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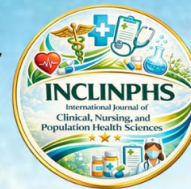
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Frailty and symptom burden as predictors of kidney disease-specific quality of life among Filipino patients undergoing maintenance hemodialysis

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Abstract

Aim: This study determined the levels of frailty, symptom burden, and kidney disease-specific quality of life among Filipino patients undergoing maintenance hemodialysis, examined differences across dialysis vintage groups, and assessed the relationships and predictive associations of frailty and symptom burden with quality of life.

Methodology: A cross-sectional predictive-correlational study was conducted among 165 consenting adults undergoing hemodialysis for at least three months at five private dialysis centers in Pampanga, Philippines. Data were collected using the FRAIL Scale, the revised Edmonton Symptom Assessment System (ESAS-r), and three kidney disease-targeted domains of the Kidney Disease Quality of Life-36 (KDQOL-36). Statistical analyses included the Kruskal–Wallis H test, one-way analysis of variance, Spearman's rank-order correlation, and multiple linear regression, with a significance level of .05 and Bonferroni correction applied within each research question.

Results: The mean frailty score was 1.76 ($SD = 1.51$), with 127 participants (77.0%) classified as pre-frail or frail. The mean symptom burden score was 27.98 ($SD = 13.24$). Mean quality-of-life scores ranged from 70.83 for Symptoms and Problems of Kidney Disease to 42.01 for Burden of Kidney Disease. Frailty differed significantly across dialysis vintage groups, $H(2) = 12.42$, $p = .002$, $\varepsilon^2 = .076$. However, differences in the Burden of Kidney Disease ($p = .029$) and Effects of Kidney Disease ($p = .042$) domains did not remain significant after Bonferroni correction. Frailty ($p = -.315$ to $-.383$) and symptom burden ($p = -.428$ to $-.631$) were negatively associated with all three quality-of-life domains ($p < .001$). Together, the two predictors accounted for 21.8% to 45.0% of the variance in domain scores, with symptom burden demonstrating the stronger predictive association in every model. The strongest observed associations involving symptom burden may partly reflect overlapping item content between the measures.

Conclusion: Symptom burden demonstrated a stronger association with kidney disease-specific quality of life than frailty among the participating patients. These findings highlight the importance of systematic symptom assessment in nursing care, alongside frailty screening to identify patients who may benefit from closer assessment and individualized support. Because the study used a cross-sectional design, the findings indicate associations rather than causal relationships and should be interpreted within the context of the five participating private dialysis centers.

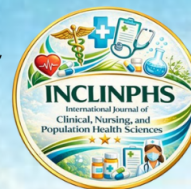
Keywords: *frailty, symptom burden, quality of life, maintenance hemodialysis, KDQOL-36, nursing assessment, Philippines*

INTRODUCTION

Frailty and symptom burden are among the most consequential states in maintenance hemodialysis. Pooling 16 observational studies of 2,446 patients aged 60 and above across eight countries, Li et al. (2025) reported frailty in 41% and pre-frailty in 37%. Symptoms are equally pervasive: pooling 21 studies of 2,943 dialysis participants,

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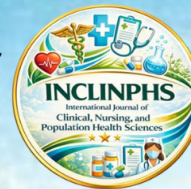
fatigue reached a prevalence of 70%, with pain rated the most severe symptom in the dialysis group (Fletcher et al., 2022). Both states track with poorer outcomes. A narrative review of advanced kidney disease reports that frailty independently predicts worse health-related quality of life (Kennard et al., 2024), and among 591 hemodialysis patients, individual symptoms independently predicted poorer mental and physical health-related quality of life (Davison & Jhangri, 2010). Frailty also arrives earlier in kidney disease than in the general population (Nair et al., 2025), which makes routine screening a nursing concern rather than a geriatric one alone.

The Philippine dialysis population is large and center-dependent. Philippine Renal Disease Registry data reported by Villanueva et al. (2025) recorded 49,715 patients on hemodialysis and 319 on peritoneal dialysis between September 2022 and July 2023, and national estimates cited by Pajimna et al. (2023) placed 94% of Filipinos with end-stage renal disease on center-based hemodialysis. Treatment exposure is shaped by financing. Philippine Health Insurance Corporation (PhilHealth) coverage expanded to 156 sessions per year only in June 2023, following successive amendments at 45, 90, and 144 sessions, and before that expansion patients resorted to twice-weekly treatment or paid the balance themselves (Pajimna et al., 2023). Household out-of-pocket payments account for 44.4% of Philippine current health expenditure (Villanueva et al., 2025). Local outcome evidence has not kept pace with this volume. The Filipino version of the Kidney Disease Quality of Life Short Form (KDQOL-SF) was translated and culturally validated in 2009 (Bataclan & Dial, 2009), and no subsequent Filipino validation of a KDQOL instrument was located.

Three gaps follow from this. The first is empirical: frailty and symptom burden have accumulated evidence on separate tracks and are seldom entered into the same model, leaving their relative contribution to quality of life unquantified, and evidence specific to hemodialysis remains scarce even for frailty alone (Shariff et al., 2024). The second is contextual: the largest available synthesis of symptom burden and quality of life in kidney disease drew most heavily on studies from the United States, Brazil, the United Kingdom, Turkey, and China, with the Philippines not among the leading contributors (Fletcher et al., 2022), so Filipino patients enter the global evidence base mainly by inference. The third is population-specific: based on the literature retrieved for this review, evidence examining frailty, symptom burden, and kidney disease-specific quality of life together among Filipino patients undergoing maintenance hemodialysis appears limited. Dialysis vintage, the length of time a patient has received maintenance dialysis, compounds the problem. Findings on its relation to symptom burden and quality of life conflict internationally (Lu et al., 2024; Yan et al., 2025; Zhu et al., 2023), and given the coverage history described above, equivalent vintage in a Filipino sample may not represent equivalent cumulative treatment exposure. This is an inference the present study did not test directly, since it recorded current weekly dialysis frequency but not the cumulative number of sessions each respondent had received.

This study therefore determined the levels of frailty, symptom burden, and kidney disease-specific quality of life among Filipino patients undergoing maintenance hemodialysis in selected private dialysis centers, compared these variables across dialysis vintage groups, examined the relationships of frailty and symptom burden with quality of life, and tested whether the two predictors, entered together, predicted each of the three kidney disease-targeted domains of the Kidney Disease Quality of Life-36 (KDQOL-36). The findings were then synthesized into nursing care recommendations. The study was conducted in five private dialysis centers in Pampanga, Philippines. Evidence from this setting is useful because, as noted above, center-based hemodialysis is the treatment received by most Filipinos with end-stage renal disease, and patient-level data from such centers can show how frailty, symptom burden, and kidney disease-specific quality of life present in routine dialysis care. Theoretically, the study applies the ordering proposed by Wilson and Cleary (1995), in which biological and physiological factors and symptom status precede overall quality of life, to a population and setting in which, to the authors' knowledge, it has not been tested. Methodologically, it enters both predictors into a single model and reports quality of life domain by domain rather than as a composite, preserving the wide spread already documented across KDQOL scales. Practically, it provides patient-level Filipino evidence that may inform brief frailty and symptom assessment within a treatment session and help nurses direct further assessment toward the quality-of-life domains most affected.

This study contributes to the clinical and nursing literature by examining frailty and symptom burden together in relation to kidney disease-specific quality of life among Filipino patients undergoing maintenance hemodialysis. By evaluating their individual and joint predictive associations across three kidney disease-targeted quality-of-life domains, the study provides context-specific evidence that may help nurses and dialysis care teams identify patient-reported symptoms and frailty-related vulnerabilities requiring further assessment. Its findings may also inform future multicenter research and the development of context-sensitive assessment approaches. Because the study is cross-sectional and draws participants from selected private dialysis centers, its findings should be interpreted as associational and should not be assumed to represent all Filipino patients receiving hemodialysis.



Review of Related Literature and Studies

Frailty and Symptom Burden among Patients on Maintenance Hemodialysis

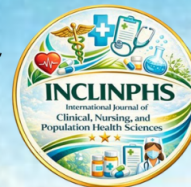
Frailty is a clinical syndrome of diminished physiological reserve across multiple systems, operationalized by Fried et al. (2001) as a phenotype comprising exhaustion, weakness, slowness, low physical activity, and unintentional weight loss. In kidney disease this state arrives early. Uremia is understood to accelerate the pathways underlying frailty (Kennard et al., 2024), and frailty occurs earlier among people living with kidney disease than in the general population (Nair et al., 2025). Prevalence figures bear this out: pooling 16 observational studies of 2,446 participants aged 60 and above on maintenance hemodialysis across eight countries, Li et al. (2025) reported frailty in 41% and pre-frailty in 37%. Performance-based assessment is difficult to fit into a dialysis session, so brief self-report screening has become the practical alternative, and the five-item FRAIL Scale (Fatigue, Resistance, Ambulation, Illnesses, and Loss of weight; Morley et al., 2012) performs credibly in this setting. Among 137 Brazilian hemodialysis patients it classified 36.5% as frail and was associated with a 2.8-fold higher risk of hospitalization, while the Clinical Frailty Scale applied to the same cohort showed no such association (Barbosa et al., 2023). That divergence reads as much as a caution as an endorsement, because a systematic review of frailty measurement properties in chronic kidney disease found the FRAIL Scale's discriminative validity demonstrated mainly in people with chronic kidney disease not yet receiving dialysis, with only one of the included studies reporting reliability and the evidence base of low to moderate quality overall (Puri et al., 2025). Symptom burden occupies adjacent ground. Fatigue reached a pooled prevalence of 70% among the 2,943 dialysis participants contributing to that estimate in a global review of 449 studies, significantly higher than the prevalence pooled in controls, with pain rated the most severe symptom in the dialysis group and fatigue second (Fletcher et al., 2022). The two constructs travel together, and frailty has been linked to greater symptom burden in advanced kidney disease (Kennard et al., 2024), yet they are not interchangeable: frailty describes a physiological state inferred from function, whereas symptom burden describes what the patient reports feeling. Their overlap is also a measurement problem worth naming, since fatigue is the first item of the FRAIL Scale (Morley et al., 2012) and appears again within symptom inventories, so studies entering both as predictors risk blurring a physiological indicator with a subjective one. How each of these states relates to quality of life, and whether they carry distinct weight when examined together, is the question the following section takes up.

Quality of Life in Hemodialysis and Its Association with Frailty and Symptom Burden

Quality of life in kidney disease is not one thing. The Wilson and Cleary (1995) model arranges patient outcomes across five levels, moving from biological and physiological factors through symptom status, functional status, and general health perceptions to overall quality of life, and the measurement literature has followed that logic toward multidimensional assessment. Peipert et al. (2018) evaluated the KDQOL-36 in 70,786 United States dialysis patients across 1,381 facilities, reporting acceptable internal consistency for each kidney-targeted scale ($\alpha = .83$ to $.85$) and confirmatory factor analysis supporting Burden, Symptoms and Problems, and Effects as distinct scales. Whether those scales are better reported separately or combined remains open, since the same group later derived a single summary score from them (Peipert et al., 2019). Pooled dialysis figures favor separation: Burden of Kidney Disease averaged 41.7, Effects 63.2, and Symptoms and Problems 73.6 on the 0-to-100 metric, a spread of more than thirty points across scales drawn from one instrument (Fletcher et al., 2022). Against this outcome, both predictors have accumulated evidence, though on separate tracks. Among 93 in-center hemodialysis patients assessed with the KDQOL-36 and the Edmonton Frail Scale, frailty correlated negatively with every quality-of-life component, most strongly with the physical component ($r = -.64, p < .001$), and the authors noted that evidence specific to hemodialysis remains scarce (Shariff et al., 2024). Reviews of advanced kidney disease report the same direction, with frailty independently predicting worse health-related quality of life (Kennard et al., 2024). Symptom burden shows a comparable pattern. Among 591 hemodialysis patients assessed with a modified Edmonton Symptom Assessment System alongside the KDQOL-SF, pain, tiredness, lack of wellbeing, and depression independently predicted mental health composite scores, accounting for 42.5% of their variance, while pain, fatigue, lack of wellbeing, and shortness of breath predicted physical health composite scores, accounting for 38.5% (Davison & Jhangri, 2010). A systematic review and meta-analysis of 62 studies later reported an inverse correlation between symptom burden and quality of life, together with a positive correlation between symptom burden and time on dialysis (Lu et al., 2024). More recently, a four-center study of 359 Chinese hemodialysis patients found symptom distress, measured with the Dialysis Symptom Index, negatively correlated with every KDQOL-SF domain and most

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strongly with the Symptom/Problem List ($p = -.890$), which the authors interpreted as concordance between two symptom-focused measures (Qiao et al., 2026). Whether that time translates into worse quality of life is unsettled. Zhu et al. (2023) found symptom prevalence and severity significantly higher among patients dialyzing beyond 12 months than among those at or below that threshold, whereas Yan et al. (2025) observed symptom burden rising only as a non-significant trend across vintage groups ($p = .084$) while KDQOL-SF scores improved significantly at longer vintage on the kidney disease-targeted summary and on the Symptoms and Problems, Effects, and Burden scales. Adaptation, survivor effects, and differing vintage cut-points are all plausible explanations, and none has been tested directly. Two limitations run through this body of work: the designs are predominantly cross-sectional and single-site, and frailty and symptom burden are seldom entered into the same model, leaving their relative contribution to quality of life largely unexamined. These studies also share a setting, and it is not the Philippines.

