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A Comparison of Patient-Reported Outcome Measures of Quality of Life By Dialysis Modality in the Treatment of Kidney Failure: A Systematic Review

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Abstract

Background: There is an increasing demand to incorporate patient-reported outcome measures (PROMs) such as quality of life (QOL) in decision-making when selecting a chronic dialysis modality.

Objective: To compare the change in QOL over time among similar patients on different dialysis modalities to provide unique and novel insights on the impact of dialysis modality on PROMs.

Design: Systematic reviews, randomized controlled trials, and nonrandomized controlled trials were examined via a comprehensive search strategy incorporating multiple bibliographic databases.

Setting: Data were extracted from relevant studies from January 1, 2000 to December 31, 2019 without limitations on country of study conduction.

Patients: Eligible studies included adults (≥18 years) with end-stage kidney disease of any cause who were prescribed dialysis treatment (either as lifetime treatment or bridge to transplant).

Measurements: The 5 comparisons were peritoneal dialysis (PD) vs in-center hemodialysis (ICHD), home hemodialysis (HHD) vs ICHD, HHD modalities compared with one another, HHD vs PD, and self-care ICHD vs traditional nurse-based ICHD.

Methods: Included studies compared adults on different dialysis modalities with repeat measures within individuals to determine changes in QOL between dialysis modalities (in-center or home dialysis). Methodological quality was assessed by the Scottish Intercollegiate Guidelines Network (SIGN 50) checklist. A narrative synthesis was conducted, synthesizing the direction and size of any observed effects across studies.

Results: Two randomized controlled trials and 9 prospective cohort studies involving a combined total of 3711 participants were included. Comparing PD and ICHD, 5 out of 9 studies found significant differences ($P < .05$) favoring PD in the change of multiple QOL domains, including "physical component score," "role of social component score," "cognitive status," "role limitation due to emotional function," "role limitation due to physical function," "bodily pain," "burden of kidney disease," "effects of kidney disease on daily life," "symptoms/problems," "sexual function," "finance," and "patient satisfaction." Conversely, 3 of these studies demonstrated statistically significant differences ($P < .05$) favoring ICHD in the domains of "role limitation due to physical function," "general health," "support from staff," "sleep quality," "social support," "health status," "social interaction," "body image," and "overall health." Comparing HHD and ICHD, significant differences ($P < .05$) favoring HHD for the QOL domains of "general health," "burden of kidney disease," and the visual analogue scale were reported.

Limitations: Our study is constrained by the small sample sizes of included studies, as well as heterogeneity among both study populations and validated QOL scales, limiting inter-study comparison.

Conclusions: We identified differences in specific QOL domains between dialysis modalities that may aid in patient decision-making based on individual priorities.

Trial registration: PROSPERO Registration Number: CRD42016046980.

Primary funding source: The original research for this study was derived from the Canadian Agency for Drugs and Technologies in Health (CADTH) 2017 optimal use report, titled "Dialysis Modalities for the Treatment of End-Stage Kidney Disease: A Health Technology Assessment." The CADTH receives funding from Canada's federal, provincial, and territorial governments, with the exception of Quebec.

Abrégé

Contexte: On observe une demande croissante pour intégrer des mesures des résultats déclarées par les patients (MRDP) comme la qualité de vie (QDV) dans la prise de décision quant à la modalité de dialyse.

Objectif: Comparer l'évolution de la QDV chez des patients de profils similaires, mais utilisant différentes modalités de dialyse, pour fournir un éclairage nouveau sur l'incidence de la modalité sur les MRDP.
Type d'étude: Des revues systématiques et des essais contrôlés avec ou sans répartition aléatoire ont été examinés dans le cadre d'une stratégie de recherche globale incorporant plusieurs bases de données bibliographiques.
Conception: Les données ont été extraites des études pertinentes entre le 1er janvier 2000 et le 31 décembre 2019 sans limitation relativement à l'origine (pays) de l'étude.
Sujets: Les études admissibles portaient sur des adultes atteints d'insuffisance rénale terminale (toutes causes) auxquels un traitement de dialyse avait été prescrit, soit comme traitement à vie, soit en attendant une transplantation.
Mesures: Ont été comparées 1) la dialyse péritonéale [DP] vs l'hémodialyse en centre [HDC]; 2) l'hémodialyse à domicile [HDD] vs l'HDC; 3) les modalités d'HDD les unes aux autres; 4) l'HDD vs la DP; et 5) l'HDC autogérée vs l'HDC traditionnelle sous supervision d'une infirmière.
Méthodologie: Les études incluses comparaient des adultes sous différentes modalités de dialyse et comportaient des mesures répétées permettant d'observer des changements dans la QDV selon la modalité (en centre ou à domicile). La qualité méthodologique a été évaluée avec la grille d'évaluation du *Scottish Intercollegiate Guidelines Network* (SIGN 50). Une synthèse narrative a été réalisée pour résumer la direction et l'ampleur de tous les effets observés dans les différentes études.
Résultats: Ont été inclus deux essais contrôlés à répartition aléatoire et neuf études de cohorte prospectives (3 711 patients au total). En comparant la DP à l'HDC, cinq des neufs études rapportaient des différences significatives ($P<0,05$) favorisant la DP dans plusieurs aspects de la QDV, notamment quant au « score de la composante physique », au « rôle du score de la composante sociale », à « l'état cognitif », à la « limitation dans les activités quotidiennes en raison des aspects émotionnels », à la « limitation dans les activités quotidiennes en raison des aspects physiques », à la « douleur physique », au « fardeau de la néphropathie », aux « conséquences de la néphropathie sur la QDV », aux « symptômes/problèmes », à la « fonction sexuelle », aux « conséquences financières » et à la « satisfaction du patient ». En revanche, trois de ces études montraient des différences statistiquement significatives ($P<0,05$) favorisant l'HDC dans les aspects suivants: « limitation dans les activités quotidiennes en raison des aspects physiques », « état de santé général », « soutien du personnel soignant », « qualité du sommeil », « soutien social », « état de santé », « interactions sociales », « image corporelle » et « état de santé global ». En comparant l'HDD et l'HDC, des différences significatives ($P<0,05$) favorisant l'HDD ont été rapportées en ce qui concerne « l'état de santé général », le « fardeau de la néphropathie » et l'échelle visuelle analogique.
Limites: L'étude est limitée par la faible taille des échantillons des études incluses, ainsi que par l'hétérogénéité des populations et des échelles validées pour la mesure de la QDV, ce qui restreint les comparaisons entre les études.
Conclusion: Des différences significatives touchant certains aspects propres à la qualité de vie ont été observées entre les différentes modalités de dialyse. Ces observations pourraient orienter une prise de décision en fonction des priorités individuelles des patients.

Keywords
health-related quality of life, quality of life, dialysis choice, dialysis, peritoneal dialysis

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What was known before

Quality of life (QOL) measures are a key patient-reported outcome and may facilitate decision-making when choosing dialysis modalities. As direct comparisons of QOL between the different dialysis modalities are difficult due to inherent differences between the 2 groups, QOL changes over time may be more informative.

What this adds

In this systematic review, we synthesized the literature on QOL differences between the various dialysis modalities focusing on changes over time. Examining 11 studies with a total of 3711 patients, we identified a number of specific QOL domains that changed over time between the different dialysis modalities.

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Impact

The identified differences in specific quality of life domains between dialysis modalities may aid in patient decision-making based on individual priorities.

