systems mastery (infection control protocols, occupational health standards), and professional development imperatives (clinical leadership, interprofessional collaboration). Notably, the differential retention rates between ACLS (80%) versus BLS training (excluded at 64%) suggest expert prioritization of higher-acuity emergency interventions, potentially reflecting the complex clinical profiles of contemporary hemodialysis populations (Clancy-Burgess, 2024). The unanimous inclusion of electronic health records training (CVI=1) further underscores the growing imperative of digital health literacy in nephrology practice (Nguyen et al., 2021).

The program's incorporation of holistic care components, particularly spiritual wellness (CVI=1) and mental health training (CVI=0.9), signifies an important evolution toward patient-centered care paradigms in renal nursing. This dual emphasis on technical and psychosocial competencies aligns with emerging evidence demonstrating improved patient outcomes through integrated care approaches (Kearney et al., 2020), while simultaneously addressing quadruple aim objectives of enhancing both patient experiences and provider well-being (Bodenheimer & Sinsky, 2014).

The robust consensus on research methodology (CVI=0.9) and data analytics training (CVI=0.9) positions frontline nurses as active participants in evidence generation and quality improvement initiatives—a critical competency in value-based care models (Flythe et al., 2021). The program's structured approach to competency development offers a replicable framework for specialty nursing education. However, periodic reevaluation of excluded components may be warranted as clinical evidence and practice standards evolve.

Implementation of this refined training framework holds significant potential to enhance multiple dimensions of hemodialysis care delivery. Clinically, the emphasis on vascular access competencies directly addresses a predominant complication domain in hemodialysis populations (Ravani et al., 2016). Professionally, the leadership development components empower nurses as change agents in quality improvement initiatives (Mannix et al., 2013). Organizationally, the streamlined scope enhances program adoptability while maintaining comprehensive coverage of critical competencies. However, the findings cannot be generalized to the rest of the Philippines, as the study was conducted only in the Ilocos region and involved three private hospitals. They may yield different results in other parts of the country due to cultural differences and the autonomous nature of medical practices in each region. Moreover, the study was focused on private dialysis centers; it did not include tertiary hospital settings, stand-alone dialysis centers, or dialysis units with ongoing private partnership hemodialysis settings that may have other policies on CQI.

Future directions should incorporate longitudinal evaluation of competency retention, correlation with patient outcomes, and systematic assessment of implementation barriers. This refined training architecture represents a significant advancement in hemodialysis nursing education, effectively balancing evidence-based standards with practical implementation considerations to optimize both patient care and professional practice outcomes.

Conclusion

The study highlights the pressing challenges faced by hemodialysis nurses, including staffing shortages, extended workloads, limited resources, and the complex demands of end-stage renal disease care, which often lead to burnout and compromised patient outcomes. These findings underscore the necessity for systemic reforms and enhanced support mechanisms. The proposed enhancement training program, developed with expert consensus, represents a comprehensive approach to addressing these challenges. By integrating evidence-based practices, advanced clinical training, and holistic care components, the program seeks to empower nurses with the skills and resilience needed for quality improvement in hemodialysis settings.

The final program includes 19 components with substantial expert consensus, as indicated by a Fleiss' kappa score of 0.729. Training priorities such as infection prevention, vascular access management, mental health, and advanced clinical competencies reflect a balance between technical skills and nurses' holistic well-being. These areas are critical for ensuring patient safety, improving outcomes, and fostering a supportive work environment. The inclusion of mental health, spiritual wellness, and professional development components underscores the importance of sustaining nurse resilience and job satisfaction, which are integral to sustaining quality improvement initiatives.

In sum, the program addresses the identified gaps in hemodialysis care through a structured, evidence-based framework. It prioritizes continuous professional growth, interdisciplinary collaboration, and a patient-centered approach to care. By equipping nurses with the necessary tools and support systems, this training initiative promises to improve care quality, enhance patient outcomes, and ensure the well-being of both patients and nurses in hemodialysis settings.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by Ethics Review Committee (ERC) of Trinity University of Asia, Quezon City, Philippine (Code: 2024-1st-CNU-Fernandez-V1). The research ensured compliance with ethical safeguards. It followed guidelines to ensure that participants took part willingly and voluntarily in a safe environment. The data were handled in a manner that ensured anonymity, confidentiality, and privacy. The respondents had the right to withdraw from the study at any time. A cover letter was attached to each informed consent form, explaining the study details. Stringent measures were implemented to protect participant confidentiality, including the use of pseudonyms derived from common hemodialysis medications to anonymize individual identities throughout the study. Furthermore, the study findings were made available to a selected research locale and its participants upon request for future research.

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Authors' contributions

All authors contributed equally to the conception and design of the study, data collection and analysis, interception of the results and drafting of the manuscript. Each author approved the final version of the manuscript for submission.

Conflict of interest

The authors declared no conflict of interest.

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