The Philippine Dialysis Context

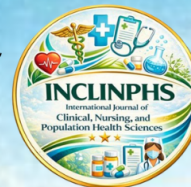
The Philippine case is defined by scale and by financing. Philippine Renal Disease Registry data reported by Villanueva et al. (2025) recorded 49,715 patients on hemodialysis and 319 on peritoneal dialysis between September 2022 and July 2023. National estimates cited by Pajimna et al. (2023) place 94% of Filipinos with end-stage renal disease on center-based hemodialysis, 4% on peritoneal dialysis, and 2% transplanted, though the registry's peritoneal dialysis count falls well below that 4% estimate, a divergence the available sources do not reconcile. What is not in dispute is the dominance of center-based hemodialysis, and financing shapes how that treatment is actually received. PhilHealth coverage expanded to 156 sessions per year only in June 2023, following successive amendments at 45, 90, and 144 sessions, and before that expansion patients resorted to twice-weekly treatment or paid the balance themselves (Pajimna et al., 2023). Coverage is also uneven, with registration data from 2018 to 2021 showing a few remote provinces at 52% or below (Pajimna et al., 2023), and household out-of-pocket payments account for 44.4% of Philippine current health expenditure (Villanueva et al., 2025). This coverage history has a methodological implication for the present study. Because coverage fell short of thrice-weekly treatment until June 2023, dialysis vintage in a Filipino sample may not represent the same cumulative treatment exposure as an equivalent vintage in cohorts dialyzing three times weekly throughout. This is an interpretation of the coverage history rather than a measured finding, and it supports treating vintage as a grouping variable whose meaning depends on local treatment conditions rather than as a directly portable measure. Filipino evidence on the outcome side is thin and dated. The Filipino version of the KDQOL-SF was translated and culturally validated in 2009 (Bataclan & Dial, 2009), and no subsequent Filipino validation of a KDQOL instrument was located. International syntheses do little to close that distance. The largest available review of symptom burden and quality of life in kidney disease drew most heavily on studies from the United States, Brazil, the United Kingdom, Turkey, and China, with the Philippines not among the leading contributors (Fletcher et al., 2022). Filipino patients therefore enter the global evidence base mainly by inference. Based on the literature retrieved for this review, evidence examining frailty, symptom burden, and kidney disease-specific quality of life together among Filipino patients undergoing maintenance hemodialysis appears limited.

Synthesis

Read together, the three bodies of evidence converge on one point and diverge on nearly everything that follows from it. Frailty and symptom burden are both common in maintenance hemodialysis and both track with poorer quality of life, yet each relationship has been established on its own track, in samples that are predominantly cross-sectional and single-site, and against a recommended treatment standard of thrice-weekly dialysis that Philippine financing did not fully underwrite until 2023. Three gaps follow. The two predictors appear not to have been modeled together, leaving their relative contribution to quality of life unquantified, which is what Research Question 8 tested. Whether the KDQOL-36 is better reported as separate domains or as a summary score remains unsettled in the psychometric literature, yet its dialysis domain means diverge by more than thirty points, so a domain-by-domain treatment is defensible and is what Research Questions 4, 6, 7, and 8 applied. Dialysis vintage produces contradictory findings internationally and may carry different cumulative treatment exposure under Philippine coverage conditions, which Research Question 5 examined locally. For dialysis nursing, the practical value of examining the two predictors together is that it may help distinguish patients whose kidney disease-specific quality-of-life limitations are more closely associated with reported symptoms, which brief self-report tools can capture during the dialysis session, from those whose limitations are more closely associated with frailty, whose screening items concern fatigue, strength, ambulation, illness, and weight loss (Morley et al., 2012). This is a potential use of the analysis rather than a demonstrated clinical outcome. This study did not resolve the vintage

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contradiction, nor did it settle the composite question. It contributed Filipino patient-level evidence on the levels of all three constructs (Research Questions 2 to 4) and on how they relate to one another within a single sample drawn from private dialysis centers.

Theoretical Framework

This study was anchored primarily on the conceptual model of patient outcomes proposed by Wilson and Cleary (1995), which arranges health outcomes across five levels: biological and physiological factors, symptom status, functional status, general health perceptions, and overall quality of life, with individual and environmental characteristics acting as modifying factors. The model supplied the ordering logic for this study. Frailty occupies the biological and physiological level as a state of diminished physiological reserve, and symptom burden occupies the symptom-status level. Quality of life was measured through the three kidney disease-targeted domains of the KDQOL-36, which register the disease-specific impact of kidney failure downstream of biological function and symptom status. The functional status and general health perception levels of the model were not measured separately, so no domain is assigned to a single level, and the model is used for its ordering of antecedents and outcome. Dialysis vintage enters as an individual characteristic, which is the model's warrant for treating it as a grouping variable rather than as a predictor.

Two qualifications apply. Wilson and Cleary (1995) specify causal relationships between levels, whereas this study was cross-sectional and observational. The model was therefore used to justify the ordering of the variables and the direction of the regression, not to support causal inference. The model also treats symptom status as conceptually prior to the outcome levels, yet the KDQOL-36 Symptoms and Problems scale measures symptom bother directly, so it shares content with the revised Edmonton Symptom Assessment System (ESAS-r). This overlap is acknowledged here and revisited in the Limitations.

Frailty was conceptualized through the frailty phenotype of Fried et al. (2001), which defines frailty as a clinical syndrome of cumulative decline across physiological systems, manifested as unintentional weight loss, exhaustion, weakness, slow gait speed, and low physical activity, with three or more criteria indicating frailty. The FRAIL Scale (Morley et al., 2012) used in this study is a brief self-report screen aligned with that phenotype (Woo et al., 2012), though it is not identical to it. It substitutes self-reported difficulty for the performance-based grip strength and gait speed measures of the original phenotype, and its Illnesses item introduces comorbidity burden, which Fried et al. (2001) held conceptually distinct from frailty. The scale was therefore treated as a phenotype-aligned screen rather than as a direct measure of the phenotype.

Taken together, Fried et al. (2001) supply the conceptual definition of frailty, and Wilson and Cleary (1995) supply the ordering that positions frailty and symptom burden as antecedents of quality of life in maintenance hemodialysis. Neither is a nursing theory, so the framework explains the relationships among the variables rather than prescribing nursing action. The translation from these relationships to assessment and care planning is made in the Recommendations.

As shown in Figure 1, frailty and symptom burden are positioned as predictors of kidney disease-specific quality of life, which is measured as three separate KDQOL-36 domain scores rather than a composite. Solid arrows denote the bivariate relationships tested in Research Questions 6 and 7 through correlation analysis of each predictor with each domain, and, with both predictors entered together, the joint contribution tested in Research Question 8 through three multiple linear regression models, one per domain. The dashed connector denotes dialysis vintage as a grouping variable, on which frailty, symptom burden, and the three domains were compared in Research Question 5 through one-way analysis of variance or the Kruskal-Wallis H test, selected according to distributional assumptions; it does not denote moderation, which was not tested. Research Questions 2 to 4 describe the level of each construct before these relationships are examined.

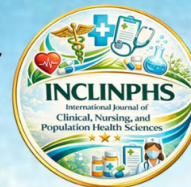
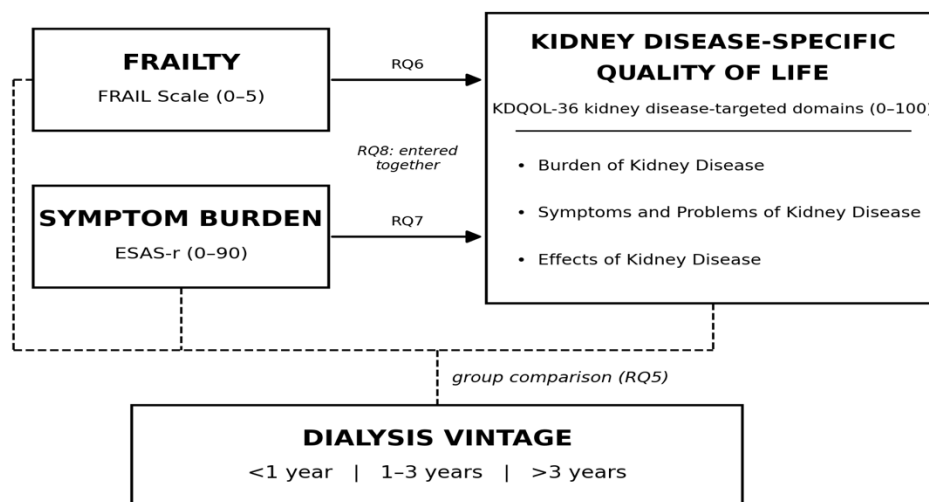


Figure 1
Conceptual Framework of the Study



Adapted from Wilson and Cleary (1995) and Fried et al. (2001)

Note. Adapted from the conceptual model of patient outcomes of Wilson and Cleary (1995) and the frailty phenotype of Fried et al. (2001). FRAIL = Fatigue, Resistance, Ambulation, Illnesses, and Loss of weight; ESAS-r = revised Edmonton Symptom Assessment System; KDQOL-36 = Kidney Disease Quality of Life-36; RQ = research question.

Statement of the Problem

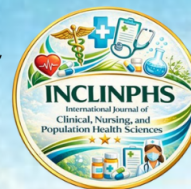
Frailty, symptom burden, and impaired kidney disease-specific quality of life are important concerns among patients undergoing maintenance hemodialysis. Understanding how these factors are distributed and how they relate to one another may help healthcare professionals, particularly nurses, identify patients who may require closer assessment and individualized support. However, the relationships among frailty, symptom burden, and the different domains of kidney disease-specific quality of life need to be examined within specific patient populations and healthcare settings.

In the Philippine context, evidence from selected private dialysis centers may help clarify the clinical characteristics of patients undergoing maintenance hemodialysis and the relationships between frailty, symptom burden, and quality of life. Examining these variables across dialysis vintage groups may also provide information about differences associated with the duration of dialysis treatment. Furthermore, determining the individual and joint predictive associations of frailty and symptom burden with the kidney disease-targeted domains of the Kidney Disease Quality of Life-36 (KDQOL-36) may contribute to a better understanding of the factors associated with patients' reported quality of life.

Accordingly, this study examined the demographic and clinical profile of Filipino patients undergoing maintenance hemodialysis in selected private dialysis centers, determined their levels of frailty, symptom burden, and kidney disease-specific quality of life, compared these variables across dialysis vintage groups, and assessed the relationships and predictive associations between frailty, symptom burden, and quality-of-life domains. Based on the findings, nursing care recommendations were proposed for patients undergoing maintenance hemodialysis in private dialysis settings. The study focused on associations and predictive relationships and did not seek to establish causal effects.

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Research Objectives

General Objective

To determine the levels of frailty, symptom burden, and kidney disease-specific quality of life among Filipino patients undergoing maintenance hemodialysis in selected private dialysis centers, and to examine differences, relationships, and predictive associations among these variables.

Specific Objectives

Specifically, this study sought:

1. To describe the demographic and clinical profile of the respondents in terms of age, sex, civil status, highest educational attainment, primary cause of end-stage renal disease, number of comorbidities, dialysis vintage, dialysis frequency per week, employment status, and source of payment for dialysis.
2. To determine the level of frailty among the respondents as measured by the FRAIL Scale.
3. To determine the level of symptom burden among the respondents as measured by the revised Edmonton Symptom Assessment System (ESAS-r).
4. To determine the level of kidney disease-specific quality of life among the respondents using the three kidney disease-targeted domains of the Kidney Disease Quality of Life-36 (KDQOL-36): Burden of Kidney Disease, Symptoms and Problems of Kidney Disease, and Effects of Kidney Disease.
5. To compare frailty, symptom burden, and kidney disease-specific quality of life across groups defined by dialysis vintage.
6. To examine the relationships between frailty and each of the three kidney disease-targeted quality-of-life domains.
7. To examine the relationships between symptom burden and each of the three kidney disease-targeted quality-of-life domains.
8. To determine whether frailty and symptom burden, entered together, significantly predict each of the three kidney disease-targeted quality-of-life domains.
9. To propose nursing care recommendations for patients undergoing maintenance hemodialysis in private dialysis centers based on the study findings.