Background

There are an increasing number of patients globally requiring chronic dialysis for the treatment of end-stage kidney disease (ESKD), with in-center hemodialysis (ICHD), and peritoneal dialysis (PD) remaining the most common modalities. Despite the discordant uptake of ICHD over home dialysis modalities, limited empirical evidence to date suggests that clinical outcomes, such as survival, are comparable between groups.[1,2] Clinical studies examining outcomes have proven to be difficult as autonomous patients often have a preference among offered dialysis modalities and so are reluctant to consent to being randomized. As a consequence, most of the evidence is based on observational data with its inherent limitations, the most prominent being confounding by treatment indication (patients who choose home dialysis modalities are healthier, on average).[3] As high-quality evidence guiding the selection of the optimal dialysis modality is lacking, decision-making regarding dialysis modality should incorporate other metrics, particularly patient-reported outcome measures (PROMs) such as quality of life (QOL) and patient satisfaction.[4,5] Of concern, it has been suggested that dialysis modality selection process may not accurately reflect patient choice.[4] Recent policy changes in the United States (The Advancing American Kidney Health Executive Order) have acknowledged existing barriers to home dialysis utilization and employed a series of incentives to reduce ICHD. From a health provider perspective, there are clear cost-related differences in the dialysis modalities, with home modalities being more cost effective than in-center dialysis delivery.[6,7]

As patients on the various dialysis modalities often differ significantly in terms of demographics, comorbidities, motivation, and functional status, direct comparisons in QOL outcomes between patient groups become problematic. However, comparisons of the change in QOL over time among similar patients on different dialysis modalities may provide unique and novel insights on the impact of dialysis modality on PROMs. We updated a systematic review originally conducted by the Canadian Agency for Drugs and Technologies in Health (CADTH)[8,9] as a broader health technology assessment focusing specifically on within individual changes in QOL between the various dialysis modalities.

Methods

We conducted a systematic review update in accordance with the Preferred Reporting Items for Systematic Reviews (PRISMA) statement. A flow chart reflecting the study selection for the primary outcome (ie, QOL-related research questions) is outlined in Figure 1. This study is an updated systematic review focusing on a specific objective of an original broader CADTH health technology assessment on dialysis modalities that included evidence synthesis of clinical outcomes, economic analysis, and patient perspectives.[8,9]

Data Sources and Searches

In brief, the original CADTH report searched the following bibliographic databases: MEDLINE via Ovid; Embase via Ovid; the Cochrane Database of Systematic Reviews, the Database of Abstracts of Reviews of Effects (DARE), and the Cochrane Central Register of Controlled Trials via Ovid; Cumulative Index to Nursing and Allied Health Literature (CINAHL) via EBSCO; and PubMed for relevant studies.[8,9] The search strategy used both MeSH terms and keywords (for full details see the published protocol[9]). The original search was limited to documents published since January 1, 2000 and the updated search was limited to additional publications from January 1, 2016 to December 31, 2019. The main search concepts were *home dialysis, peritoneal dialysis*, and *self-care in-center dialysis.* The search was limited to English- or French-language publications and excluded conference abstracts.

Study Selection Criteria and Research Questions

We included comparative studies that included adults (≥18 years) with ESKD of any cause who were prescribed dialysis treatment (either as lifetime treatment or bridge to transplant) and that included the comparison of interest with respect to the primary outcome, that is, within individual repeat measures of QOL using a standardized tool (generic or dialysis-specific). We performed 5 comparisons in total as follows: (1) PD vs ICHD; (2) home hemodialysis (HHD) vs ICHD; (3) HHD modalities compared with one another, including nocturnal, short-daily, and conventional home hemodialysis (CHHD); (4) HHD vs PD; and (5) self-care ICHD vs traditional nurse-based ICHD.

Included studies were required to report the primary outcome of within individual repeat measures of QOL. Minimal clinically important differences (MCID) were extracted and reported as defined by the original study authors. Two reviewers independently screened titles and abstracts of all citations retrieved from the literature search relevant to Research Questions, followed by an independent review of the full-text articles with subsequent discussion and consensus of excluded and included studies. A single reviewer extracted data from each paper, and a second reviewer checked the extracts for accuracy. Disagreements between extractor and reviewer were resolved through discussion, involving a third reviewer, if necessary.

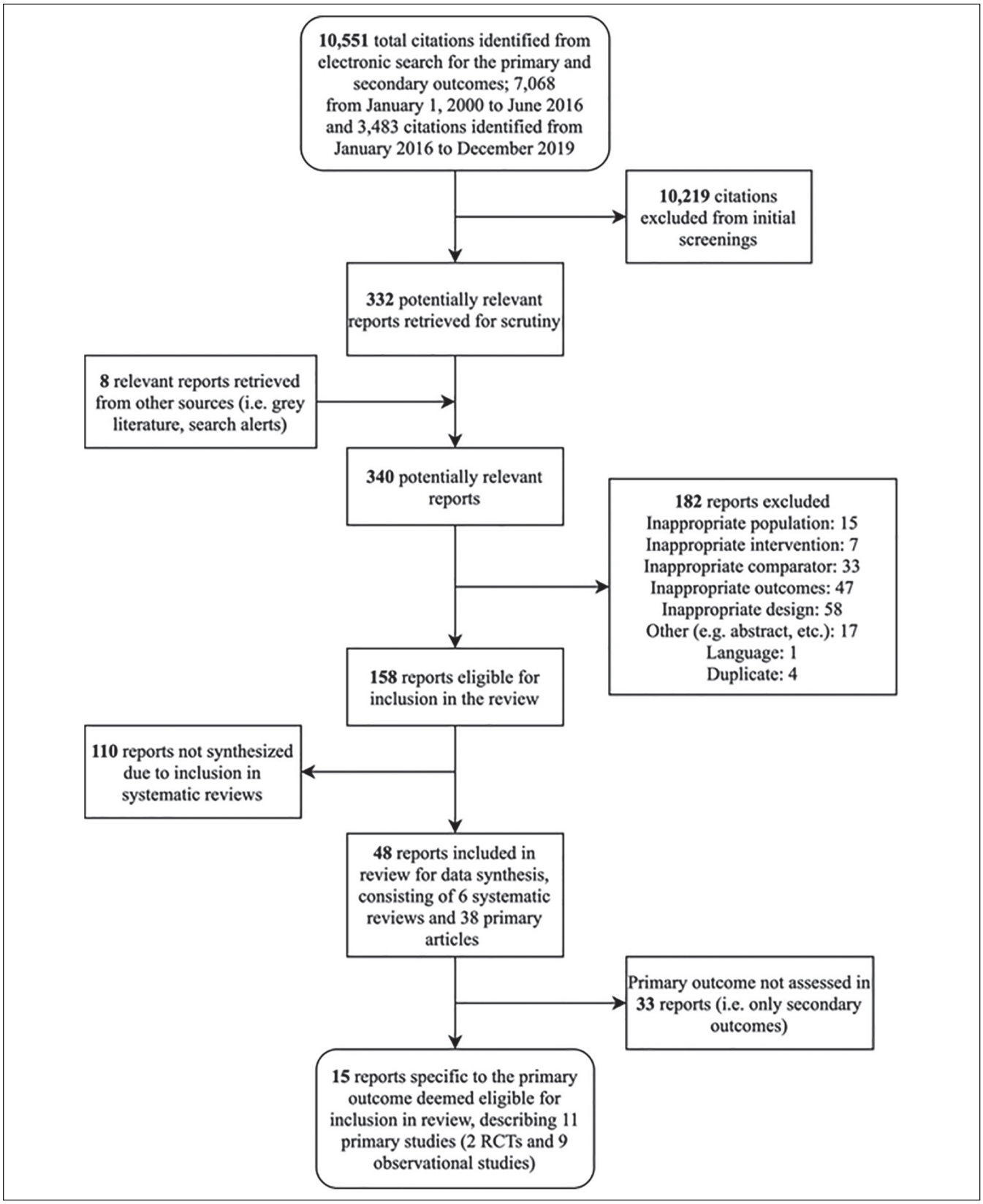

Figure 1. Flow diagram showing selection of studies.

