The Effects of Self-Management Interventions on the Health Outcomes of Individuals With Chronic Kidney Disease After Critical Illness: An Integrative Review

Claudia LEUNG Ho Yau[a] and *Janita CHAU Pak Chun, RN, PhD*[b]

Background: *Self-management is a crucial step towards achieving better physical and mental well-being and a better health-related quality of life for individuals with chronic kidney disease (CKD). Despite the high prevalence of CKD and the significant burdens faced by the individuals with CKD, their caregivers, and healthcare systems, very few studies have explored CKD and its consequences compared to other chronic diseases.* ***Objective:*** *To synthesize and present the best available evidence on the effectiveness of CKD self-management interventions in terms of the biomedical, psychosocial, and behavioral aspects of health outcomes.* ***Methods:*** *Three electronic English-language literature databases were searched from inceptions to March 2018. Two reviewers independently selected articles according to pre-specified criteria, critically appraised and extracted data from relevant research. Narrative summaries were presented because the interventions and study features of the included articles were heterogeneous.* ***Results:*** *Of the five included articles, three were interventional and two were systematic reviews. Effective self-management interventions have beneficial effects on biomedical outcomes such as blood pressure, psychosocial outcomes such as quality of life and self-efficacy, and behavioral outcomes such as CKD knowledge, self-management techniques, and adherence to self-care regimens and treatments.* ***Conclusions:*** *A self-management program that could provide better education and guidance for individuals with CKD is needed, as this would improve the provision of resources and preparations for foreseeable and avoidable CKD complications. The findings from the included articles demonstrate that limited amount of research has focused on CKD management. Additional randomized controlled trials that compare interventions with usual care are needed to determine the efficacy of CKD self-management programs.*

Keywords: chronic kidney disease, self-management, patient education, integrative review

INTRODUCTION

In patients with chronic kidney disease (CKD), the kidneys are damaged or have a decreased ability to filter blood (Centers for Disease Control and Prevention [CDC], 2017). Consequently, excess fluids and blood waste products are retained in the body and may lead to complications such as kidney failure, cardiovascular disease, stroke, anemia, and pulmonary edema (CDC, 2017). The global CKD prevalence is estimated to range from 11% to 13%, and these rates are even higher than the estimated diabetes prevalence of 8.2% (Hill et al., 2016). Common risk factors for CKD include a family history, advanced age, obesity, low socioeconomic status, smoking, alcohol consumption, diabetes, and hypertension (Kazancioğlu, 2013).

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CKD can be categorized using the "traffic light" staging system based on the creatinine-based estimated glomerular filtration rate (eGFR) and albuminuria levels, which was formulated by the Kidney Disease Improving Global Outcomes (KDIGO) (Fraser & Blakeman, 2016). Both CKD staging and risk increase as the levels of these parameters increase. In the staging system based on eGFR and albuminuria levels, eGFR levels are divided into five categories of dysfunction, G1–G5, whereas albuminuria is divided into three levels, A1–A3 (Fraser & Blakeman, 2016).

A diagnosis of CKD also represents a series of psychosocial consequences, including increased risks of depression and anxiety and a compromised health-related quality of life (HRQoL) (Wyld et al., 2020). These consequences may be caused by daily stressors that affect the individuals' emotional states. These daily stressors include strict dietary and fluid restrictions, concerns about the initiation of dialysis, a fear of burdening caregivers, and the burden of symptoms such as pain, fatigue, and an impaired well-being. Individuals with CKD also face a higher risk of developing critical illnesses and acute conditions such as myocardial infarction, cardiac arrest, malignant arrhythmias, and sepsis, which often require advanced support and critical care in intensive care units (ICUs) (De Rosa, Samoni, Villa, & Ronco, 2017; Haas et al., 2020). Typically, patients with CKD also have worse outcomes after ICU admission when compared with patients without renal dysfunction (Rimes-Stigare et al., 2015). The complications associated with CKD affect both the patients and their caregivers, and seem to worsen as CKD progresses, despite the provision of treatment and initiation of dialysis (Kittiskulnam, Sheshadri, & Johansen, 2016). CKD management regimens usually comprise multidisciplinary programs that include patient education, nutrition therapy and counselling, and guideline-driven nephrology care. Such programs aim to decrease cardiovascular morbidity, slow CKD progression, and improve the transition to dialysis or kidney transplantation (Turner, Bauer, Abramowitz, Melamed, & Hostetter, 2011).