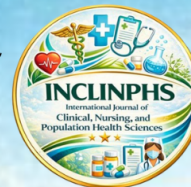
Research Questions

This study sought to answer the following questions:

1. What is the demographic and clinical profile of the respondents in terms of:
 - 1.1. age;
 - 1.2. sex;
 - 1.3. civil status;
 - 1.4. highest educational attainment;
 - 1.5. primary cause of end-stage renal disease (diabetic, non-diabetic, or not sure);
 - 1.6. number of comorbidities;
 - 1.7. dialysis vintage (less than 1 year, 1 to 3 years, or more than 3 years);
 - 1.8. dialysis frequency per week;
 - 1.9. employment status; and
 - 1.10. source of payment for dialysis?
2. What is the level of frailty among the respondents as measured by the FRAIL Scale?
3. What is the level of symptom burden among the respondents as measured by the revised Edmonton Symptom Assessment System (ESAS-r)?
4. What is the level of kidney disease-specific quality of life among the respondents in terms of the three kidney disease-targeted domains of the KDQOL-36: Burden of Kidney Disease, Symptoms and Problems of Kidney Disease, and Effects of Kidney Disease?
5. Is there a significant difference in frailty, symptom burden, and kidney disease-specific quality of life across groups defined by dialysis vintage?
6. Is frailty significantly associated with each of the three kidney disease-targeted quality-of-life domains?
7. Is symptom burden significantly associated with each of the three kidney disease-targeted quality-of-life domains?

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8. Do frailty and symptom burden, entered together, significantly predict each of the three kidney disease-targeted quality-of-life domains?
9. Based on the findings, what nursing care recommendations can be proposed for patients undergoing maintenance hemodialysis in private dialysis centers?

Hypotheses

The null hypotheses were tested at the .05 level of significance.

H₀₁: There are no statistically significant differences in frailty, symptom burden, or kidney disease-specific quality of life across groups defined by dialysis vintage.

H₀₂: Frailty is not significantly associated with any of the three kidney disease-targeted quality-of-life domains.

H₀₃: Symptom burden is not significantly associated with any of the three kidney disease-targeted quality-of-life domains.

H₀₄: Frailty and symptom burden, entered together, do not significantly predict any of the three kidney disease-targeted quality-of-life domains.

Because several tests were conducted within Research Questions 5 to 8, Bonferroni-adjusted thresholds were also applied within each research question, and both unadjusted and adjusted decisions are reported, as described under Treatment of Data.

METHODOLOGY

Research Design

This study used a quantitative, nonexperimental, cross-sectional design, described here as cross-sectional predictive-correlational, with descriptive, comparative, correlational, and multiple-regression components. No variable was manipulated, no intervention was introduced, and data were collected from each respondent at a single point in time (Polit & Beck, 2021). Research Questions 1 to 4 were descriptive, establishing the respondents' profile and the levels of frailty, symptom burden, and quality of life. Research Question 5 was comparative, dialysis vintage being a naturally occurring rather than an assigned grouping variable. Research Questions 6 and 7 were correlational. Research Question 8 was predictive and constituted the highest-order analysis. Wilson and Cleary (1995) provided the conceptual rationale for positioning frailty and symptom burden as predictors of quality of life; the statistical adequacy of each regression model was assessed separately through the diagnostics described under Treatment of Data. Research Question 9 synthesized the preceding findings. Because the data were cross-sectional and observational, the predictive findings are interpreted as the proportion of variance in quality of life accounted for by the predictors, not as causal or temporal prediction. The terms *relationship* and *association* are used throughout in place of *effect* or *influence*.

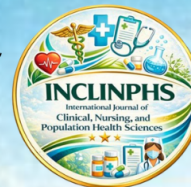
Population and Sampling

The respondents were adult patients undergoing maintenance hemodialysis at five private dialysis centers in Pampanga, Philippines. Inclusion criteria were: (a) aged 18 years and above; (b) diagnosed with end-stage renal disease and on maintenance hemodialysis for at least three months; (c) receiving treatment at one of the participating centers; (d) able to read and comprehend English; and (e) alert, oriented, and clinically stable at the time of data collection. Excluded were patients on peritoneal dialysis or receiving hemodialysis for acute kidney injury, those hospitalized or acutely ill during the data collection period, those with documented cognitive impairment or any condition preventing reliable self-report, and kidney transplant recipients.

Screening of the hemodialysis census at the five centers identified 191 patients receiving treatment during the data collection period. Of these, 26 did not meet the criteria. All 26 exclusions arose from three criteria, namely maintenance hemodialysis for less than three months, age below 18 years, or clinical instability at the time of screening; no patient in the census was excluded under the remaining criteria, leaving an eligible population of 165. Total population sampling was employed, and all 165 eligible patients were invited to participate. A census was appropriate because the eligible population was finite, identifiable, and accessible across the participating centers (Polit & Beck, 2021). All 165 gave written informed consent and returned complete and usable instruments with no item left unanswered, so no imputation was required, yielding a participation rate of 100% and covering 86.4% of the hemodialysis census at the five centers. The respondents were distributed as follows: Center A, 40 (24.2%); Center B, 23 (13.9%); Center C, 30 (18.2%); Center D, 39 (23.6%); and Center E, 33 (20.0%). Because the census

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covered eligible patients at five private centers in one province, the findings describe this population and are not assumed to represent patients treated in public hospitals, government dialysis units, or other Philippine regions.

Because total enumeration fixes the sample at the size of the eligible population, adequacy was evaluated through a sensitivity power analysis rather than an a priori sample-size calculation. Detectable effects at $N = 165$, two-tailed $\alpha = .05$, and power = .80 were derived from the noncentral F distribution (noncentrality $\lambda = f^2N$) for the regression and group-comparison analyses and from the Fisher z transformation for the correlations. On these assumptions, the study could detect a correlation of $r = .217$; an omnibus effect of $f^2 = 0.060$ ($R^2 = .056$) for the two-predictor regression model and $f^2 = 0.048$ for either predictor's unique contribution within it; and a between-group effect of $f = 0.244$ ($\eta^2 = .056$) across the three dialysis vintage groups, the last assuming equal group sizes, whereas the observed groups were unequal (32, 61, and 72). At the Bonferroni-adjusted thresholds used in the analysis, the detectable effects were larger: $r = .249$ and $f^2 = 0.078$ ($R^2 = .072$) at $\alpha = .0167$, and $f = 0.294$ at $\alpha = .01$. For comparison with conventional medium effects, the realized sample exceeded the number required for the two-predictor regression at $f^2 = 0.15$ (68, consistent with Green's [1991] benchmark of $N \geq 50 + 8m$), for a bivariate correlation at $r = .30$ (85), and for a one-way comparison of three equal groups at $f = 0.25$ (159). These figures indicate the effects the design could detect under the stated assumptions; smaller effects may not have been detected.

Instruments

A four-part self-administered questionnaire of 60 items was used, comprising a researcher-developed profile sheet and three standardized instruments, completed in 20 to 25 minutes during the dialysis session.

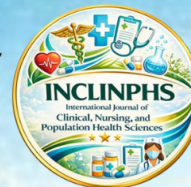
Part I: Demographic and Clinical Profile. The 10-item profile sheet gathered the variables enumerated in Research Question 1. Dialysis vintage, defined as the time since the start of maintenance hemodialysis, was recorded in three categories (less than 1 year, 1 to 3 years, and more than 3 years) and also served as the grouping variable for the comparative analysis.

Part II: Frailty. The FRAIL Scale (Morley et al., 2012) is a five-component screen, each component scored 1 for a positive response (range 0 to 5; 0 = robust, 1 to 2 = pre-frail, 3 to 5 = frail). No items were reverse-scored. The continuous total served as the predictor and the categories as descriptive reporting. Each published component and its adaptation for self-administration were as follows. Fatigue asks how much of the time during the past four weeks the respondent felt tired, with all or most of the time scored 1; the adapted item was a single Yes or No response retaining these positive anchors. Resistance asks whether, by themselves and without aids, the respondent has difficulty walking up 10 steps without resting; it was retained without change. Ambulation asks about difficulty walking several hundred yards; the distance was expressed in meters. Illnesses asks which of 11 physician-diagnosed conditions the respondent has, with five or more scored 1; the 11 conditions were listed as individual response options within the single item, which does not alter the item count. Loss of weight compares current weight with weight one year earlier, scoring 1 for a loss of 5% or more; current and prior weights were recorded separately, and the researchers computed the percentage as $[(\text{prior weight} - \text{current weight}) / \text{prior weight}] \times 100$, as in the published scoring. Both weights were recorded as post-dialysis dry weight, the target body weight reached once excess fluid has been removed at the end of a session, which limits the influence of interdialytic fluid gain, although the prior weight depended on recall. Because kidney disease is one of the 11 published conditions and every respondent had end-stage renal disease, the published rule of five or more conditions was in effect met by any four of the remaining ten. The main analyses applied the published rule; a sensitivity scoring requiring five of the ten non-kidney conditions, so that the component again required five conditions beyond the one shared by all respondents, was computed to test whether this feature altered the findings. Component structure, scoring direction, and range were retained, but equivalence of the adapted wording and format to the original administration was assumed rather than tested, and no criterion comparison against the Fried phenotype was made in this sample.

Content validation ran two rounds with three experts: a nurse educator, a psychometrician, and a dialysis nurse. The first round yielded a scale-level content validity index of 0.93 by the averaging method (S-CVI/Ave) and 0.80 by the universal agreement method (S-CVI/UA), with the illnesses item at an item-level content validity index (I-CVI) of 0.67. Because Lynn (1986) requires complete agreement among panels of five or fewer, that item and the weight-loss item were restructured and re-rated, after which all five reached I-CVI = 1.00, yielding S-CVI/Ave = 1.00 and S-CVI/UA = 1.00 (Polit & Beck, 2006; Polit et al., 2007). Diagnostic performance against the Fried phenotype (Sukkriang & Punsawad, 2020) used the original administration format and is cited as background only. Because the five components are scored dichotomously, internal consistency was estimated with the Kuder-Richardson Formula 20 (KR-20), which for dichotomous items is equivalent to Cronbach's alpha (Cronbach, 1951): KR-20 = .707 in the

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pilot ($n = 30$) and .680, 95% CI [.595, .751], in the main sample ($N = 165$). The main-sample value falls below the conventional .70 benchmark. Because the scale combines five distinct components into a screening index rather than measuring a single homogeneous trait, a modest coefficient is not unexpected, but frailty scores are interpreted with corresponding caution, as noted in the Limitations.

Part III: Symptom Burden. The ESAS-r (Watanabe et al., 2011), developed from the original ESAS (Bruera et al., 1991), rates nine symptoms, including wellbeing, 0 to 10 for how the respondent feels at administration, summed to a 0-to-90 total, higher scores indicating greater burden. No items were reverse-scored; wellbeing runs 0 = best to 10 = worst and is directionally consistent with the other eight. Only the optional open-ended item was omitted. Apart from this omission, the English item wording, 0-to-10 numeric format, and "now" time frame of the ESAS-r were unchanged. Selby et al. (2010) identified 7 or higher as severe and either 4 or 5 as the moderate threshold; this study applied 4. These thresholds were used only to describe symptom prevalence and to frame the item-level considerations in the nursing recommendations; all inferential analyses used the continuous total score, and neither threshold is treated as a diagnostic cutoff. The original ESAS demonstrated $\alpha = .79$ in cancer patients (Chang et al., 2000), and Davison et al. (2006) validated a modified ESAS in dialysis patients, and the ESAS-r itself has been administered to patients receiving dialysis and kidney transplant recipients, in whom its anxiety and depression items discriminated well against established screening questionnaires (Tang et al., 2022). Internal consistency was $\alpha = .854$ in the pilot and $\alpha = .842$, 95% CI [.803, .876], in the main sample.

Part IV: Quality of Life. The KDQOL-36, English version 1.0 (Hays et al., 1994; RAND Corporation & University of Arizona, 2000), was adopted without modification. Its 36 items comprise the 12-Item Short Form Survey (SF-12) generic core (items 1 to 12) and three kidney disease-targeted domains: Burden of Kidney Disease (4 items), Symptoms and Problems (12), and Effects of Kidney Disease (8). Precoded responses were transformed to a 0-to-100 metric on which higher scores indicate better quality of life: Burden items were scored in their precoded direction, and Symptoms and Problems and Effects items were reverse-coded so that, for example, a response of not at all bothered received 100. Each scale score was the mean of its transformed items (Hays et al., 1997). The scoring manual computes a scale score from the items answered when responses are missing; because no responses were missing, this rule did not need to be applied. The full instrument was administered. This report analyzes quality of life through the three kidney disease-targeted domains as distinct outcomes, the instrument yielding no single total. The SF-12 core yields norm-based Physical and Mental Component Summaries that require RAND's scoring algorithm; these were not scored for this report, and the omission is stated in the Limitations. The hemodialysis access-site item and the English version were used, the latter consistent with the English-comprehension inclusion criterion. Peipert et al. (2018) reported $\alpha = .83$ to .85 for the kidney-targeted scales in 70,786 United States dialysis patients, and Rokhman et al. (2023) reported good internal consistency in an Indonesian validation. Pilot internal consistency was $\alpha = .781$, .865, and .804 for Burden, Symptoms and Problems, and Effects; main-sample values were .782 [.722, .832], .858 [.824, .888], and .797 [.747, .841].

