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Title: 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: Chronic Kidney Disease (CKD) and End-Stage Renal Disease (ESRD) rising cases poses a serious challenge for hemodialysis patients and healthcare teams, which can be addressed by an effective management through the implementation of Continuous Quality Improvement (CQI). Despite medical advancements, gaps in CQI persist, particularly in hemodialysis settings. This study that was conducted from August to November 2024, aims to develop a standardized CQI program for dialysis nursing care using the Delphi method, ensuring safe, effective, and patient-focused hemodialysis services in Ilocos Region, Philippines.

Methods: The study employed a Delphi method, involving 15 hemodialysis nurses to understand their experiences. Fifteen (15) 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 four themes for the CQI: (1) the need for flexibility, resourcefulness, and commitment; (2) coping mechanisms; (3) aspirations for better CQI; and (4) personal realizations motivating their work. In the second round, a twenty-eight (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 three 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.

Keywords: Chronic renal insufficiency, Quality of health care, Hemodialysis, Nursing, Delphi Method

Highlights

- Continuous Quality Improvement (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) and refined the program with >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 four key areas needing attention: the 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 the most critical areas like 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 gives dialysis nurses practical tools to handle their demanding jobs more effectively while improving patient safety and care quality. By tackling issues like proper staffing, skills training, and emotional support, this initiative aims to create better working conditions for nurses and better treatment outcomes for their patients. 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, challenges in resources and the complexities inherent in these systems place a significant strain on healthcare providers, 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 the integration of 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 (USRDS) (Smith & Doe 2023). In the Philippines, the Universal Health Care (UHC) Act (RA 11223) emphasizes the importance of quality care, rendering CQI crucial for 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 (PHIC) 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 (AO) 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).

Implementation of CQI in hemodialysis needs a systematic approach, leadership commitment, data-driven decision-making, and a culture of continuous learning to ensure standardized healthcare outcomes for patients especially with end-stage renal disease (ESRD) (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 improved patient outcomes (Lelorain et al., 2019). However, gaps in interdisciplinary collaboration, patient engagement, and regulatory understanding still persist, which dedicated focus on CQI in hemodialysis settings is imperative (Watnick et al., 2023). Despite the DOH mandate for CQI programs adoption in hospitals, data and standardized tools are still 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 Continuous Quality Improvement (CQI) program specifically tailored to hemodialysis settings using 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 and 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 was 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, while Round 2 refined these findings to establish the final version of 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, meeting these criteria, were contacted via email and provided with details regarding the study's purpose and significance. It was expounded to them that the study would like to address the problems in the standardization of CQI in hemodialysis nursing care.

Participants

This descriptive study employed a purposive sampling strategy to recruit fifteen (15) senior hemodialysis nurses aged 21 to 58 years from private hospitals in Region 1, Philippines. The number of panelists can vary from a minimum of 4 to several thousand. Typically, the number of Delphi panelists is between 8 and 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: (1) registration as a nurse under the Philippine Regulation

Commission (PRC) with active membership in local or national Renal Nurses Association of the Philippines (RENAP) chapters; (2) age between 21 and 58 years; (3) no restrictions regarding - gender; (4) possession of nephrology nursing certification; (5) demonstrated clinical experience in hemodialysis settings; and (6) capacity to provide informed consent.

Research setting

This study was conducted in the Ilocos Region (Region 1), located in northwestern Luzon, 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 utilized open-ended questions specifically designed to elicit comprehensive responses, allowing 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 clear and unambiguous, we conducted pilot testing with a small group through interviews prior to 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 collection occurred between August and September 2024 through in-depth interviews with participants 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 fifteen interviews were completed and subsequently included in the final analysis.

Prior to 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 prior to analysis.

For the Delphi component, structured questionnaire developed using Google Forms, comprising six key sections: (1) program title, (2) strategic design and rationale, (3) learning objectives, (4) content implementation, (5) evaluation framework, and (6) open commentary

space for expert feedback. The Delphi process was conducted from October to November 2024 across two sequential rounds. The initial questionnaire incorporated 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 have been intense discourses regarding the standardization of Delphi method in nursing research and he suggested to adopt 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, the participants were allotted a two-week response period for each round, with automated reminders issued at six-day intervals. Consensus thresholds were established a priori, with items requiring $\geq 70\%$ expert agreement for retention. Non-consensus items ($< 70\%$ agreement) were systematically eliminated, 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).