Data Extraction and Quality Appraisal

A priori, it was planned to treat the different prescriptions of HD (ICHD, short-daily HD, and nocturnal HD) as distinct. When studies did not specify the HD modality used, it was assumed to be ICHD. In the absence of other forms of heterogeneity, it was planned to pool continuous ambulatory peritoneal dialysis (CAPD) and automated peritoneal dialysis (APD) as a single group receiving PD. The following data were extracted by a single reviewer from the original CADTH report and any articles identified in the updated search: study design; inclusion and exclusion criteria for patients; method of assigning patients to treatment groups; details of intervention and control; setting and type of assistance with dialysis; number of patients in each group; demographic and clinical information for patients; relationship and demographics for carers; QOL measures, QOL measurement, scale and domain, and minimally clinical important difference, if reported. No formal assessment of inter-rater agreement was used. The methodological quality of included randomized controlled trials (RCTs) and nonrandomized studies was evaluated using the Scottish Intercollegiate Guidelines Network (SIGN 50) checklist for controlled trials for internal validity and overall assessment. For all study types, an overall rating of "High Quality" (++), "Acceptable" (+), "Low Quality" (−), and "Unacceptable—reject" was assigned to the study as recommended by SIGN and based on the reviewers' confidence regarding the attempt to minimize bias, accompanied by an overall evaluation of the methodology used, the statistical power of the study, and level of certainty that the overall effect observed is because of the study intervention.[8] Primary studies were not excluded on the basis of quality appraisal, though quality was considered in formulating conclusions regarding strength of evidence and risk of bias.[8,9]

Data Synthesis and Analysis

A narrative synthesis was conducted, presenting findings within summary tables and texts, and describing study and clinical characteristics believed to contribute to heterogeneity, as determined during our exploration of the data. The aim was to synthesize the direction and size of any observed effects across studies in the absence of a meta-analysis.

Results

Selection and Description of Studies

We identified 10 551 studies prior to initial full-text screening. Of these, 15 papers describing 11 primary studies, assessing a total of 3711 patients, were included (see Figure 1) for the primary outcome (ie, QOL) of the 5 research questions. The original CADTH report included 7 studies with the literature update adding 4 studies.[10-13] Of the included 8 primary studies, 2 were RCTs (described by 6 articles)[14-19] and 9 were nonrandomized studies of prospective cohorts[10-13,20-24] (see Table 1). Nine of the studies compared PD with ICHD,[10-13,20-24] 1 compared nocturnal home hemodialysis (NHHD) with ICHD,[18,19] and 1 compared NHHD with CHHD.[14-17] The mean patient ages between studies ranged from 51.6 to 77 (see Table 2).

PD vs ICHD

Nine nonrandomized studies were retrieved that compared PD and ICHD for QOL and met eligibility criteria, with sample sizes ranging from 75 to 1041 patients.[10-13,20-24] These studies reported on various patient scales, including Short-Form 36 (SF-36) which incorporates the Short-Form 12 (SF-12), Kidney Disease Quality of Life (KDQOL), CHOICE Health Experience Questionnaire (CHEQ), EuroQOL-5D-3L, visual analogue scale (VAS), Index Score (IND), Hospital Anxiety and Depression Scale (HADS), Symptoms score, Barthel score, the Illness Intrusive Rating Scale (IIRS), and the Renal Treatment Satisfaction Questionnaire (RTSQ). The QOL measurements, measurement technique, and statistical significant domains are presented in Table 3.

Eight studies employed SF-36 at multiple time points between baseline and 24 months with absolute mean scores at various time points[10,12,13,20-22,24] described in Supplementary Tables 1 and 2. Data are also presented as "same/better/worse" from baseline to 12 months,[20,23] as seen in Supplementary Table 3. When comparing ICHD and PD for specific SF-36 QOL domains over time, significant differences emerged. Using the SF-36, 2 studies demonstrated significant differences ($P < .05$) favoring PD over time, with one study reporting improvements in emotional functioning, physical functioning, and bodily pain,[21] and the other reporting improvements in the physical component score and the role of social component score.[10] Conversely, one study significantly ($P < .05$) favored ICHD over time in the domains of physical functioning and general health[20] (Table 3). One study noted significant domain-specific differences over time within a specific dialysis modality (ie, PD or ICHD), but these differences were no longer significant when comparing the changes in QOL between the 2 modalities.[12]

Six studies employed the KDQOL scale at multiple time points between baseline and 24 months with absolute mean scores at various time points,[11,12,21,22,24] described in Supplementary Table 4. Data are also presented as "same/better/worse" from baseline to 12 months[23] (Supplementary Table 5). Certain QOL domains in the KDQOL demonstrated statistical significance ($P < .05$) favoring PD over time, including cognitive status and patient satisfaction in one study,[23] and burden of kidney disease, effects of kidney disease on daily life, symptoms, and sexual function in another.[21] Conversely, other QOL domains statistically ($P < .05$) favored ICHD over time, including the following domains as reported by one study: support from staff, sleep quality, social support, health status, and social interaction[23] (Table 3).

Table 1. Study Characteristics of Included Studies.