The FRAIL Scale is free for non-commercial research use, the ESAS-r requires acknowledgement of Alberta Health Services, and the KDQOL-36 is a public document that RAND makes available without charge or permission for non-commercial use (RAND Corporation, n.d.).

Data Collection

Data collection began only after written permission had been obtained from each of the five participating private dialysis centers, as described under Ethical Considerations.

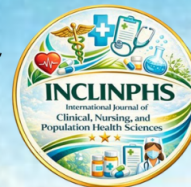
The instruments were pilot tested with 30 maintenance hemodialysis patients at a sixth dialysis center that did not participate in the main study, with the permission of that facility. No pilot participant formed part of the main sample. The adapted FRAIL Scale had been finalized earlier on the basis of two-round expert content validation; the pilot established internal consistency for all three instruments and confirmed administration time, which averaged 22 minutes.

Data were collected from May to June 2026. In coordination with each center's nursing staff, the researchers reviewed the hemodialysis census against the inclusion and exclusion criteria, identifying 165 eligible patients from 191 receiving treatment. Eligible patients were approached individually during their scheduled dialysis sessions, informed of the study's purpose, procedures, risks, and voluntary nature, and given the opportunity to ask questions. Those who agreed signed the informed consent form.

Respondents completed the 60-item self-administered questionnaire on-site during the dialysis session, taking approximately 20 to 25 minutes. Data were collected by the researchers themselves; no research assistants were involved. The researchers remained available to clarify items on request but did not assist with responses.

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Respondents completed the questionnaire themselves while receiving treatment, returned it in a sealed envelope, and could leave any item unanswered. The protocol specified completion during the session but not a fixed point within it. Completed questionnaires were checked for completeness before collection and placed in sealed envelopes. Consent forms were stored separately from the questionnaires. Data security, retention, and disposal are described under Ethical Considerations.

Treatment of Data

Completed questionnaires were coded and encoded into IBM SPSS Statistics version 29. The FRAIL Scale and ESAS-r were scored as summated totals, and the three kidney-targeted KDQOL-36 scales were transformed to the 0-to-100 metric and averaged within each scale; the SF-12 core was not scored, as noted under Instruments. Normality was assessed using the Shapiro-Wilk test, a nonsignificant result being read as absence of evidence against normality rather than as proof of it, and homogeneity of variance using Levene's test. All hypotheses were tested two-tailed at the .05 level, with the Bonferroni-adjusted thresholds described below.

Categorical profile variables were summarized as frequencies and percentages, and the continuous profile variables (age and number of other comorbidities) as means, standard deviations, medians, and ranges, to describe the respondents' profile (Research Question 1 [RQ1]). The levels of frailty (RQ2), symptom burden (RQ3), and quality of life (RQ4) were summarized as means and standard deviations, with medians, ranges, or score distributions also reported because the scores were not normally distributed (Tables 2, 6, and 7). For RQ5, frailty, symptom burden, and each kidney disease-targeted domain were compared across the three dialysis vintage groups. One-way analysis of variance (ANOVA) was used for an outcome only when Shapiro-Wilk indicated no departure from normality in all three groups and Levene's test indicated homogeneous variances; Welch's ANOVA with the Games-Howell procedure was specified for normally distributed outcomes with unequal variances; and the Kruskal-Wallis H test was used when normality was rejected in at least one group. Effect sizes were eta squared for ANOVA and epsilon squared ($\epsilon^2 = H / [N - 1]$) for Kruskal-Wallis. Where an omnibus test was significant, pairwise comparisons used the procedure matched to it: Tukey's honestly significant difference (HSD) after ANOVA and the Dwass-Steel-Critchlow-Fligner (DSCF) procedure after Kruskal-Wallis. For the outcome analyzed by ANOVA, a Kruskal-Wallis test was also run as a sensitivity check.

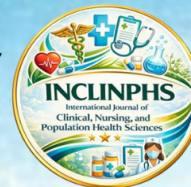
For RQ6 and RQ7, frailty and symptom burden were each correlated with the three kidney disease-targeted domains. Pearson's *r* was specified where both variables were approximately normally distributed, linearly related, and free of influential outliers, and Spearman's rho, which assesses monotonic association and is less sensitive to outliers, otherwise. Because Shapiro-Wilk indicated non-normal distributions for frailty, symptom burden, and all three domains, Spearman's rho was used for every pair, with 95% confidence intervals computed through the Fisher *z* transformation.

For RQ8, three multiple linear regression models were fitted by the Enter method, each with one kidney disease-targeted domain as the dependent variable and frailty and symptom burden entered together as the two predictors. Unstandardized and standardized coefficients, R^2 , adjusted R^2 , *F*, and *p* were reported. Assumptions were assessed against stated criteria: residual normality by Shapiro-Wilk on the residuals, homoscedasticity by the Breusch-Pagan test, residual independence by the Durbin-Watson statistic, influence by Cook's distance (values of 1.00 or above treated as influential), and multicollinearity by tolerance above .10 and a variance inflation factor (VIF) below 10. Inference was based on the ordinary least squares estimates of the primary models. As robustness checks, bias-corrected bootstrap 95% confidence intervals from 5,000 resamples were computed for every coefficient and reproduced at two further random seeds, and heteroscedasticity-consistent (HC3) robust standard errors were computed for any model in which homoscedasticity was rejected. Where a robustness check disagreed with the primary estimate, the coefficient was reported as not confirmed. R^2 values are interpreted as the proportion of variance in each domain accounted for by the two predictors, not as evidence that the predictors produced that variance.

Multiplicity was controlled within each inferential research question, because each question tests a separate null hypothesis (H_{01} to H_{04}) and forms its own family of related tests. Within each family, the significance threshold rather than the *p* value was adjusted: unadjusted *p* values were compared with $\alpha = .05/5 = .01$ for the five outcomes in RQ5, and with $\alpha = .05/3 = .0167$ for the three domains in each of RQ6 and RQ7 and for the three models in RQ8, including the predictor coefficients within them. Decisions at both thresholds are reported; the adjusted decision governs interpretation, and results significant only at .05 are labeled exploratory. Pairwise tests carry their own adjustment within an outcome (Tukey HSD, DSCF) and are interpreted as exploratory when their omnibus test did not reach the adjusted threshold.

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Two sensitivity analyses were conducted. First, because every respondent met the kidney disease condition of the FRAIL illnesses component, the frailty analyses in RQ5 to RQ8 were rerun with that component rescored to require five of the ten non-kidney conditions, to test whether this feature altered any conclusion. Second, because the coverage history described in the Introduction meant that weekly dialysis frequency and out-of-pocket payment could differ by length of time on dialysis, their distributions across the three vintage groups were compared using chi-square tests of independence. These two variables were examined descriptively as possible alternative explanations for vintage differences, not modeled as confounders; a chi-square association indicates that a factor differed across groups, not that it accounts for a difference in any outcome.

Ethical Considerations

The researchers conducted the study in compliance with the Declaration of Helsinki as revised in 2024 (World Medical Association, 2025), the Belmont Report (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979), the international ethical guidelines of the Council for International Organizations of Medical Sciences (CIOMS, 2016), and the National Ethical Guidelines for Research Involving Human Participants (Philippine Health Research Ethics Board, 2022), applying the principles of respect for persons, beneficence, and justice at every stage of recruitment, data collection, and data handling. Written permission was secured from the medical director or administrator of each participating center before recruitment began.

All 165 respondents gave written informed consent after being briefed on the study's purpose, procedures, risks, and benefits. Participation was voluntary and refusal did not affect treatment. The researchers held no authority over respondents, staff took no part in the consent decision, and no compensation was offered. Because consent was signed and administration was face to face, confidentiality rather than anonymity was maintained: responses were numerically coded, consent forms stored separately, findings reported in aggregate, and records kept in locked storage and password-protected files under the Data Privacy Act of 2012 (Republic of the Philippines, 2012). Access to the coded data was limited to the researchers. Any record linking response codes to consent forms was stored separately from the coded data and was likewise accessible only to the researchers. All records will be retained for five years after completion of the study, after which all paper and electronic data will be permanently destroyed or deleted.

Risks were minimal: the 20 to 25 minutes of completion time, possible fatigue during dialysis, and potential discomfort with items on frailty, symptoms, mood, anxiety, and sexual functioning. Participation occurred within the scheduled session, respondents could skip items or stop at any point, staff remained present, and those showing distress or reporting a severe symptom score (7 or higher on any ESAS-r item, as defined under Instruments) were referred to the attending nurse or nephrologist. The questionnaire was not used to diagnose any condition; referral served only to bring the report to the attention of the clinical team. No direct benefit was promised. All eligible patients were invited without preference, and the findings are intended to inform nursing assessment and care planning in private dialysis settings.

RESULTS and DISCUSSION

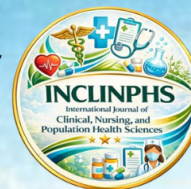
Table 1

Demographic and Clinical Profile of the Respondents

Profile variable	<i>f</i>	%
Age (years)		
18–29	1	0.6
30–39	12	7.3
40–49	25	15.2
50–59	39	23.6
60–69	50	30.3
70–79	24	14.5

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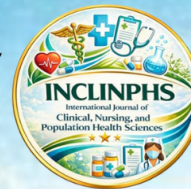
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Profile variable	<i>f</i>	%
80 and above	14	8.5
Sex		
Male	91	55.2
Female	74	44.8
Civil status		
Married	97	58.8
Widowed	29	17.6
Single	28	17.0
Separated	9	5.4 ^a
Other	2	1.2
Highest educational attainment		
None (no formal schooling)	1	0.6
Elementary	26	15.8
High school	73	44.2
College	60	36.4
Postgraduate	5	3.0
Primary cause of end-stage renal disease		
Non-diabetic cause	92	55.8
Diabetes	55	33.3
Not sure	18	10.9
Number of other comorbidities		
0	5	3.0
1	24	14.5
2	41	24.9 ^a
3	38	23.0
4	26	15.8
5	14	8.5
6	14	8.5
7	3	1.8
Dialysis vintage		
Less than 1 year	32	19.4
1 to 3 years	61	37.0

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Profile variable	<i>f</i>	%
More than 3 years	72	43.6
Dialysis frequency per week		
1x	4	2.4
2x	63	38.2
3x	97	58.8
4x	1	0.6
Employment status		
Unemployed	74	44.8
Retired or pensioner	44	26.7
Homemaker	26	15.8
Employed	21	12.7
Source of payment for dialysis		
PhilHealth and out-of-pocket	104	63.0
PhilHealth only	40	24.3 ^a
Out-of-pocket only	16	9.7
Other	5	3.0

Note. *N* = 165. Each profile variable sums to 100.0%. Age: *M* = 59.67, *SD* = 13.82, *Mdn* = 60.00, range 26 to 89. Number of other comorbidities: *M* = 3.02, *SD* = 1.63, *Mdn* = 3.00, range 0 to 7. Primary cause of end-stage renal disease records the cause as reported by the respondent's physician and is distinct from the comorbidity checklist in Table 4, on which 106 respondents (64.2%) reported a diabetes diagnosis. Number of other comorbidities is a self-reported count and is distinct from the 11-option illnesses item of the FRAIL Scale reported in Tables 2 and 4. FRAIL = Fatigue, Resistance, Ambulation, Illnesses, and Loss of weight.

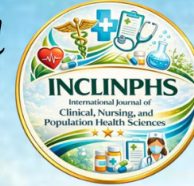
^aPercentage allocated by the largest remainder method so the variable sums to 100.0%.

The respondents averaged 59.67 years of age (*SD* = 13.82), with 88 (53.3%) aged 60 and above and a single respondent below 30. Males slightly outnumbered females (91, 55.2%), most were married (97, 58.8%), and high school was the most common educational attainment (73, 44.2%). A non-diabetic cause of end-stage renal disease was most common (92, 55.8%), while 18 respondents (10.9%) did not know the cause of their kidney disease. The largest vintage group had been on maintenance hemodialysis for more than three years (72, 43.6%), and most dialyzed three times weekly (97, 58.8%), although 67 respondents (40.6%) received fewer than three sessions per week. Only 21 respondents (12.7%) were employed, and 104 (63.0%) paid for dialysis through PhilHealth supplemented by out-of-pocket spending.