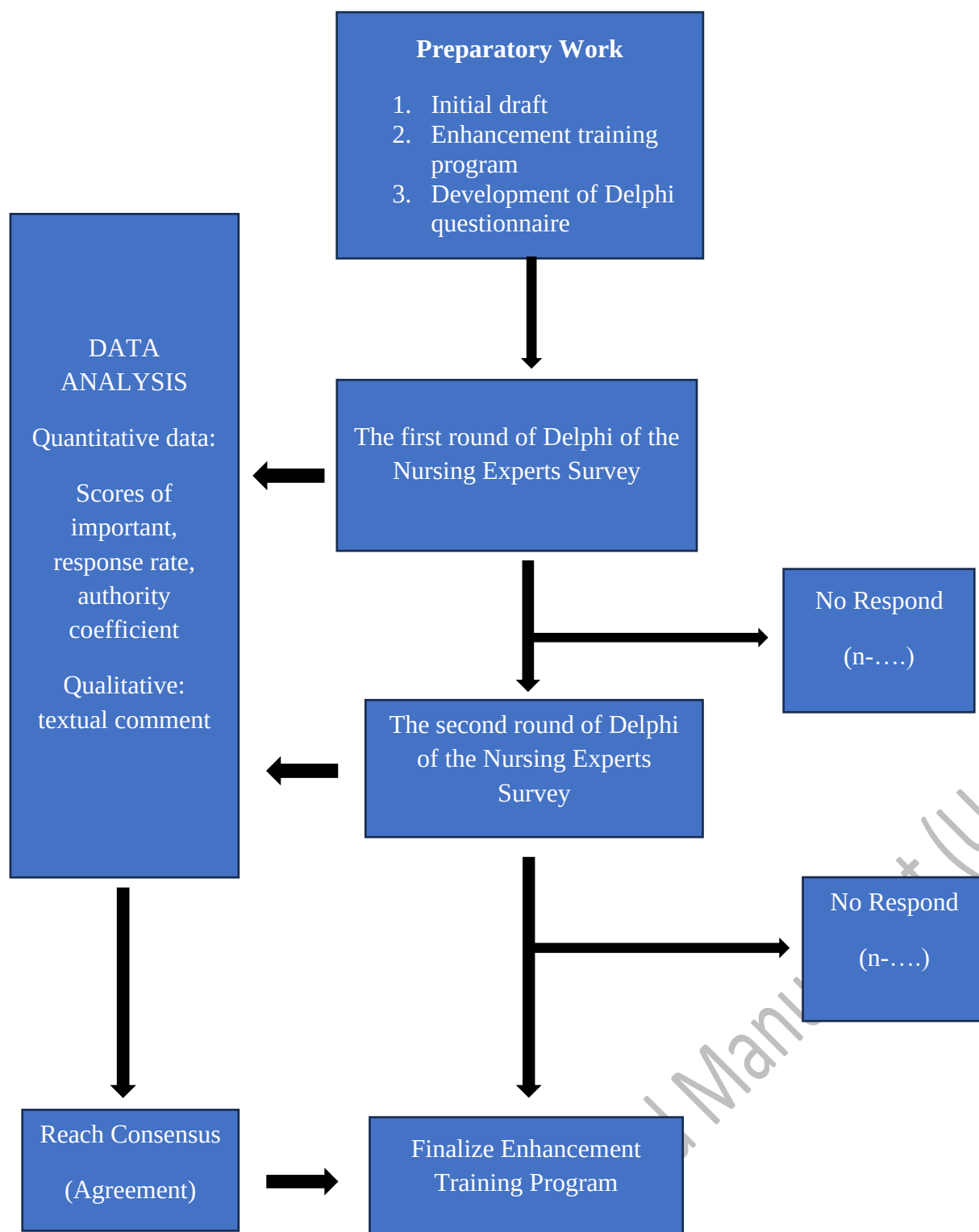


Figure 1. The entire work flow of the Delphi process used in the study

Results

The participants identified different pieces of training as an important component of enhancement of training programs aimed in enhancing and achieving quality improvement measures in the 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 like 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.

The results underscore the importance of prioritizing high-agreement programs ($\geq 70\%$) 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 better meet their needs. 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.

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

ENHANCEMENT TRAINING PROGRAM	ROUND I 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%
OCCUPATIONAL SAFETY AND HEALTH (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%

BASIC LIFE SUPPORT (BLS)	Desire for more training Desire for Organizational Support	10	5	66.66%
ADVANCED CARDIAC LIFE SUPPORT (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 IN OPERATING A HEMODIALYSIS CENTER	Desire for more training Desire for Organizational Support Realizations	11	4	73.33%

Legend: 70% to 100%: Accepted
0%- 69.99%: Not Accepted

The statistical analysis of inter-rater agreement among nursing experts regarding the initial program proposal demonstrated substantial reliability as shown in Table 2. Fleiss' Kappa ($\kappa = 0.679$), computed across 19 items evaluated by 15 raters, indicates a significant degree of concordance beyond chance expectations (Landis & Koch 1977). This magnitude of agreement, classified as substantial per conventional benchmarks (McHugh 2012), was further corroborated by robust inferential statistics ($z = 17.8$, $p < 0.001$), effectively rejecting 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 ($\kappa = 0.679$, 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). Such consensus is particularly noteworthy given the multidimensional nature of the evaluation criteria, where perfect agreement is typically challenging to achieve.