For individuals with chronic illnesses, self-management is a crucial step toward achieving better physical and mental well-being, a better HRQoL, and a preferably normal life (Lee, Wu, Hsieh, & Tsai, 2016). Examples of self-management programs for individuals with CKD include self-efficacy training, cognitive behavioral therapy, empowerment programs, educational interventions, and behavioral contracting through weekly telephone contact interventions (Reid, Hall, Boys, Lewis, & Chang, 2011). The research tools used to measure the effectiveness of self-management interventions usually focus on behavioral outcomes such as adherence and disease knowledge (Boger et al., 2015). Individuals with CKD who can effectively perform self-management can maximize their ability to overcome illness, slow the deterioration of their health, and prevent the onset of complications (Lee et al., 2016).

Despite the high prevalence of CKD and the significant burdens faced by the individuals with CKD, their caregivers, and healthcare systems, very few studies have explored CKD and its consequences compared to other chronic diseases. This integrative review aims to identify, summarize, and critically appraise the current literature evaluating the effectiveness of CKD self-management interventions in terms of the biomedical, psychosocial, and behavioral aspects of health outcomes.

LITERATURE SEARCH

Methods

Search Strategy. Three electronic English-language literature databases—MEDLINE, CINAHL, and PsycINFO—were searched from inception to March 2018. A range of Medical Subject Headings (MeSH) and key terms were combined using Boolean phrases (i.e., "and" and "or") and applied to a systematic search. Details of the strategy used to search all the databases are presented in Appendix A.

Additionally, the reference lists of all relevant articles were reviewed to identify potentially missed studies.

Inclusion Criteria. Two reviewers independently screened the titles of all identified articles. If the relevance of the study could not be determined from the title or the abstract, full text was retrieved for further assessment according to the pre-specified criteria. Any disagreement between the two reviewers were resolved by discussion. Studies were required to meet the following criteria to be deemed eligible for inclusion in this review:

Population. The population must have comprised adults (≥18 years old) with a clinical diagnosis of stage 1–4 CKD.

Interventions. Participants in the intervention groups must have participated in a CKD self-management program such as education intervention or psychological care intended to improve the participants' well-being. No restriction was placed on the format (individual/group, supervised/self-monitored), setting (hospital/-community), frequency, or duration of the intervention.

Comparison. The comparison group could have received "usual care" or "no active intervention."

Outcomes. *Biomedical outcomes*

The GFR, albumin to creatinine ratio, proteinuria, and blood pressure (BP) were evaluated as the biomedical outcomes.

Psychosocial outcomes

The HRQoL and self-efficacy were evaluated as a psychosocial outcome.

Behavioral outcomes

The participants' self-management techniques, adherence, and knowledge level were evaluated as the behavioral outcomes.

Types of Studies. This review included randomized controlled trials (RCTs), non-randomized experimental studies, and systematic reviews published in English.

Exclusion Criteria. This review excluded thesis and conference papers, as well as studies that did not assess an outcome of interest.

Quality Assessment. The quality of the interventional studies included in this review was assessed using the Effective Public Health Practice Project Quality assessment tool for quantitative studies (Effective Public Health Practice Project, 1998). The quality of the included systematic reviews was assessed using the Joanna Briggs Institute Critical Appraisal Checklist for Systematic Reviews and Research Syntheses (Joanna Briggs Institute, 2017).