Study Country Study design	Stated study objective	Name of trial/registry Years of recruitment Length of follow-up	Funding source Author conflicts	Dialysis modalities Total no. of patients (N) Incident or prevalent patients	Inclusion/exclusion criteria	Primary/secondary outcomes of interest	Analytic model Model covariates
Culleton et al[18] and Manns et al[19] Canada RCT	Comparison of frequent nocturnal HD vs conventional HD on changes in left ventricular mass and HRQOL over 6 mo	Trial name NR 2004-2006 Follow-up to Dec 2006	Funded by the Kidney Foundation of Canada Authors declare no conflict of interest	Nocturnal HHD, conventional HD N = 52 Prevalent patients	Inclusion: patients age ≥18 y, receiving in-center, self-care, or home conventional HD 3 times weekly, and interested in training for nocturnal HHD Exclusion: patients lacking the mental or physical capacity to train for nocturnal HHD	Primary: Cognitive functioning	Intent-to-treat with last value carried forward approach; sensitivity analysis of using covariance (ANCOVA) Covariates: ANCOVA model: 6-mo value was the dependent variable, and baseline value was the covariate
de Abreu et al[23] Brazil Prospective cohort	Comparison of the QOL in patients on HD or PD in Brazil	Trial name NR 2007-2009 12 mo follow-up	Funded by Baxter Healthcare Corp One author employed by Baxter	PD, HD N = 350 Prevalent patients	Inclusion: Patients at one of 6 dialysis centers, aged ≥18 y who had been on the same dialysis modality for at least 1 mo Exclusion: hospitalized patients and those who planned to change modality within 6 mo	Primary: HRQOL Secondary: NR	Multivariate regression to compare influence of dialysis modality on QOL for the 3 time periods and from baseline to 12 mo Covariates: included demographics, comorbidities, lab values, time receiving dialysis, type of health insurance (public or private)
Frimat et al[21] France Prospective cohort	Comparison of in patients contra-indicated for kidney transplant, who were only on HD and those given PD as a first RRT	Epidémiologie de l'insuffisance renale chronique terminale en Lorraine (EPIREL) 1997-1999 13-24 mo follow-up	Govt funding Author declare no conflict of interest NR	PD, ICHD N = 387 (321 for QOL analysis) Incident patients	Inclusion: Patients with kidney failure, living in Lorraine France for ≥3 mo, and began RRT between June 1997 and June 1999 Exclusion: patients with acute reversible renal failure or those returning to dialysis following kidney graft failure; age <15 y	Primary: mortality Secondary: HRQOL, hospitalization	Multivariate analysis for analysis of variance and covariance Covariates: age, sex, comorbidity index, first dialysis session (planned vs unplanned)
Harris et al[24] UK Prospective cohort	Comparison of the effect of dialysis modality on in elderly patients on PD vs HD	North Thames Dialysis Study (NTDS) 1995-1996 12 mo follow-up	Govt funding Author no conflict of interest NR	PD, ICHD N = 174 Incident and prevalent patients	Inclusion: patients aged ≥70 y, with 90 days of uninterrupted chronic dialysis Exclusion: patients with terminal illness with life expectancy of <6 mo; diagnosis of psychosis; cognitive impairment	Primary: survival, hospitalization, QOL Secondary: NR	Cox proportional hazards models, Poisson regression models, multiple linear regression analyses Covariates: study cohort, time on dialysis, age, sex, social class (manual or nonmanual occupation), and comorbidity

(continued)

Table 1. (continued)

Study Country Study design	Stated study objective	Name of trial/registry Years of recruitment Length of follow-up	Funding source Author conflicts	Dialysis modalities Total no. of patients (N) Incident or prevalent patients	Inclusion/exclusion criteria	Primary/secondary outcomes of interest	Analytic model Model covariates
Manns et al[22] Canada Prospective cohort	Comparison of HRQOL in patients receiving HD or PD	Name of trial NR 1999-1999 12-mo follow-up	Govt funding Various authors work for university or the Institute of Health Economics (Alberta)	PD (continuous ambulatory peritoneal dialysis and cyclic PD), HD (ICHD, satellite, home or self-care; 71.5% ICHD) N = 192 Prevalent patients (>6 mo)	Inclusion: patients on HD or PD for >6 mo Exclusion: dementia, inability to speak English, unwilling or unable to complete HRQOL questionnaires	Primary: HRQOL Secondary: NR	Multiple linear regression Covariates: NR
Rocco et al[15] Rocco et al[14] Unruh et al[17] Unruh et al[16] Canada and USA RCT with prospective cohort extension study	Comparison of frequent nocturnal HHD 6 times per week with conventional 3 times per week HD	Frequent Hemodialysis Network (FHN) Nocturnal Trial 2006-2009 Follow-up to May 2010, with extension to Jul 2011	Funded by National Institute of Health, National Institutes Diabetes, Digestive and Kidney Diseases (NIDDK), Center for Medicare and Medical Services (CMS) Several authors have affiliations with industry	Conventional HHD (3 times/wk; <5 h/session), nocturnal HHD (6 times/wk; ≥6 h/session) N = 87 (extension study N = 83 at 1 y and N = 70 at 2 y) Prevalent patients	Inclusion: Patients age ≥18 y with kidney failure, who achieved mean dialysis adequacy measurement of ≥1.0 for last 2 baseline HD sessions Exclusion: current requirement for HD more than 3 times/wk; GFR >10 mL/1.73 m^2, <3 mo since kidney transplant failure, life expectancy <6 mo	Primary: all-cause mortality/survival Secondary: hospitalization, self-reported depression, transplant, adverse events, technical adverse events	Log-rank test, Cox proportional hazards regression Covariates: diabetes, age and baseline GFR (for time to death, first nonaccess hospitalization/death, and first access intervention)
Wu et al[20] USA Prospective cohort	Comparison of self-reported HRQOL and overall health status for HD and PD patients at the initiation of dialysis therapy and after 1 y	Choices for Healthy Outcomes in Caring for kidney failure (CHOICE) 1995-1998 12-mo follow-up	Funded by govt agencies One author is supported by one of the govt agencies	PD, ICHD N = 928 (585 completed 12-mo questionnaire) Incident patients	Inclusion: age ≥18 y, initiating dialysis Exclusion: HHD patients	Primary: HRQOL Secondary: NR	Intention-to-treat; difference in modalities compared using *t* tests (unadjusted) or Wald test (adjusted) Covariates: age, sex, race, education, albumin, creatinine, hematocrit, and Index of Co-existent Disease (ICED) score
Hiramatsu et al[10] Japan Prospective cohort study	Comparison of HRQOL over time for HD and PD patients at time of initiation, 12 mo, and 24 mo	Name of trial NR October 2013—December 2016 2-y follow-up	No conflict of interest to disclose	PD, ICHD N = 75 (56 completed 24-mo questionnaire) Incident patients	Inclusion: Patients with kidney failure referred for RRT who independently chose PD or HD. Exclusion: Patients unable to answer the questionnaire themselves	Primary: HRQOL Secondary: Depressive state, grip strength, cognitive impairment 24-hour urine volume	Data between groups analyzed with Student *t* test, Mann-Whitney *U* test or χ^2 square test. Treatment and times were included as main effects for repeated measured variables with treatment × time used as an interaction and analyzed with the linear mixed model using compound symmetry covariance pattern. Covariates: Age, sex, comorbidities, lab values

(continued)

Table 1. (continued)