The profile matches the treatment environment documented for Philippine end-stage renal disease care, in which 94% of patients receive center-based hemodialysis and PhilHealth coverage reached the 156 sessions required for thrice-weekly treatment only in June 2023, after successive caps of 45, 90, and 144 sessions (Pajimna et al., 2023). Data for this study were collected three years after that expansion, yet 67 respondents (40.6%) dialyzed fewer than three times weekly and 104 (63.0%) supplemented PhilHealth with out-of-pocket payment, while only 21 (12.7%) were employed; the study did not measure the reasons for either pattern. The scale of the national burden gives these proportions weight, as the Philippine Renal Disease Registry recorded 49,715 hemodialysis patients against 319 on peritoneal dialysis between September 2022 and July 2023 (Villanueva et al., 2025). Wilson and Cleary (1995) position characteristics of the individual and of the environment as influences operating across every level of their model, and in this sample those characteristics appear chiefly as constrained treatment intensity and

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shared payment burden. The 18 respondents (10.9%) who did not know the cause of their kidney disease suggest a patient education gap that dialysis unit nurses are positioned to address.

Table 2
Level of Frailty Among the Respondents

Variable or category	<i>n</i>	<i>M</i> or %	<i>SD</i>	<i>Mdn</i>	Min	Max
Panel A. Descriptive statistics						
Frailty total score (FRAIL Scale, 0–5)	165	1.76	1.51	1.00	0.00	5.00
Conditions ticked (FRAIL item 4, 0–11)	165	4.05	1.62	4.00	1.00	8.00
Weight change over one year (%)	165	5.59	5.84	5.56	–9.95	23.61
Panel B. Frailty category						
Robust (score 0)	38	23.0				
Pre-frail (score 1–2)	75	45.5				
Frail (score 3–5)	52	31.5				
Total	165	100.0				

Note. *N* = 165. In Panel A the second and third columns report *n* and *M*; in Panel B they report frequency and percentage. Frailty total computed as the sum of five component scores. Categories follow Morley et al. (2012): 0 = robust, 1–2 = pre-frail, 3–5 = frail. Negative weight change indicates weight gain; 29 respondents (17.6%) gained weight over the year and scored 0 on the loss of weight component. FRAIL = Fatigue, Resistance, Ambulation, Illnesses, and Loss of weight.

Table 3
Endorsement of the Five FRAIL Scale Components

Component	<i>n</i> endorsed	%	Rank
Loss of weight (over 5%)	88	53.3	1
Ambulation	83	50.3	2
Illnesses (5 or more of 11)	54	32.7	3
Fatigue	34	20.6	4
Resistance	32	19.4	5

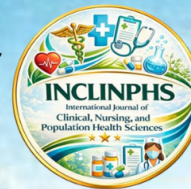
Note. *N* = 165. Each component scored 1 for a positive response and 0 otherwise. The five endorsement rates sum to the frailty total mean of 1.76. FRAIL = Fatigue, Resistance, Ambulation, Illnesses, and Loss of weight.

Table 4
Prevalence of Comorbid Conditions Within FRAIL Item 4

Condition	<i>n</i>	%
Kidney disease	165	100.0
Hypertension	162	98.2
Diabetes	106	64.2

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Condition	<i>n</i>	%
Congestive heart failure	66	40.0
Angina	56	33.9
Heart attack	36	21.8
Arthritis	36	21.8
Stroke	17	10.3
Asthma	10	6.1
Cancer	7	4.2
Chronic lung disease	7	4.2

Note. *N* = 165. The 11 conditions are response options within a single FRAIL Scale item, not 11 separate items. Percentages are independent and do not sum to 100.0%. Kidney disease at 100.0% follows from the end-stage renal disease inclusion criterion. FRAIL = Fatigue, Resistance, Ambulation, Illnesses, and Loss of weight.

The respondents obtained a mean frailty score of 1.76 (*SD* = 1.51) on the 0-to-5 FRAIL Scale, placing the sample as a whole in the pre-frail range. Pre-frailty was the most common category (75, 45.5%), followed by frailty (52, 31.5%) and robustness (38, 23.0%); taken together, 127 respondents (77.0%) were either pre-frail or frail. Loss of weight was the most frequently endorsed component (88, 53.3%), closely followed by ambulation difficulty (83, 50.3%), while fatigue (34, 20.6%) and resistance (32, 19.4%) were endorsed least. Weight change averaged a loss of 5.59% (*SD* = 5.84) over one year, though 29 respondents (17.6%) gained weight and correctly scored zero on that component. Within the illnesses item, respondents ticked a mean of 4.05 conditions (*SD* = 1.62), with kidney disease present in all 165 by definition, hypertension in 162 (98.2%), and diabetes in 106 (64.2%).

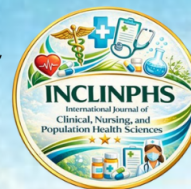
Frailty or pre-frailty was identified in roughly three of every four respondents, a burden that fits the pattern reported for dialysis populations but is not directly comparable to the most frequently cited benchmark. Li et al. (2025) pooled 16 studies of 2,446 patients aged 60 and above across eight countries and estimated frailty at 41% (95% CI 34%–49%) and pre-frailty at 37% (95% CI 26%–48%); the present frailty figure of 31.5% is lower and the pre-frailty figure of 45.5% higher, which is consistent with this sample not being age-restricted (mean age 59.67 years) and with the pooled studies having used several frailty instruments, most often the Fried phenotype. The closer comparison is Barbosa et al. (2023), who applied the original FRAIL Scale to 137 Brazilian hemodialysis patients of median age 61 and classified 36.5% as frail, a figure the present 31.5% approaches. Against the phenotype of Fried et al. (2001), developed in 5,317 community-dwelling adults aged 65 and older, the component profile here inverts the expected emphasis: weight loss and ambulation difficulty carried the sample, while exhaustion, one of the five defining criteria, was endorsed by only one in five. That comparison is indicative rather than exact, since Fried and colleagues measured exhaustion through depression-scale items whereas the adapted FRAIL Scale used here collapsed fatigue to a single Yes or No response. Within the Wilson and Cleary (1995) model, this profile sits at the biological and physiological function level. It suggests that frailty screening in this population may need to include weight trajectory and mobility rather than rely on self-reported tiredness alone, although the cross-sectional data do not show that these components account for the quality-of-life differences reported below. Because the classifications come from an adapted screening scale with a main-sample KR-20 of .680, they indicate screening status rather than clinically established frailty.

Table 5
Level of Symptom Burden and Symptom Prevalence, Ranked by Mean Severity

Symptom	<i>M</i>	<i>SD</i>	Rank	<i>n</i> ≥ 4	% ≥ 4	<i>n</i> ≥ 7	% ≥ 7
Tiredness (lack of energy)	4.62	2.53	1	105	63.6	42	25.5
Wellbeing	4.18	2.46	2	94	57.0	32	19.4

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Symptom	<i>M</i>	<i>SD</i>	Rank	<i>n</i> ≥ 4	% ≥ 4	<i>n</i> ≥ 7	% ≥ 7
Lack of appetite	3.59	2.37	3	77	46.7	22	13.3
Pain	3.39	2.33	4	71	43.0	19	11.5
Drowsiness (feeling sleepy)	3.19	2.27	5	65	39.4	16	9.7
Shortness of breath	2.61	2.08	6	47	28.5	9	5.5
Anxiety (feeling nervous)	2.50	2.04	7	44	26.7	8	4.8
Depression (feeling sad)	2.30	1.97	8	38	23.0	6	3.6
Nausea	1.60	1.75	9	18	10.9	4	2.4
ESAS-r total (0–90)	27.98	13.24	—	—	—	—	—

Note. *N* = 165. Each symptom rated 0 to 10, higher scores indicating greater severity. Total computed as the sum of nine items, range 0 to 90; observed range 3 to 68. Cutpoints follow Selby et al. (2010): 4 or higher denotes a moderate-or-greater symptom, 7 or higher a severe symptom. The wellbeing item runs from 0 = best to 10 = worst and was not reverse-scored. Dashes indicate values not applicable to the total score. ESAS-r = revised Edmonton Symptom Assessment System.

Table 6

Distribution of ESAS-r Total Scores

Band	<i>f</i>	%
None or mild (0–35)	120	72.7
Moderate (36–62)	44	26.7
Severe (63–90)	1	0.6
Total	165	100.0

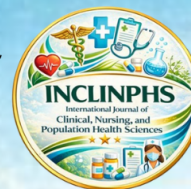
Note. *N* = 165. Band boundaries were derived arithmetically from the Selby et al. (2010) item cutpoints through the mean-item metric and are not a published banding of the ESAS-r total. ESAS-r = revised Edmonton Symptom Assessment System.

The respondents reported a mean ESAS-r total of 27.98 (*SD* = 13.24) out of a possible 90, with individual totals ranging from 3 to 68. Most fell in the none-or-mild band (120, 72.7%), 44 (26.7%) in the moderate band, and one respondent (0.6%) in the severe band, these being the study's operational bands (Table 6). Tiredness was the most severe symptom (*M* = 4.62, *SD* = 2.53) and the most widely endorsed, reaching moderate-or-greater intensity in 105 respondents (63.6%) and severe intensity in 42 (25.5%). Impaired wellbeing ranked second (*M* = 4.18, *SD* = 2.46), affecting 94 respondents (57.0%) at moderate-or-greater intensity. Nausea was both the least severe (*M* = 1.60, *SD* = 1.75) and the least prevalent, and it showed the smallest dispersion of the nine symptoms. The ranking by mean severity and the ranking by prevalence at the Selby threshold were identical across all nine symptoms.

Tiredness dominating both severity and prevalence aligns with the largest available synthesis of this literature: Fletcher et al. (2022) pooled 449 studies of 199,147 patients across 62 countries and found fatigue to be the most prevalent symptom in dialysis, at 70% (95% CI 64%–76%) across 21 studies and 2,943 participants. The present figure of 63.6% at the moderate-or-greater threshold sits just below that interval, and the difference is at least partly definitional, since Fletcher and colleagues pooled prevalence as reported across heterogeneous instruments while this study applied a fixed numerical cutpoint. One finding diverges: Fletcher et al. (2022) identified pain as the most severe symptom in dialysis with fatigue second, whereas pain ranked fourth here (*M* = 3.39). This ordering warrants attention rather than explanation, as no variable in this study accounts for it. Within the Wilson and Cleary (1995) model, these scores occupy the symptom status level, which the model places between biological

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function and quality of life. The concentration of burden in tiredness and impaired wellbeing rather than in pain suggests that symptom assessment in these units may usefully begin with energy and general wellbeing, although a higher sample mean does not make tiredness the most urgent problem for every patient. The single respondent in the severe band should not be read as reassurance, since the banding is derived rather than published and 44 respondents (26.7%) fell in the moderate band; band membership describes reported symptom intensity, not a clinical diagnosis.

Table 7

Level of Kidney Disease-Specific Quality of Life Across the KDQOL-36 Kidney Disease-Targeted Domains

Domain	Items	<i>M</i>	<i>SD</i>	<i>Mdn</i>	Min	Max	VI	Rank
Symptoms and Problems of Kidney Disease	12	70.83	16.25	72.92	29.17	95.83	High	1
Effects of Kidney Disease	8	61.97	17.96	62.50	9.38	93.75	High	2
Burden of Kidney Disease	4	42.01	22.51	37.50	0.00	93.75	Moderate	3

Note. *N* = 165. Each item was transformed to a 0-to-100 metric on which higher scores indicate better quality of life, then averaged within domain. The KDQOL-36 yields no single overall total, so no grand mean is reported. Verbal interpretation band: 0–20 = Very Low; 20.01–40 = Low; 40.01–60 = Moderate; 60.01–80 = High; 80.01–100 = Very High. This band is an equal-interval operational convenience adopted for this study and is not published by RAND. KDQOL-36 = Kidney Disease Quality of Life-36; VI = verbal interpretation.