Data Extraction. Study details, including the methods, sample characteristics, intervention regimens, outcome variables and measures of interest, drop-out and adherence rates, and results, were extracted from the included articles.

Data Synthesis. The included articles were categorized according to the type of CKD self-management intervention. Narrative summaries were used because the interventions and study features of the included articles were heterogeneous.

RESULTS

Results of the Search

A total of 1,390 articles were retrieved via electronic database search. A further manual search identified one additional article. After removing duplicates, the remaining 1,381 articles were subjected to a review of the titles and/or abstracts. A further 1,342 articles were excluded because of obvious irrelevance, and the full texts of the remaining 39 articles were retrieved for further assessment. Thirty-four of these articles were subsequently excluded as they did not meet the inclusion criteria. Primary reasons for exclusion were that the populations were not individuals with

CKD and inappropriate types of studies were used. The remaining five articles were included in this review. A PRISMA flow diagram of the study selection process is included in Appendix B. Of the five included articles, three were interventional studies (two RCTs and one non-equivalent control group, non-synchronized design) and two were systematic reviews.

Study Characteristics

The three interventional studies involved a total of 325 participants. Two interventional studies examined the effectiveness of educational interventions (Choi & Lee, 2012; Kauric-Klein, 2012), whereas the third investigated the effectiveness of a disease management program (Wong, Chow, & Chan, 2010). Two of the included studies evaluated the effects of intervention on biomedical outcomes, including the BP, sodium level, and GFR (Choi & Lee, 2012; Kauric-Klein, 2012), one assessed the HRQoL (Wong et al., 2010), two assessed self-care ability (Choi & Lee, 2012; Wong et al., 2010), two assessed adherence (Kauric-Klein, 2012; Wong et al., 2010), and one assessed CKD knowledge (Choi & Lee, 2012).

One of the two systematic reviews examined the effectiveness of educational interventions (Lopez-Vargas, Tong, Howell, & Craig, 2016), whereas the other examined the effectiveness of self-management interventions (Bonner et al., 2014). Both systematic reviews summarized and reported the effects of their respective interventions on CKD knowledge and clinical outcomes. One systematic review also examined the participants' adherence, CKD progression, health literacy, self-efficacy, HRQoL, and/or hospitalizations (Bonner et al., 2014).

One each of the three interventional studies originated from the United States (Kauric-Klein, 2012), Korea (Choi & Lee, 2012), and Hong Kong (Wong et al., 2010). The sample sizes ranged from 61 to 118 participants. Of the studies that provided demographic details, the mean ages of the participants ranged from 53.9 to 62.4 years. The characteristics of the included studies are summarized in Appendix C (Tables A1 and A2).

Quality Assesment

According to the Effective Public Health Practice Project Quality assessment tool for quantitative studies (Effective Public Health Practice Project, 1998), all three of the interventional studies adequately addressed the research questions with a low risk of selection bias. Additionally, the study designs were generally appropriate for assessing the effectiveness of self-management programs with respect to the biomedical, psychosocial, and behavioral outcomes of individuals with CKD, except for one study that adopted a non-equivalent control group and non-synchronized design (Choi & Lee, 2012). The confounders were well controlled in two of the studies, as there were generally no statistically significant differences between the experimental and control groups in terms of the demographic characteristics and study variables at baseline (Choi & Lee, 2012; Wong et al., 2010). However, one study conducted the randomization process at two separate locations, which led to significant differences in several baseline variables between the two groups (Kauric-Klein, 2012). Two of the three interventional studies had problems with blinding. One study did not mention whether the outcome assessors had been blinded to the allocation of participants into the control and intervention groups (Kauric-Klein, 2012), which may have led to detection bias. In the other study, the outcome assessors were aware of the participants' intervention or exposure status because of the non-synchronized design (Choi & Lee, 2012). All the instruments used for data collection were well validated and reliable, which allowed the evaluation of outcomes among the participants. All three studies reported the number of withdrawals and drop-outs, and all subjects in all groups remained in the study at the final data collection period (Appendix D; Tables A3 and A4).