Study Country Study design	Stated study objective	Name of trial/registry Years of recruitment Length of follow-up	Funding source Author conflicts	Dialysis modalities Total no. of patients (N) Incident or prevalent patients	Inclusion/exclusion criteria	Primary/secondary outcomes of interest	Analytic model Model covariates
Neumann et al[11] Germany Prospective cohort study	Comparison of KDQOL domain of cognitive functioning over time for HD and PD patients at time of initiation and 12 mo	Choice of Renal Replacement Therapy (CORETH) Project May 2014—May 2015 12-mo follow-up	CORETH project funded by German Federal Ministry of Education and Research	PD, ICHD N = 271 Prevalent patients	Inclusion: Patients ≥18 y among 55 dialysis units in Germany, initiated on dialysis 6 to 24 mo prior to baseline evaluation Exclusion: Patients unable to understand or answer the questionnaire themselves, and patients with acute psychiatric symptoms	Primary: HRQOL Secondary: NR	Treatment and times were included as main effects for repeated measured variables with treatment × time used as an interaction and analyzed with the linear mixed modeling with maximum likelihood estimation Covariates: Age, education level, employment status, comorbidities
Jung et al[12] South Korea Prospective cohort study	Comparison of HRQOL over time for HD and PD patients at time of initiation, 3-, 12- and 24 mo, and 24 mo	Comprehensive Prospective Study for Mode of Dialysis Therapy and Outcomes in ESRD July 2009 to September 2018 2-y follow-up	Grant from the Korea Health Technology R&D Project through the Korea Health Industry Development Institute	PD, ICHD N = 989 (who completed 3-mo questionnaire, 2492 completed 12-mo questionnaire, and 262 completed 24-mo questionnaire) Incident patients	Inclusion: Patients ≥19 y with ESRD able to give informed consent who are initiating dialysis in South Korea Exclusion: Patients scheduled for kidney transplant or emigration to foreign country within 3 mo. Patients with acute renal failure	Primary: HRQOL Secondary: Associated factors related to persistently impaired HRQOL	Baseline markers were compared using Pearson χ^2 square test or Fisher exact test for categorical variables and using the Student *t* test for continuous variables. Differences in questionnaire scores at each time point between dialysis modality were analyzed from adjusted regression analyses. Effects of dialysis modality, time, and their interaction required repeated measures ANOVA Covariates: Age, sex, body mass index, education, employment, marital status, lab values, primary cause of renal disease
Iyasere et al[13] United Kingdom Prospective cohort study	Comparison of HRQOL over time for HD and PD patients at time of initiation and every 3 mo for 2 y	Name of trial NR September 2011 to December 2013 2-y follow-up	One author received speaking honoraria and research funding from Baxter Healthcare	PD, ICHD N = 206 Prevalent patients	Inclusion: Patients ≥60 y who had been on dialysis >3 mo and free of hospital admission >30 d Exclusion: Patients with life expectancy <6 mo, dementia, inability to understand English, or lack of informed consent	Primary: HRQOL Secondary: NR	Categorical variables were compared between the HD and PD cohorts using Fisher exact tests. Continuous variables were compared at baseline, using the Mann-Whitney test. A linear mixed model approach was used to evaluate the marginal effects of risk factors or covariates for each outcome measure. Covariates: Age, sex, ethnicity, comorbidities

Note. RCT = randomized controlled trial; HD = hemodialysis; HRQOL = health-related quality of life; HHD = home hemodialysis; QOL = quality of life; PD = peritoneal dialysis; NR = not reported; ICHD = in-center hemodialysis; RRT = renal replacement therapy; govt = government; GFR = glomerular filtration rate; ESRD = end-stage renal disease.

Table 2. Patient Characteristics of Included Studies.

Study	Dialysis modality	Number of patients	Age, mean (±SD)	Male, No. %	Frequency and no. of h of dialysis	Vascular access	Comorbidities, No. %	Duration of dialysis at start of study; RRF
Culleton et al[18] Manns et al[19]	Frequent nocturnal HHD	26	55.1 (12.4)	18 (69%)	5-6 sessions/wk; minimum 6 h/night	Arteriovenous fistula: 15 (58%); tunneled dialysis catheter: 7 (27%); AV graft: 4 (15%)	CVA 5 (19%); IHD 10 (38%); CHF 6 (23%); PVD 4 (15%); diabetes 10 (38%)	Duration at start of study: mean 5.5 y RRF NR
	Conventional HD	25	53.1 (13.4)	14 (56%)	3 sessions/wk	AV fistula: 14 (56%); tunneled dialysis catheter: 6 (24%); AV graft: 5 (20%)	CVA 3 (12%); IHD 10 (40%); CHF 5 (20%); PVD 4 (16%); diabetes 11 (44%)	Duration at start of study: mean 4.8 y RRF NR
de Abreu et al[23]	PD	161	59.6 (13.8)	48.4%	NR	NR	CHD 83 (51.6%); cardiac arrhythmias 28 (17.4%); hypertension 147 (91.9%); CHF 28 (17.4%); PVD 18 (11.2%); stroke 19 (11.8%); cancer 5 (3.1%); diabetes 110 (68.3%)	Duration at start of study: mean 3.28 (SD ±1.78) y RRF NR
	HD	189	55.6 (14.8)	50.3%	NR	NR	CHD 106 (56.1%); cardiac arrhythmias 21 (11.6%); hypertension 159 (84.4%); CHF 28 (15.3%); PVD 20 (10.6%); stroke 14 (7.4%); cancer 5 (2.7%); diabetes 109 (57.7%)	Duration at start of study: mean 3.95 (SD ±2.18) y RRF NR
Frimat et al[21]	PD	184	70.8 (11.4)	58 (56.3%)	NR	NR	CHD 45 (43.7%); CHF 33 (32.0%); CVA 23 (22.3%); PVD 31 (30.1%); diabetes 38 (36.9%)	Duration NR (incident patients) RRF NR
	HD	284	67.6 (11.3)	170 (59.9%)	At 6 mo: 13.6/wk ±3.1 h; At 12 mo: 13.9/wk ± 3.8 h	NR	CHD 101 (35.6%); CHF 106 (37.3%); CVA 45 (15.9%); PVD 110 (38.7%); diabetes 111 (39.1%)	Duration NR (incident patients) RRF NR
Harris et al[24]	PD	78 (36 incident)	76.8 (4.0); range 70-91	55 (70%)	NR (majority of patients received continuous ambulatory PD)	NR	Reported as conditions (presence of diabetes, IHD, PVD, CVA, chronic obstructive pulmonary disease, or cancer) None: 19 (24%); 1 condition: 29 (37%); 2 or more conditions: 30 (39%)	Duration NR RRF NR
	ICHD	96 (42 incident)	77.0 (4.4); range 70-93	60 (62%)	NR	NR	None: 20 (21%); 1 condition: 32 (33%); 2 or more conditions: 44 (46%)	Duration NR RRF NR

(continued)

Table 2. (continued)

Study	Dialysis modality	Number of patients	Age, mean (±SD)	Male, No. %	Frequency and no. of h of dialysis	Vascular access	Comorbidities, No. %	Duration of dialysis at start of study; RRF
Manns et al[22]	PD	41	56.1 (95% CI 48.8-63.4)	20 (48.7%)	NR	NR	Diabetes 15 (36.6%)	Duration at start of study: median 23 mo (IQR: 10-42) RRF NR
	HD	151	62.2 (95% CI 59.2-65.3)	87 (57.6%)	3 sessions/wk for ≥4 h	NR	Diabetes 36 (23.8%)	Duration at start of study: median 22 mo (IQR: 9-44) RRF NR
	Intensive HHD	375	49.8 (15.7)	291 (78%)	≥5 sessions/wk; any h/session	NR	PVD 82 (22%); CVA 31 (8%); lung disease 56 (15%); coronary artery disease 116 (31%); type 1 diabetes 11 (3%); type 2 diabetes 120 (32%)	Duration NR RRF: estimated glomerular filtration rate (mL/min/1.73 m²), median 5.3 (IQR: 3.5)
Rocco et al[15] Rocco et al[14] Unruh et al[17] Unruh et al[16]	Nocturnal HHD	45	51.7 (14.4)	29 (64%)	Mean 5.06 (SD ±0.80) sessions/wk; session time mean 379 (SD ±62) min; total time mean 30.8 (SD ±9.1) h/wk	Fistula 49%; synthetic graft 7%; catheter 44%	PVD 8 (18%); chronic pulmonary disease 2 (4%); stroke/CVA 1 (2%); heart failure 5 (11%); MI 5 (11%); hypertension 41 (91%); diabetes 19 (42%)	Duration NR RRF (urea clearance in mL/min): Anuric = 29%; >0-1 =16%; >1-3 = 36%; >3 +20%
	Conventional HHD	42	54.0 (12.9)	28 (67%)	Mean 2.91 (SD ±0.21) sessions/wk; session time mean 256 (SD ±65) min; total time mean 12.6 (SD ±3.9) h/wk	Fistula 41%; synthetic graft 10%; catheter 50%	PVD 7 (17%); chronic pulmonary disease 2 (5%); stroke/CVA 1 (2%); heart failure 7 (17%); MI 4 (10%); hypertension 39 (93%); diabetes 18 (43%)	Duration NR RRF (urea clearance in mL/min): Anuric = 26%; >0-1 = 21%; >1-3 = 33%; >3 = 19%
Wu et al[20] reporting baseline data of total cohort, as this study was ITT. There is also data for 1-y cohort	PD	230	54	125 (54%)	NR geographical location data also available (ie, urban or rural)	NR	ICED 1-2: 111 (48%) 2: 60 (26%) 3: 59 (26%)	Duration NR RRF NR
	ICHD	698	59	366 (52%)	NR	NR	ICED 1-2: 217 (31%) 2: 270 (39%) 3: 210 (30%)	Duration NR RRF NR