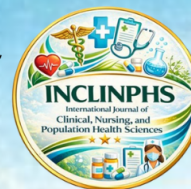
Table 8

Item-Level Quality-of-Life Scores Ranked Within Each KDQOL-36 Domain

Domain and item	<i>M</i>	<i>SD</i>	VI	Rank
Symptoms and Problems of Kidney Disease				
Chest pain	86.06	20.35	Very High	1
Nausea or upset stomach	81.67	22.45	Very High	2
Problems with your access site	76.97	24.07	High	3
Shortness of breath	75.76	24.29	High	4
Numbness in hands or feet	72.88	25.51	High	5
Faintness or dizziness	71.97	25.72	High	6
Lack of appetite	70.61	26.33	High	7
Soreness in your muscles	68.94	27.07	High	8
Cramps	62.73	28.37	High	9
Washed out or drained	61.82	28.77	High	10
Itchy skin	61.06	28.60	High	11
Dry skin	59.55	28.89	Moderate	12
Domain mean	70.83	16.25	High	
Effects of Kidney Disease				

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Domain and item	<i>M</i>	<i>SD</i>	VI	Rank
Your personal appearance	78.79	23.36	High	1
Your sex life	72.58	25.49	High	2
Being dependent on doctors and other medical staff	66.21	27.58	High	3
Your ability to work around the house	60.15	28.94	High	4
Your ability to travel	56.97	29.16	Moderate	5
Stress or worries caused by kidney disease	56.06	29.37	Moderate	6
Dietary restriction	53.64	29.51	Moderate	7
Fluid restriction	51.36	29.51	Moderate	8
Domain mean	61.97	17.96	High	
Burden of Kidney Disease				
I feel frustrated dealing with my kidney disease	48.64	29.51	Moderate	1
Too much of my time is spent dealing with my kidney disease	43.94	29.37	Moderate	2
My kidney disease interferes too much with my life	40.45	28.89	Moderate	3
I feel like a burden on my family	35.00	27.99	Low	4
Domain mean	42.01	22.51	Moderate	

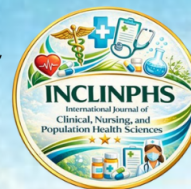
Note. $N = 165$. Higher scores indicate better quality of life, that is, less bother or less burden. Verbal interpretation band as in Table 7. Items within the Burden domain were forward-recoded; items within the Symptoms and Problems and Effects domains were reverse-recoded during transformation. KDQOL-36 = Kidney Disease Quality of Life-36; VI = verbal interpretation.

Quality of life varied widely across the three kidney disease-targeted domains. The verbal labels High, Moderate, and Low refer to the study's equal-interval operational bands (Table 7 note), not to published RAND categories. Symptoms and Problems of Kidney Disease obtained the highest mean ($M = 70.83$, $SD = 16.25$, High), followed by Effects of Kidney Disease ($M = 61.97$, $SD = 17.96$, High), while Burden of Kidney Disease obtained the lowest ($M = 42.01$, $SD = 22.51$, Moderate), the only domain to fall below the High band. Within Symptoms and Problems, chest pain ($M = 86.06$) and nausea ($M = 81.67$) were the least bothersome items, while dry skin was the only item in that domain to fall below the High band ($M = 59.55$, Moderate). Within Effects, the four lowest-ranked items all concerned treatment-imposed restriction and worry, with fluid restriction lowest ($M = 51.36$). Within Burden, feeling like a burden on one's family was the lowest-scoring of the 24 kidney disease-targeted items ($M = 35.00$, Low), and the Burden domain's dispersion, the widest of the three ($SD = 22.51$), indicates that this experience was not shared evenly. Three items fell close to a band boundary and were classified from unrounded means: dry skin at 59.55 (Moderate), ability to work around the house at 60.15 (High), and interference with life at 40.45 (Moderate).

The domain profile closely resembles the pooled international pattern, despite differences in samples and settings. Fletcher et al. (2022), synthesizing KDQOL data across 449 studies and 199,147 patients in 62 countries, reported pooled dialysis means of 73.6 for Symptoms and Problems, 63.2 for Effects, and 41.7 for Burden; the corresponding values here are 70.83, 61.97, and 42.01, preserving both the rank order and the approximate magnitudes. This convergence supports treating the three scales separately rather than as one composite, consistent with the confirmatory factor structure Peipert et al. (2018) reported in 70,786 United States dialysis patients, even though the same group later derived a single summary score (Peipert et al., 2019). The ranking of the three domains

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therefore follows a pattern typical of the instrument in dialysis populations rather than one specific to this sample. The domains share a 0-to-100 metric but measure different content, so the lower Burden mean does not show that patients' difficulties lie outside symptom control. The more specific signal is at item level: feeling like a burden on one's family was the lowest-scoring item ($M = 35.00$), which identifies a reported concern that may warrant further assessment, although the item alone does not establish the reason for the concern or that family relationships are impaired. These findings concern the three kidney disease-targeted domains only, since the SF-12 summaries were not scored.

Table 9
Descriptive Statistics by Dialysis Vintage

Outcome and group	<i>n</i>	<i>M</i>	<i>SD</i>	Mean rank
Frailty				
Less than 1 year	32	1.16	1.19	64.67
1 to 3 years	61	1.62	1.65	76.43
More than 3 years	72	2.15	1.42	96.72
Symptom burden				
Less than 1 year	32	27.53	13.86	81.95
1 to 3 years	61	25.41	12.38	73.93
More than 3 years	72	30.35	13.41	91.15
Burden of Kidney Disease				
Less than 1 year	32	33.20	18.34	64.80
1 to 3 years	61	41.80	23.04	82.25
More than 3 years	72	46.09	22.87	91.73
Symptoms and Problems of Kidney Disease				
Less than 1 year	32	66.02	15.82	67.14
1 to 3 years	61	72.44	15.24	87.56
More than 3 years	72	71.61	17.07	86.19
Effects of Kidney Disease				
Less than 1 year	32	56.05	18.41	68.86
1 to 3 years	61	61.01	19.45	81.54
More than 3 years	72	65.41	15.79	90.52

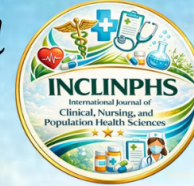
Note. $N = 165$. Mean ranks enter the analysis for the four outcomes tested by Kruskal–Wallis and for the sensitivity Kruskal–Wallis reported for Effects of Kidney Disease. For the three quality-of-life domains, higher scores indicate better quality of life.

Table 10
Difference in Frailty, Symptom Burden, and Quality of Life by Dialysis Vintage

Outcome	Test	Statistic	<i>df</i>	<i>p</i>	Effect size	Magnitude	Decision
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Outcome	Test	Statistic	df	p	Effect size	Magnitude	Decision
Frailty	Kruskal–Wallis	$H = 12.42$	2	.002	$\varepsilon^2 = .076$	Medium	Reject H_0
Symptom burden	Kruskal–Wallis	$H = 4.31$	2	.116	$\varepsilon^2 = .026$	Small	Fail to reject H_0
Burden of Kidney Disease	Kruskal–Wallis	$H = 7.12$	2	.029	$\varepsilon^2 = .043$	Small	Reject H_0 (unadjusted only)
Symptoms and Problems of Kidney Disease	Kruskal–Wallis	$H = 4.41$	2	.110	$\varepsilon^2 = .027$	Small	Fail to reject H_0
Effects of Kidney Disease	One-way ANOVA	$F = 3.23$	2, 162	.042	$\eta^2 = .038$	Small	Reject H_0 (unadjusted only)

Note. $N = 165$. $\alpha = .05$, two-tailed. Kruskal–Wallis was applied where per-group Shapiro–Wilk indicated non-normality in at least one vintage group; one-way ANOVA was applied to Effects of Kidney Disease, the only outcome normal in all three groups. $\varepsilon^2 = H / (N - 1)$. Effect size benchmarks: .01 = small, .06 = medium, .14 = large. Confidence intervals are not standard output for Kruskal–Wallis or for the ANOVA omnibus test and are therefore not reported. Bonferroni-adjusted α for the five outcomes = .01; only the frailty difference remains significant after adjustment. ANOVA = analysis of variance.

Table 11

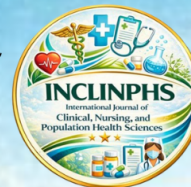
Post-Hoc Pairwise Comparisons for Outcomes With a Significant Omnibus Test

Outcome	Post-hoc test	Comparison	p	Decision
Frailty	DSCF	Less than 1 year vs. 1 to 3 years	.562	Not significant
Frailty	DSCF	Less than 1 year vs. More than 3 years	.002	Significant
Frailty	DSCF	1 to 3 years vs. More than 3 years	.041	Significant
Burden of Kidney Disease	DSCF	Less than 1 year vs. 1 to 3 years	.235	Not significant
Burden of Kidney Disease	DSCF	Less than 1 year vs. More than 3 years	.019	Significant
Burden of Kidney Disease	DSCF	1 to 3 years vs. More than 3 years	.505	Not significant
Effects of Kidney Disease	Tukey HSD	1 to 3 years vs. Less than 1 year	.407	Not significant
Effects of Kidney Disease	Tukey HSD	1 to 3 years vs. More than 3 years	.331	Not significant
Effects of Kidney Disease	Tukey HSD	Less than 1 year vs. More than 3 years	.037	Significant

Note. $N = 165$. DSCF = Dwass–Steel–Critchlow–Fligner, the pairwise procedure following a significant Kruskal–Wallis test. HSD = honestly significant difference. Post-hoc comparisons were not performed for symptom burden or for

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Symptoms and Problems of Kidney Disease because their omnibus tests were not statistically significant. Both procedures adjust for multiple pairwise comparisons within an outcome. Contrasts for Burden and Effects of Kidney Disease are exploratory because their omnibus tests did not survive the Bonferroni threshold of .01.

Per-group Shapiro-Wilk testing indicated non-normal distribution within at least one vintage group for frailty, symptom burden, Burden of Kidney Disease, and Symptoms and Problems, so the Kruskal-Wallis H test was used for those four outcomes. Effects of Kidney Disease met normality in all three groups (Shapiro-Wilk $p = .057$, $.071$, and $.152$) and was analyzed by one-way ANOVA. Levene's test indicated homogeneity of variance for all five outcomes ($F = 0.25$ to 2.12 , all $p > .05$), so no Welch correction or Games-Howell procedure was required. Frailty differed significantly across vintage groups, $H(2) = 12.42$, $p = .002$, $\epsilon^2 = .076$, and the null hypothesis was rejected; DSCF comparisons located the difference between respondents dialyzing more than three years and both shorter-vintage groups ($p = .002$ against less than one year; $p = .041$ against one to three years), with frailty rising monotonically from $M = 1.16$ to $M = 2.15$. Burden of Kidney Disease also differed, $H(2) = 7.12$, $p = .029$, $\epsilon^2 = .043$, with the single significant contrast between less than one year ($M = 33.20$) and more than three years ($M = 46.09$), $p = .019$, indicating better burden scores among longer-vintage respondents. Effects of Kidney Disease differed by one-way ANOVA, $F(2, 162) = 3.23$, $p = .042$, $\eta^2 = .038$, with Tukey HSD identifying a significant difference between less than one year ($M = 56.05$, $SD = 18.41$) and more than three years ($M = 65.41$, $SD = 15.79$), $p = .037$. This result must be read as marginal, because a sensitivity Kruskal-Wallis on the same outcome yielded $H(2) = 4.66$, $p = .097$, $\epsilon^2 = .028$, which is not significant, so the finding depends on test choice. Symptom burden and Symptoms and Problems of Kidney Disease did not differ significantly across vintage groups, $H(2) = 4.31$, $p = .116$ and $H(2) = 4.41$, $p = .110$ respectively, and post-hoc analysis was not warranted for either. After Bonferroni correction for the five outcomes ($\alpha = .01$), only the frailty difference remained significant. The Burden ($p = .029$) and Effects ($p = .042$) differences, and their pairwise contrasts in Table 11, are therefore reported as exploratory.

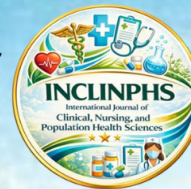
At $\alpha = .05$, the null hypothesis was rejected for frailty, Burden of Kidney Disease, and Effects of Kidney Disease, and was not rejected for symptom burden or Symptoms and Problems; after Bonferroni correction, it was rejected for frailty only. The frailty difference is the principal finding, being the only one to survive the Bonferroni threshold: frailty was higher among longer-vintage respondents. The quality-of-life differences are exploratory. Burden and Effects scores were higher, indicating better quality of life, at longer vintage, but neither difference survived correction and the Effects difference also depended on test choice. This direction resembles Yan et al. (2025), who reported in 213 Chinese hemodialysis patients a non-significant rise in symptom burden ($p = .084$) alongside higher quality-of-life scores at longer vintage. The present symptom burden result ($p = .116$) matches that non-significance, though it sits against Lu et al. (2024), whose meta-analysis of 62 studies found symptom burden positively correlated with dialysis vintage, and against Zhu et al. (2023), who reported higher symptom prevalence and severity at longer vintage. Wilson and Cleary (1995) offer one reading: their model treats health perceptions and overall quality of life as shaped by individual valuation and expectation, not only by biological state, so a group with lower physiological reserve may appraise its situation no less favorably with longer time on dialysis. Because the design is cross-sectional and the quality-of-life differences are exploratory, this is a candidate explanation, and survivor effects offer an equally consistent account that these data cannot separate. Treatment conditions were checked as a further source of difference. The proportion dialyzing fewer than three times weekly did not differ across the three vintage groups (43.8%, 37.7%, and 41.7%; $\chi^2(2) = 0.38$, $p = .828$), but the proportion paying any part of treatment out of pocket did (78.1%, 57.4%, and 83.3%; $\chi^2(2) = 11.80$, $p = .003$). Payment source was not modeled, so its relation to the vintage pattern is unknown; its non-monotonic distribution does not track the steady rise in frailty. For practice, the finding argues against assuming that long-vintage patients need less attention, since their frailty was the highest in the sample while their kidney disease-specific quality-of-life scores were not lower.