According to the Joanna Briggs Institute Critical Appraisal Checklist for Systematic Reviews and Research Syntheses (Joanna Briggs

Institute, 2017), the two included systematic reviews clearly addressed questions regarding the self-management programs provided for individuals with CKD (Bonner et al., 2014; Lopez-Vargas et al., 2016). Both studies conducted comprehensive literature search using explicitly defined eligibility criteria. In both studies, the critical appraisal was conducted independently by two reviewers, and appropriate measures were taken to minimize data extraction errors and combine studies. Both reviews applied appropriate critical appraisal items when assessing the included studies. However, neither review assessed publication bias using statistical tests such as Egger's test or funnel plots. Both reviews provided recommendations for current CKD self-management programs, identified knowledge gaps, and suggested potential future research directions. Overall, the quality of the included studies was average, and the strength of the included evidence was acceptable.

Effectiveness of Educational Interventions for Individuals With CKD

Although very few studies reported improvements in the participants' GFR and BP (Lopez-Vargas et al., 2016), supportive nursing education was associated with significant decreases in both the systolic and diastolic BP (Kauric-Klein, 2012). However, other physiological indicators of kidney function, such as the blood urea nitrogen, creatinine, sodium, potassium, calcium, phosphate, and hemoglobin concentrations and the GFR, were not significantly improved, and the serum sodium concentration actually increased significantly in the experimental group of one study (Choi & Lee, 2012).

The beneficial effects of educational interventions on psychosocial and behavioral outcomes have been well documented. Additionally, educational interventions have yielded significant but inconsistent improvements in the HRQoL, psychosocial function, and self-efficacy (Lopez-Vargas et al., 2016). Face-to-face self-care management programs can significantly improve the levels of self-efficacy and disease knowledge among individuals with CKD, and continuous increases in knowledge have been observed throughout the intervention period (Choi & Lee, 2012).

Effectiveness of Disease Management Interventions for Individuals With CKD

Evidence from an interventional study revealed that CKD management based on a specialty-general nurse model can effectively improve the adherence of participants to self-care management with respect to diet and continuous ambulatory peritoneal dialysis, as well as various aspects of HRQoL (Wong et al., 2010). One systematic review reported that because of measurement issues, the findings were difficult to interpret and the effects of self-management programs on individuals with stage 1–4 CKD could not be conclusively ascertained. The most substantial effects observed in that study were improvements in CKD knowledge and HRQoL. However, the evidence suggesting that self-management programs could improve adherence was weak (Bonner et al., 2014), and this observation was inconsistent with the results from an interventional study (Wong et al., 2010).

Effective Design of Interventions

To ensure the provision of effective self-management, educational interventions, or psychological care for individuals with CKD, the designs with respect to the content, format, duration, and provider were identified from the included studies.

Content. All the included studies adopted different types of self-management interventions but did not suggest a consistent design. One study showed that the contents of an effective educational intervention included practical skills, workshops to provide practical experience, goal-setting in collaboration with the participants, a series of lectures delivered by a healthcare professional, telephone follow-ups, increased individual participation, frequent teaching episodes, and multidisciplinary team involvement (Lopez-Vargas et al., 2016). Another study demonstrated the efficacy of implementing a

systematic approach that focused on facilitating, supporting, and sustaining individuals' behaviors. Self-management programs that aim to maximize an individual's confidence to understand, cope with, problem-solve, and stay motivated about their adherence to the prescribed diet, fluids, and medications and participation in follow-up appointments will likely contribute to an improved QoL and reductions in hospitalizations and mortality (Bonner et al., 2014).