(continued)

Table 2. (continued)

Study	Dialysis modality	Number of patients	Age, mean (±SD)	Male, No. %	Frequency and no. of h of dialysis	Vascular access	Comorbidities, No. %	Duration of dialysis at start of study; RRF
Hiramatsu et al[10]	ICHD	22	66.6 (8.4)	13 (59%)	NR	NR	Diabetes 8 (36%)	Duration NR (incident patients) RRF (mean urine volume mL/d): Baseline: 820.0 12 mo: 275.0 24 mo: 85.0
	PD	34	63.1 (11.0)	23 (68%)	NR	NR	Diabetes 11 (32%)	Duration NR (incident patients) RRF (mean urine volume mL/d): Baseline: 800.0 12 mo: 500.0 24 mo: 352.0
Neumann et al[11]	ICHD	163	57.0 (15.0)	118 (72%)	NR	NR	Neurological/CVA disease 6 (4%) Psychotropic drug intake 31 (19%)	Duration at start of study, mean 14.8 mo RRF NR
	PD	108	56.0 (14.7)	71 (66%)	NR	NR	Neurological/CVA disease 7 (6%) Psychotropic drug intake 14 (13%)	Duration at start of study, mean 14.8 mo RRF NR
Jung et al[12]	ICHD	652	56.6 (13.5)	409 (63%)	NR	NR	Diabetes 407 (62%)	Duration NR (incident patients) RRF (mL/min/1.73 m^2) 3 mo: 10.7 12 mo: 5.7 24 mo: 4.2
	PD	337	51.6 (12.8)	201 (59.4%)	NR	NR	Diabetes 165 (49%)	Duration NR (incident patients) RRF (mL/min/1.73 m^2) 3 mo: 11.1 12 mo: 5.8 24 mo: 4.2
Iyasere et al[13]	ICHD	100	75 (IQR 69-80)	57 (57%)	NR	NR	Diabetes 47 (47%); IHD 58 (58%); LVD 20 (20%); PAD 23 (23%); Malignancy 23 (23%); systemic collagen vascular disease 5 (5%)	Duration at start of study, median 29 mo RRF NR
	PD	106	76 (IQR 69-81)	41 (39%)	NR	NR	Diabetes 56 (53%); IHD 45 (42%); LVD 23 (22%); PAD 29 (28%); Malignancy 13 (12%); systemic collagen vascular disease 4 (4%)	Duration at start of study, median 24 mo RRF NR

Note. RRF = residual renal function; HHD = home hemodialysis; AV = arteriovenous; IHD = ischemic heart disease; CHF = congestive heart failure; PVD = peripheral vascular disease; NR = not reported; HD = hemodialysis; PD = peritoneal dialysis; CHD = coronary heart disease; CI = confidence interval; IQR = interquartile range; CVA = cerebrovascular accident; MI = myocardial infarction; ICED = Index of Co-existent Disease; ICHD = in-center hemodialysis; LVD = left ventricular dysfunction; PAD = peripheral artery disease.

One study used the EuroQOL-5D-3L standardized instrument—incorporating the VAS and the IND—to study changes from baseline to 6 and 12 months (Supplementary Table 6).[22] Using this scale, no significant differences were identified in either dialysis group.

One study used the CHEQ to examine mean domain scores from baseline to 12 months as an absolute score, as well as via changes in domains scores as reported by percentage of patients that were "same," "better," or "worse" (Supplementary Table 7).[18] Using this questionnaire, significant differences over time favoring PD were present in the domain of finance, while domains significantly favoring ICHD included sleep and body image (Table 3).

Finally, one study employed multiple scores to evaluate QOL over time between ICHD and PD from 3 to 24 months over 3-month intervals (Supplementary Table 8), including the HADS, Symptoms score, Barthel score, IIRS, and the RTSQ.[13] None of these QOL scales demonstrated consistently statistically significance at 3-month intervals up to 24 months.

HDD vs ICHD

Comparing HDD and ICHD, one small RCT (n = 52) met eligibility criteria, comparing NHHD with ICHD from baseline and prerandomization to 6 months[18,19] (Table 4). This study demonstrated no significant differences between groups using the EQ-5D-3L version questionnaire (mean difference = 0.05, 95% CI = −0.07 to 0.17) score after 6 months, where higher scores in the scale reflect better QOL (summarized in Supplementary Tables 9 and 10). However, using the VAS of the EQ-5D-3L, a clinically significant difference favoring NHHD was an MCID as defined by a >10-point change. Using the SF-36 and KDQOL scales, no significant differences at baseline in any QOL domains were found. However, after 6 months, there were significant improvements favoring NHHD over ICHD in the domains of "general health" per the SF-36 (mean difference = 12.82, 95% CI = 2.88-22.77) and "burden of kidney disease" per the KDQOL (mean difference = 10.70, 95% CI = 2.42-18.99) scales.

CHDD vs NHDD

One RCT (n = 87)—the Frequent Hemodialysis Network (FHN) Nocturnal Trial—compared QOL between NHHD (6 times per week, ≥6 hours per session) and CHHD (3 times per week, <5 hours per session) from baseline to 12 months (Table 5).[14-17] Using the SF-36 scale, the Beck Depression Inventory, and the Sleep Problems Index, there were no significant improvements in any of the component scores after 12 months in either the NHHD or CHHD groups (summarized in Supplementary Table 11). Calculated mean differences between groups demonstrated no significant differences when compared with each other, with the greatest nonsignificant difference in "energy/fatigue" favoring NHHD (mean difference = 7.2, 95% CI = −3.1 to 17.5). Notably, the NHHD group saw relatively better outcomes in all 5 measured SF-36 domains as compared with CHHD, but relatively worse outcomes in the "Sleep Problems Index" and "Beck Depression Inventory."

PD vs HHD, Self-Care ICHD vs Traditional ICHD

No primary studies comparing PD with HHD or self-care ICHD with traditional ICHD for the endpoint of quality of life were found that met eligibility criteria.

Quality of Studies

The 2 RCTs and 9 observational studies were, on majority, of adequate quality. The RCTs were generalizable and well conducted with the following limitations noted: both included less than 100 patients and the intervention was unable to be blinded to patients or caregivers. Dialysis modality assessment for individual patients would be reliable, and for the outcome of interest, standardized QOL scales were used. The time between repeat QOL measures was variable and not all covariates of interest may have been captured; therefore, residual confounding could not be excluded. Finally, no correction for multiple testing was performed and some of the detected differences in individuals' QOL domains may arise by chance.