Table 12
Relationship Between Frailty and Quality of Life

Variable pair	ρ	p	95% CI	Magnitude	Decision
Frailty and Burden of Kidney Disease	-.315	< .001	[-.447, -.171]	Moderate	Reject H_0
Frailty and Symptoms and Problems of Kidney Disease	-.383	< .001	[-.506, -.244]	Moderate	Reject H_0

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Variable pair	ρ	p	95% CI	Magnitude	Decision
Frailty and Effects of Kidney Disease	-.350	< .001	[-.477, -.208]	Moderate	Reject H_0

Note. $N = 165$. $\alpha = .05$, two-tailed. Spearman's rho was used for all pairs. Confidence intervals computed by Fisher z transformation. Magnitude benchmarks: .10-.29 = weak, .30-.49 = moderate, .50-.69 = strong. Negative coefficients indicate that higher frailty scores were associated with lower quality-of-life scores, since higher KDQOL-36 scores denote better quality of life. KDQOL-36 = Kidney Disease Quality of Life-36.

Spearman's rho was used instead of Pearson's r because Shapiro-Wilk indicated non-normal distribution for frailty ($W = 0.885$, $p < .001$) and for all three quality-of-life domains ($W = 0.967$, $p < .001$ for Burden; $W = 0.957$, $p < .001$ for Symptoms and Problems; $W = 0.975$, $p = .004$ for Effects). Frailty was significantly and negatively correlated with all three kidney disease-targeted domains, and the null hypothesis was rejected in each case. The strongest association was with Symptoms and Problems of Kidney Disease ($\rho = -.383$, $p < .001$, 95% CI [-.506, -.244], moderate), followed by Effects of Kidney Disease ($\rho = -.350$, $p < .001$, 95% CI [-.477, -.208], moderate) and Burden of Kidney Disease ($\rho = -.315$, $p < .001$, 95% CI [-.447, -.171], moderate). All three coefficients fell within the moderate band, and all three confidence intervals excluded zero and overlapped substantially, so no domain can be identified as differentially related to frailty.

The null hypothesis was rejected for every kidney disease-targeted domain: higher frailty was associated with poorer self-reported quality of life across Burden, Symptoms and Problems, and Effects. The direction replicates Shariff et al. (2024), who found significant negative correlations between frailty and all KDQOL-36 aspects in 93 in-center hemodialysis patients, and Kennard et al. (2024), whose review of advanced chronic kidney disease reports frailty as an independent predictor of worse health-related quality of life. Two qualifications keep the comparison honest. Shariff and colleagues measured frailty with the Edmonton Frail Scale rather than the FRAIL Scale, and their strongest coefficient ($r = -.64$) was with the physical component, a component not analyzed in this report, so the magnitudes are not directly comparable. The ordering here is nonetheless consistent with the sequence Wilson and Cleary (1995) propose, in which biological and physiological function shapes downstream symptom and health perception levels, and with the phenotype of Fried et al. (2001), in which the losses that define frailty are functional and might be expected to register most strongly on symptom-proximal measures. Because the design is cross-sectional, these are associations only. Clinically, the consistency of the moderate negative relationship across all three domains may support frailty screening as a marker of broad quality-of-life risk rather than of any single domain.

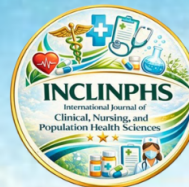
Table 13
Relationship Between Symptom Burden and Quality of Life

Variable pair	ρ	p	95% CI	Magnitude	Decision
Symptom burden and Burden of Kidney Disease	-.428	< .001	[-.545, -.295]	Moderate	Reject H_0
Symptom burden and Symptoms and Problems of Kidney Disease	-.631	< .001	[-.715, -.530]	Strong	Reject H_0
Symptom burden and Effects of Kidney Disease	-.491	< .001	[-.599, -.365]	Moderate	Reject H_0

Note. $N = 165$. $\alpha = .05$, two-tailed. Spearman's rho was used for all pairs. Confidence intervals computed by Fisher z transformation. Magnitude benchmarks as in Table 12. The ESAS-r and the KDQOL-36 Symptoms and Problems scale share item content for four of the twelve items in that scale: shortness of breath, lack of appetite, nausea, and tiredness against feeling washed out or drained. ESAS-r = revised Edmonton Symptom Assessment System; KDQOL-36 = Kidney Disease Quality of Life-36.

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Spearman's rho was used instead of Pearson's r because Shapiro-Wilk indicated non-normal distribution for symptom burden ($W = 0.972$, $p = .002$) and for all three quality-of-life domains. Symptom burden was significantly and negatively correlated with every kidney disease-targeted domain, and the null hypothesis was rejected in each case. The strongest association in the entire study was between symptom burden and Symptoms and Problems of Kidney Disease ($p = -.631$, $p < .001$, 95% CI $[-.715, -.530]$, strong). This coefficient partly reflects shared item content, since four of the twelve Symptoms and Problems items ask about symptoms the ESAS-r also measures, and it should therefore be read as a relationship between partially overlapping measures rather than between fully independent constructs. Symptom burden was also negatively correlated with Effects of Kidney Disease ($p = -.491$, $p < .001$, 95% CI $[-.599, -.365]$, moderate) and with Burden of Kidney Disease ($p = -.428$, $p < .001$, 95% CI $[-.545, -.295]$, moderate), neither of which shares item content with the ESAS-r. The Symptoms and Problems coefficient was the largest of the three, but its confidence interval overlaps those of the other two domains, so it cannot be described as significantly stronger.

The null hypothesis was rejected for all three kidney disease-targeted domains, and the coefficients were numerically larger than those observed for frailty in Research Question 6 in every domain. Because differences between correlations were not formally tested, this indicates a consistently larger observed association rather than a statistically demonstrated difference. The direction is consistent with Davison and Jhangri (2010), who found in 591 hemodialysis patients that individual symptoms measured with a modified Edmonton Symptom Assessment System independently predicted poorer mental and physical health-related quality of life, and Lu et al. (2024), whose meta-analysis of 62 studies reported symptom burden negatively correlated with quality of life. The overlap qualification matters most where the association is largest, and the two non-overlapping domains carry the more interpretable evidence: at $p = -.428$ and $p = -.491$, symptom burden was moderately associated with quality of life even where no item content is shared. A similar pattern, with the strongest correlation between a symptom inventory and the KDQOL Symptom/Problem List, was reported among 359 Chinese hemodialysis patients (Qiao et al., 2026). This is the relationship Wilson and Cleary (1995) place at the center of their model, which places symptom status between biological function and health perceptions, and the present coefficients are consistent with that ordering without demonstrating it, since the data are cross-sectional and all measures were collected in a single sitting. For dialysis unit nursing, these associations support including symptom assessment in routine care, using a brief tool such as the ESAS-r that can be completed during a session; they do not show that reducing symptoms would improve quality of life.

Table 14

Regression Model Fit for Frailty and Symptom Burden Predicting Quality of Life

Quality-of-life domain	R	R^2	Adjusted R^2	F	p	R^2 magnitude	Decision
Burden of Kidney Disease	.467	.218	.208	22.56	< .001	Medium	Reject H_0
Symptoms and Problems of Kidney Disease	.671	.450	.443	66.28	< .001	Large	Reject H_0
Effects of Kidney Disease	.508	.258	.248	28.11	< .001	Medium	Reject H_0

Note. $N = 165$. $\alpha = .05$, two-tailed. All three models used the Enter method with frailty and symptom burden entered together, and all were tested on $df = 2, 162$. R^2 benchmarks: .02 = small, .13 = medium, .26 = large.

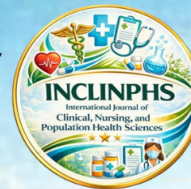
Table 15

Regression Coefficients for Frailty and Symptom Burden Predicting Quality of Life

Domain and predictor	B	SE	β	t	p	95% CI	VIF
Burden of Kidney Disease							
(Intercept)	63.919	3.674	—	17.40	< .001	[56.663, 71.175]	—
Frailty	-2.392	1.156	-.161	-2.07	.040	[-4.674, -0.109]	1.25

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Domain and predictor	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>	95% CI	VIF
Symptom burden	-0.632	0.132	-.372	-4.79	< .001	[-0.893, -0.371]	1.25
Symptoms and Problems of Kidney Disease							
(Intercept)	93.902	2.225	—	42.21	< .001	[89.508, 98.295]	—
Frailty	-1.752	0.700	-.163	-2.50	.013	[-3.134, -0.370]	1.25
Symptom burden	-0.714	0.080	-.582	-8.92	< .001	[-0.872, -0.556]	1.25
Effects of Kidney Disease							
(Intercept)	81.121	2.857	—	28.40	< .001	[75.479, 86.762]	—
Frailty	-1.822	0.899	-.154	-2.03	.044	[-3.596, -0.047]	1.25
Symptom burden	-0.570	0.103	-.420	-5.54	< .001	[-0.773, -0.367]	1.25

Note. *N* = 165. Predictors are listed in entry order. *B*, *SE*, and confidence interval bounds are reported to three decimal places because the symptom burden coefficients fall below 1.00 in absolute value and two decimals would obscure their standard errors. Dashes indicate values not applicable to the intercept. Negative coefficients indicate that higher predictor scores were associated with lower quality-of-life scores. VIF = variance inflation factor.

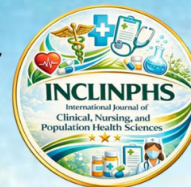
Multiple linear regression using the Enter method was applied separately to each of the three kidney disease-targeted domains, with frailty and symptom burden entered together. Multicollinearity was not a concern in any model, as the two predictors intercorrelated at $r = .448$ and produced $VIF = 1.25$ and tolerance = .799, clearing both the thresholds stated in the statistical treatment plan and the stricter $VIF < 5$ convention. Residual independence held throughout (Durbin-Watson = 1.80, 1.94, and 2.08), and no case in any model reached a Cook's distance of 1.00, the highest observed being 0.095. Two assumption violations were detected and addressed rather than set aside. Residual normality held for Symptoms and Problems of Kidney Disease (Shapiro-Wilk $W = 0.987$, $p = .118$) but was violated for Burden of Kidney Disease ($W = 0.984$, $p = .049$) and for Effects of Kidney Disease ($W = 0.973$, $p = .003$). Rather than set these results aside on the basis of the residual distributions' shape, bootstrap resampling was run on every coefficient as a direct robustness check, and the robustness of ordinary least squares to moderate departures from residual normality in large samples was noted (Lumley et al., 2002). Homoscedasticity was violated for Burden of Kidney Disease only (Breusch-Pagan LM = 7.74, $p = .021$), so HC3 robust standard errors were computed for that model; they changed no significance decision, with the frailty coefficient moving from $p = .040$ to $p = .035$ and symptom burden remaining below .001.

All three models were statistically significant and the null hypothesis was rejected in each case. The strongest was Symptoms and Problems of Kidney Disease, $F(2, 162) = 66.28$, $p < .001$, $R^2 = .450$, adjusted $R^2 = .443$, with the two predictors together accounting for 45.0% of the variance; Effects of Kidney Disease followed, $F(2, 162) = 28.11$, $p < .001$, $R^2 = .258$, adjusted $R^2 = .248$, accounting for 25.8%; and Burden of Kidney Disease, $F(2, 162) = 22.56$, $p < .001$, $R^2 = .218$, adjusted $R^2 = .208$, accounting for 21.8%.