Table 2. Significant Agreement of Nursing Experts

	n	Rater	Statistic	z	p
Fleiss' Kappa	19	15	0.679	17.8	<0.001

Round 2

The components which were accepted during the first round were subject to final quality improvement enhancement. 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, like Adequacy of Dialysis (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.

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%
OCCUPATIONAL SAFETY AND HEALTH (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%
ADVANCED CARDIAC LIFE SUPPORT (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 IN OPERATING A HEMODIALYSIS CENTER	Interventions	11	4	73.33%

Legend: 70%-100%: Accepted
0%-69%: Not Accepted

Fleiss' Kappa ($\kappa = 0.729$), computed across 19 items evaluated by 15 raters, in Table 4, indicates a significant degree of concordance beyond chance expectations (Landis & Koch 1977). This magnitude of agreement, classified as substantial per conventional benchmarks (McHugh 2012), was further corroborated by robust inferential statistics ($z = 17.8$, $p < 0.028$), effectively rejecting 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 ($\kappa = 0.729$, 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).

Table 4. Significant Agreement of Nursing Experts on the Final Quality Improvement Enhancement Training Program for Hemodialysis Nurses

	n	Rater	Statistic	z	p
Fleiss' Kappa	19	15	0.729	17.8	<0.028

Content Validity Index 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 Content Validity Index (CVI) scores across all program components, with nine of nineteen domains achieving perfect unanimity (CVI = 1.0) among the ten-member expert panel. These unanimously endorsed domains - 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 - collectively represent essential competencies for contemporary hemodialysis practice.

The remaining ten 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 ($M = 0.95$, $SD = 0.05$) provide strong empirical evidence for the program's comprehensive coverage of requisite knowledge and skill areas (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.

Table 5. Content Validity Index (CVI) Table of the Quality Improvement Enhancement Training Program –for Hemodialysis Nurses

KEY AREAS	NO. OF AGREE	CVI
LEADERSHIP AND MANAGEMENT	10	1.0
STEWARDSHIP OF RESOURCES	9	0.9
INFECTION PREVENTION AND CONTROL	9	0.9
OCCUPATIONAL SAFETY AND HEALTH	9	0.9
VASCULAR ACCESS TRAINING	10	1.0
SYMPTOMS MANAGEMENT TRAINING	9	0.9
MENTAL HEALTH TRAINING	9	0.9
SPIRITUAL WELLNESS	10	1.0
ADVANCED CARDIAC LIFE SUPPORT	9	0.9
NUTRITIONAL ASSESSMENT	9	0.9
COLLABORATION AND COMMUNICATION	10	1.0
ADEQUACY OF DIALYSIS	10	1.0
PATIENT QUALITY OF LIFE	9	0.9
COMPETENCY ASSESSMENT	10	1.0
TRAINING ON ELECTRONIC RECORDS	10	1.0
RESEARCH & QUALITY ASSURANCE	9	0.9
DATA MANAGEMENT AND REPORTING	9	0.9
REGULATORY REQUIREMENTS	10	1.0
SELF-CARE AND WELL-BEING	9	0.9

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 transplantation 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 three 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 basic life support training (excluded at 64%) suggests 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=1.0) 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=1.0) 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, though 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 since it was only conducted in Ilocos Region involving three private hospitals in which other parts of the countries may yield a different result due to cultural differences and autonomous nature of medical practices for every region. Moreover, the study was focused on private dialysis centers, it did not include tertiary hospital setting, stand-alone dialysis centers, or dialysis unit with ongoing private partnership hemodialysis setting that may have other policies on continuous quality improvement.

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.

Conclusions

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 consensus among experts, validated by a Fleiss' Kappa score of 0.729, indicating strong agreement. Training priorities such as infection prevention, vascular access management, mental health, and advanced clinical competencies reflect a balance between technical skills and the holistic well-being of nurses. 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 emphasizes the importance of sustaining nurse resilience and job satisfaction, which are integral to the sustainability of 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 enhancement training initiative promises to

enhance care quality, improve patient outcomes, and ensure the well-being of both patients and nurses in hemodialysis settings.

Ethical Considerations

Compliance with ethical guidelines

The research ensured to follow the ethical safeguards. It followed guidelines ensuring that the participants participated willingly and voluntarily in a safe environment. The data was treated with anonymity, confidentiality and privacy. Prior to the conduct of the study, approval was sought from the Ethics Review Committee (ERC) of the Trinity University of Asia (Code no: 2024-1st-CNU-Fernandez-V1). The respondents had a right to withdraw from the study at any point of the study. A cover letter was attached to each informed consent, explaining the details of the study. 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, study findings were made available for future research to a selected research locale and participants upon request.

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