Discussion

In this systematic review, we synthesized the results of published studies that used validated PROMs with a specific emphasis on changes in QOL over time to aid in clinical decision-making regarding optimal dialysis modality. We found no consistent differences in QOL measures comparing home dialysis modalities (ie, HHD or PD) with ICHD; however, differences in distinct QOL domains emerged when comparing these groups over time. Comparing ICHD with PD using multiple validated QOL scales, ICHD was associated with significantly improved outcomes in the domains of "role limitation due to physical function," "general health," "support from staff," "sleep quality," "social support," "health status," "social interaction," "body image," and "overall health." However, PD was associated with significantly better outcomes in "physical component score," "role of social component score," "cognitive status," "role limitation due to emotional function," "role limitation due to physical function," "bodily pain," "burden of kidney disease," "effects of kidney disease on daily life," "symptoms/problems," "sexual function," "finance," and "patient satisfaction." Comparing ICHD with HHD, HHD was associated with statistically significant improvements in "burden of kidney disease," "general health," and these differences achieved a minimally clinically important difference threshold compared with ICHD after 6 months. No

Table 3. Summary of Quality of Life Changes Comparing PD With In-Center Hemodialysis (ICHD) With Measures of Statistical (*P* Value).

Study	QOL scale	QOL measurement	QOL domain	ICHD value	PD value	*P* value
de Abreu et al[23]	KDQOL	Percentage of patients reporting "better" or "worse" from baseline to 12 mo	Encouragement/support from staff	21.3% better	13.0% better	$P = .0416$ favoring ICHD
			Sleep quality	39.6% better	28.6% better	$P = .0360$ favoring ICHD
			Social support	24.3% better	13.8% better	$P = .0134$ favoring ICHD
			Health status	36.2% better	23.8% better	$P = .0120$ favoring ICHD
			Cognitive status	54.3% worse	39.1% worse	$P = .0045$ favoring PD
			Overall improvement (stated in study)			$P = .004$ favoring ICHD
		Multivariate regression analysis from baseline to 12 mo	Social interaction (stated in study)	ICHD-PD = 4.86		$P = .0275$ favoring ICHD
			Patient satisfaction (stated in study)	PD-ICHD = 4.85		$P = .0285$ favoring PD
Frimat et al[21]	SF-36	Improvement in score from baseline	Role limitation due to physical function	+12.1 at 6 mo +9.2 at 12 mo	+22.8 at 6 mo +21.2 at 12 mo	$P < .05$, favoring PD
			Role limitation due to emotional function	+7.4 at 6 mo +8.5 at 12 mo	+27.3 at 6 mo +31.0 at 12 mo	$P < .05$, favoring PD
			Bodily pain	+6.7 at 6 mo +3.1 at 12 mo	+14.7 at 6 mo +10.7 at 12 mo	$P < .05$, favoring PD
	KDQOL	Improvement in score from baseline	Burden of Kidney Disease	−3.0 at 6 mo −3.7 at 12 mo	+13.7 at 6 mo, +10.8 at 12 mo	$P < .01$, favoring PD
			Effects of kidney disease on daily life	−3.8 at 6 mo −5.1 at 12 mo	+7.8 at 6 mo +5.5 at 12 mo	$P < .05$, favoring PD
			Symptoms/ problems	+3.1 at 6 mo +1.2 at 12 mo	+6.8 at 6 mo +7.0 at 12 mo	$P < .01$, favoring PD
			Sexual function	−7.8 at 6 mo −10.2 at 12 mo	+2.7 at 6 mo, +17.0 at 12 mo	$P < .05$, favoring PD
Harris et al[24]	KDQOL, SF-36	Calculated mean differences (95% CI) for PD-ICHD				No significant differences after 12 mo
Manns et al[22]	KDQOL, SF-36, EuroQOL	Improvement in score from baseline				No significant differences after 12 mo
Wu et al[20]	SF-36	Adjusted mean change from baseline to 1 y	Physical function	+0.4	−4.5	$P < .05$, favoring ICHD
			General health	+2.8	−1.0	$P < .05$, favoring ICHD
	Choice Health Equality Questionnaire dialysis domains	Adjusted mean change from baseline to 1 y	Sleep	+1.8	−5.6	$P < .05$, favoring ICHD
			Finance	−0.4	+6.2	$P < .05$, favoring PD
		Adjusted odds ratio (95% CI) on PD vs HD	Body image	0.57 (0.33 to 0.99)		$P < .05$, favoring ICHD
Hiramatsu et al[10]	SF-36	Mean improvement in score from baseline	Physical component summary	−1.4 at 12 mo, −3.1 at 24 mo	+6.1 at 12 mo, +3.4 at 24 mo	$P < .05$, favoring PD
			Role of social component summary	−5.6 at 12 mo, −7.1 at 24 mo	+9.5 at 12 mo, +9.1 at 24 mo	$P < .05$, favoring PD
Neumann et al[11]	KDQOL	Mean improvement in score from baseline within dialysis modality	Cognitive function			No significant differences after 12 mo
Jung et al[12]	KDQOL	Mean improvement in score from baseline to 24 mo within dialysis modality	Sexual function	−9.6		$P = .005$
			Sleep	−2.7		$P = .04$, significantly worsened in ICHD
			Patient satisfaction	−3.5		$P = .04$, significantly worsened in ICHD
			Burden of kidney disease		−5.3	$P = .009$, significantly worsened in PD
			Work status		−6.8	$P = .03$, significantly worsened in PD
		Changes in HRQOL over time between dialysis modalities from baseline to 24 mo	All components of KDQOL			No significant differences after 12- and 24 mos

(continued)

Table 3. (continued)

Study	QOL scale	QOL measurement	QOL domain	ICHD value	PD value	*P* value
	SF-36	Mean improvement in score from baseline to 24 mo within single dialysis modality	General health		−3.8	$P = .02$, significantly worsened in PD
			Emotional well-being		−3.4	$P = .02$, significantly worsened in PD
			Energy/fatigue		−3.1	$P = .04$, significantly worsened in PD
			Role-physical	10.4		$P = .002$, significantly improved in ICHD
		Changes in HRQOL over time between dialysis modalities from baseline to 24 mo	All components of SF-36			No significant differences after 12 and 24 mo
	Beck Depression Index	Changes in HRQOL over time between dialysis modalities from baseline to 24 mo				No significant differences after 12 and 24 mo
Iyasere et al[13]	Hospital Anxiety and Depression Scale Short-Form 12 Symptom score Illness Intrusiveness Rating Scale Barthel score Renal Treatment Satisfaction Questionnaire	Changes in HRQOL over time between dialysis modalities from 3 to 24 mo				No significant differences between dialysis modalities in any scoring system after 2 y

Note. PD = peritoneal dialysis; ICHD = in-center hemodialysis; QOL = quality of life; KDQOL = Kidney Disease Quality of Life; SF-36 = Short-Form 36; CI = confidence interval; HRQOL = health-related quality of life.

Table 4. Summary of Quality of Life Changes Over 6 Months Comparing NHHD to ICHD With Measures of Statistical (*P* Value) and MCID.