Symptom burden was a significant predictor in all three models and carried the larger standardized weight in each: $\beta = -.582$, $t = -8.92$, $p < .001$, 95% CI [-0.872, -0.556] for Symptoms and Problems; $\beta = -.420$, $t = -5.54$, $p < .001$, 95% CI [-0.773, -0.367] for Effects; and $\beta = -.372$, $t = -4.79$, $p < .001$, 95% CI [-0.893, -0.371] for Burden. Frailty reached significance in all three models as well, but at markedly weaker weights and with two results requiring qualification. In the Symptoms and Problems model, frailty predicted the outcome at $\beta = -.163$, $t = -2.50$, $p = .013$, 95% CI [-3.134, -0.370], and its bootstrap interval [-3.055, -0.339] excluded zero. In the Burden model, frailty reached $\beta = -.161$, $t = -2.07$, $p = .040$, 95% CI [-4.674, -0.109]; its bootstrap interval [-4.644, -0.210] excluded zero, but the coefficient did not survive Bonferroni correction. In the Effects model, frailty reached $\beta = -.154$, $t = -2.03$, $p = .044$, 95% CI [-3.596, -0.047]; this result is borderline and was not confirmed under bootstrap resampling, where the interval [-3.739, 0.060] included zero across 5,000 bias-corrected resamples reproduced at two further seeds. Because this is also the model with the most non-normal residuals, the bootstrap

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interval is the more trustworthy of the two, and frailty should not be described as an established independent predictor of Effects of Kidney Disease on these data.

The null hypothesis was rejected for all three kidney disease-targeted domains: frailty and symptom burden entered together significantly predicted quality of life, accounting for 21.8% to 45.0% of the variance. Davison and Jhangri (2010) reported that individual symptoms accounted for 42.5% of the variance in a mental and 38.5% in a physical health composite among 591 hemodialysis patients; those outcomes and predictors differ from the kidney disease-targeted domains and composite score used here, so the figures are indicative rather than directly comparable. The clearer finding is the asymmetry between the two predictors. Symptom burden held the larger standardized weight in every model and survived every robustness check, while frailty's standardized weights were 28% to 43% of symptom burden's and failed bootstrap confirmation in one model. This tempers, without contradicting, the position of Kennard et al. (2024) that frailty independently predicts worse health-related quality of life in advanced kidney disease; here it did so reliably for only one of three domains. Puri et al. (2025) supply a measurement reason for caution, having rated the evidence for the FRAIL Scale's discriminative validity as low in non-dialysis chronic kidney disease and very low in kidney failure, with only one of the included studies of any instrument reporting reliability, so an attenuated frailty coefficient may reflect the instrument as much as the construct. The ordering of Wilson and Cleary (1995), which places symptom status downstream of biological function and directly upstream of health perceptions, is consistent with symptom burden carrying the heavier weight, and the frailty phenotype of Fried et al. (2001) sits at the more distal biological level where a smaller direct coefficient might be expected. Because the design is cross-sectional, prediction here means variance accounted for, not temporal or causal prediction. For practice, the larger and more stable coefficients identify symptom burden as the stronger statistical predictor in these models, which supports giving symptom assessment priority. They do not show that symptom management would improve quality of life more than frailty-focused care, which would require intervention studies, and statistical significance does not by itself establish clinical importance: each one-point higher ESAS-r total corresponded to a Symptoms and Problems score 0.714 points lower (Table 15). Frailty screening retains value as a marker of vulnerability. Applying the Bonferroni thresholds set in the Treatment of Data, all six Spearman correlations survived correction at .0167, as did all three regression omnibus tests and the symptom burden coefficient in every model (all $p < .001$). Frailty survived for Symptoms and Problems ($p = .013$) but not for Burden of Kidney Disease ($p = .040$) or Effects of Kidney Disease ($p = .044$). In Research Question 5, only the frailty difference survived its threshold of .01.

The sensitivity scoring of the illnesses component did not change these conclusions. Requiring five of the ten non-kidney conditions reduced endorsement of that component from 54 to 33 respondents and the frailty mean from 1.76 to 1.64 ($SD = 1.51$), with 45 respondents robust, 76 pre-frail, and 44 frail. The rescored total still differed across vintage groups, $H(2) = 14.67$, $p < .001$, and correlated negatively with Burden, Symptoms and Problems, and Effects of Kidney Disease ($p = -.324$, $-.376$, and $-.345$; all $p < .001$). In the regression models, symptom burden remained significant in every model (all $p < .001$), while frailty remained significant at $\alpha = .05$ for Burden ($p = .038$) and Symptoms and Problems ($p = .018$) but not for Effects ($p = .072$), consistent with the bootstrap result for that model. Neither rescored frailty coefficient reached the Bonferroni threshold of .0167, which reinforces the reading of frailty as the weaker and less stable of the two predictors.

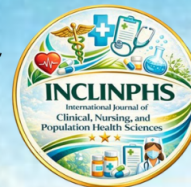
Nursing care recommendations proposed for maintenance hemodialysis patients in private dialysis centers

Four findings carry into nursing care. Symptom burden held the larger standardized weight in all three regression models, with tiredness both the most severe symptom on the ESAS-r ($M = 4.62$) and the most prevalent at moderate-or-greater intensity (105, 63.6%). Frailty was present at pre-frail or frail level in 127 respondents (77.0%), concentrated in the weight loss (88, 53.3%) and ambulation (83, 50.3%) components rather than the fatigue component (34, 20.6%). Burden of Kidney Disease was the lowest-scoring domain ($M = 42.01$, Moderate), and feeling like a burden on one's family the lowest of the 24 items in the three kidney disease-targeted domains ($M = 35.00$, Low). Respondents dialyzing more than three years carried the highest frailty ($M = 2.15$), a difference that survived correction, and did not report lower kidney disease-specific quality of life than shorter-vintage respondents.

These support five recommendations. Dialysis unit nurses may administer the nine-item ESAS-r at the chair at intervals set by each unit, treating an item score of 4 or above as warranting assessment and 7 or above as warranting escalation; the two cutpoints follow Selby et al. (2010), while the action rule attached to them is

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proposed here and untested. Administration may be feasible within a dialysis session, since the full 60-item battery averaged 22 minutes in the pilot, although per-instrument timing was not recorded. Frailty screening with the FRAIL Scale may accompany it, using weight trajectory and walking capacity as entry points, since the fatigue component alone would have identified only 34 of the 127 pre-frail or frail respondents. Li et al. (2025) pooled frailty at 41% and pre-frailty at 37% among hemodialysis patients aged 60 and above, the age group of 88 respondents (53.3%) here. Charge nurses may assess further the patients who endorse the family-burden item, a concern that symptom-focused measures do not capture, and refer them to family-inclusive support where that assessment indicates a need. Unit nurses may include the cause of kidney disease in structured education, indicated for the 18 respondents (10.9%) unable to identify it. Finally, respondents dialyzing fewer than three times weekly (67, 40.6%) or supplementing PhilHealth with out-of-pocket payment (104, 63.0%) may be referred to medical social services for benefit assistance; this study did not measure why treatment intensity fell short, so referral is offered as assessment rather than as remedy. Within the Wilson and Cleary (1995) ordering, these recommendations act at the symptom status and biological function levels, with the family-burden and social service referrals addressing concerns recorded in the Burden and Effects domains. None of these recommendations was tested for its effect on patient outcomes; each is an assessment proposal derived from the associations observed here.

Conclusions

Most respondents in the five participating private dialysis centers were classified as pre-frail or frail and reported varying levels of symptom burden. Tiredness was the most prominent symptom, while Burden of Kidney Disease had the lowest mean score among the three kidney disease-targeted domains of the KDQOL-36. Feeling like a burden on one's family was the lowest-scoring item, identifying a specific concern that may warrant further assessment in clinical practice.

Frailty and symptom burden were negatively associated with all three kidney disease-specific quality-of-life domains. When entered together in the regression models, symptom burden had the larger standardized coefficient in each model, whereas the independent contribution of frailty was less consistent. These findings identify symptom burden as the stronger statistical predictor in this sample, although the shared item content between the ESAS-r and the KDQOL-36 Symptoms and Problems domain qualifies the interpretation of the strongest observed association.

Frailty differed significantly across dialysis-vintage groups, with higher scores among respondents who had received dialysis for more than three years. The observed differences in the Burden and Effects of Kidney Disease domains did not remain statistically significant after the stated Bonferroni correction, and the result for Effects of Kidney Disease also depended on the statistical test used. Accordingly, the findings do not establish that longer dialysis vintage improves quality of life or that patients adapt to treatment over time.

The observed relationships are consistent with the conceptual ordering proposed by Wilson and Cleary (1995), which positions biological and physiological factors and symptom status in relation to broader health outcomes. However, the cross-sectional design does not establish temporal or causal relationships among the variables. The findings are limited to the three kidney disease-targeted KDQOL-36 domains and the eligible patients in the five participating private dialysis centers in Pampanga, Philippines.

Within these limits, the findings support considering symptom assessment alongside frailty screening in dialysis nursing practice. Further research is needed to determine whether integrating these assessments into routine care improves clinical decision-making or patient-reported quality of life.

Recommendations

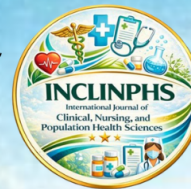
Based on the findings, dialysis unit nurses may consider incorporating brief symptom assessment into routine patient evaluation, subject to unit protocols, clinical judgment, and available resources. The ESAS-r may help identify symptoms requiring further assessment, with particular attention to tiredness and impaired wellbeing, which received the highest mean severity scores in this sample. The proposed item-level thresholds based on Selby et al. (2010) may be evaluated locally before being adopted as part of a formal assessment or escalation protocol.

Nurses may also consider using the FRAIL Scale as a screening aid, with appropriate caution regarding the adapted instrument and its measurement properties in this sample. Assessment of weight trajectory, mobility, and other relevant clinical indicators may complement screening results rather than relying on a single score to characterize a patient's condition.

Dialysis center administrators may evaluate the feasibility of establishing referral pathways for patients who report substantial family-related concerns or who request assistance with treatment-related financial difficulties. The low score for feeling like a burden on one's family may justify further assessment of psychosocial needs, while

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reported out-of-pocket payments may warrant individualized screening for possible eligibility for financial assistance. These findings do not establish the causes of financial burden or reduced dialysis frequency; referral decisions may therefore be guided by individual assessment rather than by the study's group-level results alone.

Nursing education programs may incorporate item-level interpretation of the KDQOL-36 alongside domain scores. The family-burden item may be used as an example of how an individual response can identify a concern that is not fully conveyed by the domain mean. Educational activities may emphasize appropriate follow-up assessment and the distinction between a patient-reported concern and a clinical diagnosis.

Future studies may use prospective designs to examine changes in frailty, symptom burden, and kidney disease-specific quality of life over time and to explore possible explanations for differences across dialysis-vintage groups. Researchers may also evaluate the measurement properties of the FRAIL Scale in Filipino dialysis populations, given the KR-20 estimate of .680 obtained in this study. Replication using measures with less overlapping item content may help clarify the association between symptom burden and the KDQOL-36 Symptoms and Problems domain.

Future research may also score the SF-12 component summaries using the appropriate scoring procedure so that generic physical and mental health outcomes can be examined alongside the kidney disease-targeted domains. Studies may extend recruitment to public dialysis facilities and other Philippine regions and evaluate validated Filipino-language instruments to improve the inclusion of patients who do not meet English-comprehension requirements.

Limitations

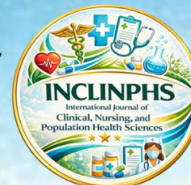
Findings are constrained by a cross-sectional, self-report design administered in a single intradialytic sitting, which permits association but not temporal or causal inference and leaves common method variance and survivor effects unresolved as explanations for the vintage pattern. The SF-12 core of the KDQOL-36 was administered but not scored, so the findings describe kidney disease-specific quality of life and do not address generic physical and mental health status. Three measurement constraints qualify the analyses: the FRAIL Scale returned KR-20 = .680, below the conventional .70 threshold (pilot .707), so frailty scores carry more measurement error than the other instruments, which may attenuate the frailty coefficients; four of the twelve Symptoms and Problems items ask about symptoms the ESAS-r also measures, so $\rho = -.631$ partly reflects shared content; and the interpretive bands applied to the KDQOL-36 domains and the ESAS-r total are operational rather than published. The FRAIL illnesses component includes kidney disease, which every respondent had, and the prior weight used for the weight-loss component relied on recall; a sensitivity scoring excluding kidney disease left the conclusions unchanged. The FRAIL Scale was adapted for self-administration, and its equivalence to the original administration format was not tested against a criterion measure in this sample. Because questionnaires were completed during treatment, privacy for sensitive items and the point within the session at which symptoms were rated were not standardized, which may have affected responses on mood, anxiety, sexual functioning, and current symptom severity. Out-of-pocket payment differed across vintage groups and was not adjusted for. Three results are marginal: the vintage differences in Burden and Effects of Kidney Disease, which did not survive Bonferroni correction, the Effects difference also depending on test choice; and the frailty coefficient for Effects, which failed bootstrap confirmation. As a census of 165 patients at five private centers in one province, the findings describe this population and are not generalizable to public facilities or to other regions.

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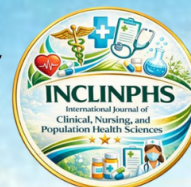
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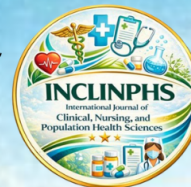
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