Study	QOL scale	QOL measurement	QOL domain	NHHD value	ICHD value	*P* value	MCID
Culleton et al[18] and Manns et al[19]	EuroQOL	Between-group mean difference (NHHD-ICHD) comparing baseline and 6 mo	Visual Analogue Score	NA		$P = .03$, favoring NHHD	>10-point change favoring NHHD
	Kidney Disease Quality of Life	Difference in QOL (NHHD-ICHD) comparing *prerandomization* and 6 mo (95% CI)	Burden of Kidney Disease	NHHD-ICHD = 10.70 (2.42, 18.99)		$P = .01$, favoring NHHD	
	Short-Form 36	Difference in QOL (NHHD-ICHD) comparing *prerandomization* and 6 mo (95% CI)	General Health	NHHD-ICHD = 12.82 (2.88, 22.77)		$P = .01$, favoring NHHD	

Note. NHHD = nocturnal home hemodialysis; ICHD = in-center hemodialysis; MCID = minimally clinical important difference; QOL = quality of life; CI = confidence interval.

significant differences were found comparing the specific HHD prescriptions over time. Finally, no studies were available comparing HHD with PD or conventional ICHD with "self-care" ICHD identifying areas of future investigation.

Between the 9 primary studies included in our systematic review comparing PD with ICHD, there were no consistent statistically significant differences in global QOL reported up to 24 months in either the PD or ICHD groups. However,

Table 5. Summary of Quality of Life Changes Comparing NHHD to CHHD Over 12 Months With Measures of Statistical (*P* Value) and MCID.

Study	QOL scale	QOL measurement	QOL domain	(F)NHHD value	CHHD value	*P* value	MCID
Unruh et al[17] and Unruh et al[16]	RAND-36 emotional subscale	Mean change in QOL scores from baseline to 12 mo (±SE)	Mental health composite	+3.0 ± 1.6	−0.7 ± 1.6	$P > .05$ for all 5 domains	Unspecified clinical significance—all 5 domains favor NHHD
			Emotional well-being	+3.3 ± 2.7	−2.0 ± 2.7		
			Role limitation due to emotional problems	+6.6 ± 5.4	+1.7 ± 5.5		
			Energy/fatigue	+3.1 ± 3.3	+0.1 ± 3.3		
			Social functioning	+7.5 ± 3.9	+0.3 ± 3.9		
	Sleep Problems Index	Mean change in QOL scores from baseline to 12 mo (±SE)		−2.0 ± 1.2	−0.4 ± 1.2	$P > .05$ for both domains	Unspecified clinical significance—both domains favor CHHD
	Beck Depression Index	Mean change in QOL scores from baseline to 12 mo (±SE)		−3.3 ± 2.8	+1.2 ± 2.8		

Note. NHHD = nocturnal home hemodialysis; ICHD = in-center hemodialysis; MCID = minimally clinical important difference; QOL = quality of life.

there were significant differences isolated in specific QOL domains when comparing the 2 dialysis prescriptions over time. It is important to recognize that this does not reflect the absolute scores in QOL domains at baseline and each time points, many of which favored PD over ICHD. This highlights the innovation of the present study: our systematic review compares changes in QOL over time between dialysis modalities rather than absolute measures, to circumvent the baseline variations of patient populations that undergo various dialysis treatments.

In the comparison of HHD modalities with ICHD, over 2 decades of slowly growing evidence supports the notion that there may be some benefit to NHHD in the context of health-related quality of life (HRQOL)[14,25-28] using various QOL scales, though many of these studies lacked common reporting methods, sufficient sample sizes, and/or adequate statistical analyses. Furthermore, recent literature has suggested that the increased frequency and duration of dialysis inherent to NHHD—which is often more intensive than ICHD—is what correlates with significant improvements in QOL.[29] This has been echoed in previous studies, with frequency of dialysis often cited as a major advantage of HHD modalities with respect to QOL.[14,28-33] In addition, recent RCTs have demonstrated that these significant QOL benefits occur independent of dialysis location (ie, home or in-center).[32,33] Increased frequency of dialysis has also been linked with improved solute clearance, volume control, nutrition, less pill burden, and reduced left ventricular hypertrophy.[14,31]

Two shortcomings in the present literature were consistent regarding home dialysis modalities: small sample sizes and paucity of studies. This notion is supported by the lack of primary articles to examine further modality comparisons of interest such as PD vs HHD or self-care ICHD vs conventional ICHD. Our updated systematic review is the first to recognize changes in QOL over time as a primary end point, as it is often underappreciated in the literature relative to its importance as a guiding variable in choice of dialysis modality. Our findings clearly underline the importance of advancing research in the field of QOL over time as it relates to home and in-center dialysis modalities, especially with PROMs holding a larger stake in dialysis choice than ever before. Fortunately, several larger studies have begun to investigate this question in recent years. The China Q study by Yu et al (NCT02378350, pending publication) is comparing QOL between 668 patients on either PD or ICHD over 1 year. In addition, a recent large retrospective cohort analysis[34] posed a similar question to the present study, comparing health-related QOL over time between patients (n = 5114) who initiated ICHD or home dialysis (PD or HHD) at multiple time points via the KDQOL scale. Despite the relatively large sample size, the study demonstrated no significant differences in QOL over time between groups after 485 days. Unfortunately, this study could not be included in our systematic review owing to the lack of subgroup analysis in the "home dialysis" population (which combined PD and HHD, thereby not meeting our predefined research questions), albeit the large majority consisted of PD patients (93.1%). Despite nonsignificant results, this study demonstrates the movement toward evaluating changes in QOL over time, rather than absolute values.

Our study has several limitations. First, the limited and indeterminate data for the primary end point (ie, QOL), particularly for HHD modalities given the relative infrequency of QOL measures and small sample sizes. Second, of the studies that did fit inclusion criteria, there was considerable heterogeneity among the QOL scales used (eg, CHEQ, SF-36, KDQOL), limiting inter-study comparisons. More recent literature supports only the utility of specific PROMs in dialysis-specific QOL analyses, namely KDQOL-36 and KDQOL-SF.[35] Third, from a pragmatic perspective, other clinically relevant variables involved in the decision for dialysis modality were omitted including socioeconomic factors, accessibility, familiarity with dialysis modality (both for physician and patient), ability to change dialysis modalities, caregiver burden, frequency of dialysis, and duration of dialysis session. We also recognize that our study does not compare all combinations of dialysis prescriptions; thus, certain important comparisons are not included (eg, nocturnal ICHD vs NHDD[36] or CAPD vs APD).[37] Finally, study populations were drawn from different countries and health care systems introducing unavoidable heterogeneity.

Conclusions

In this systematic review examining within patients changes in QOL across the various dialysis modalities, we found no consistent differences in the overall QOL outcomes between home dialysis modalities (including PD and HHD) and ICHD as a change from baseline; however, important differences are present in specific QOL domains. Although there are significant limitations in the ability to compare clinical outcomes between groups, with the improved cost-effectiveness of home dialysis prescriptions, and a growing emphasis on patient-centered dialysis choice, our findings imply that certain patients may benefit from home dialysis modalities depending on their individual preferences and acceptable trade-offs. In light of this, the current underutilization of home dialysis modalities may reflect other variables, including lack of high-quality research, governmental policy, and physician familiarity, all of which may be susceptible to intervention and improved education. Future large-scale research comparing QOL over time between dialysis modalities is critical, especially with the current landscape of dialysis shifting toward patient-centered outcomes.

Ethics Approval and Consent to Participate

Not applicable.

Consent for Publication

Not applicable.

Availability of Data and Materials

Not applicable.

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Declaration of Conflicting Interests

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Supplemental Material

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