Format. Although the included studies found that both individual and group interventions were effective, the group format yielded more beneficial effects and more credible results. For example, one study demonstrated significant improvements in the self-care practice scores of participants in a face-to-face self-care management program (Choi & Lee, 2012). Moreover, in studies involving interventions in group and patient–family settings (Bonner et al., 2014), frequent patient/educator encounters, and the involvement of a multidisciplinary team that included peer volunteers or mentors provided more effective support to individuals in terms of managing chronic health conditions in everyday life (Lopez-Vargas et al., 2016).

Duration. Self-management interventions designed to support individuals with CKD should be implemented in a timely and effective manner (Bonner et al., 2014).

Intervener. The education and delivery of self-management programs may involve multidisciplinary collaborations that include nephrologists, nurses, and social workers. However, nurses in primary healthcare settings should play a leading role in the delivery of self-management programs to individuals with CKD (Bonner et al., 2014) because these professionals hold a high level of knowledge and have frequent contacts with them. Nephrology nurses also play a pivotal role in self-management programs, as these professionals use their specialized knowledge and experience to make initial assessments, identify problems, and set mutual goals with individuals with CKD (Wong et al., 2010).

DISCUSSION

The self-management of a chronic illness is a complex but important factor that contributes to optimal disease control and maximizes an individual's capabilities to lead his/her preferred life. Effective self-management may also decrease the need for critical care, as it reduces the risks of hospitalization, cardiovascular diseases, and death (Rimes-Stigare et al., 2015). This integrative review investigated the effects of various CKD self-management programs on the biomedical, psychosocial, and behavioral outcomes of individuals with CKD. Evaluations of self-management programs, including educational, self-management, and psychosocial interventions, have demonstrated promising abilities of the programs to improve these outcomes in individuals with CKD. Effective self-management interventions particularly have beneficial effects on biomedical outcomes such as BP, psychosocial outcomes such as HRQoL, and behavioral outcomes such as self-efficacy, CKD knowledge, self-management techniques, and adherence to self-care regimens and treatments. The findings from this integrative review are consistent with previous reviews on self-management in CKD patients, which aim primarily to facilitate an individual's ability to make lifestyle changes and manage the symptoms, treatments, and physical and psychosocial consequences resulting from CKD and its complications (Donald et al., 2018).

Implications for Future Research

The findings from the included studies clearly demonstrate that limited amount of research has focused on CKD management. Additional RCTs that compare interventions with usual care are needed to determine the efficacy of CKD self-management programs. Longitudinal studies are also needed to examine the long-term effects of CKD self-management interventions on various outcomes. The development of more comprehensive and standardized self-management interventions derived from the findings of future research

may provide immense benefits to both individuals with CKD and healthcare professionals.

Implications for Nursing Practice

Nurses in primary healthcare settings should play a leading role in the delivery of self-management programs to individuals with CKD (Bonner et al., 2014) and should use their professional knowledge to teach and encourage the use of self-management interventions. Nephrology nurses are also extremely important figures in self-management programs, as these professionals use their specialty knowledge and experience to perform the initial assessments of individuals with CKD, identify problems, and set treatment goals (Wong et al., 2010). Nurses can also educate and guide junior or general nurses in the delivery of CKD self-management interventions and thus enable other professionals to teach the interventions to individuals with CKD in their own clinical environments.

Strengths and Limitations

The strength of this integrative review is that there was a systematic and rigorous critical appraisal of the quality of the included studies related to self-management interventions for individuals with CKD. However, several limitations have been identified, including a relative paucity of studies conducted in this field. Moreover, inclusion criteria such as publication in the English language and in peer-reviewed journals may have limited the number of studies deemed eligible for this review. Also, the application of various types of interventions in different studies led to heterogeneity in the available data and made it difficult to evaluate the overall effects of these interventions on the participants. Another limitation of this review involves the inconsistencies in outcome reporting. For example, only some studies showed significant improvements in certain biomedical outcomes such as the hemoglobin level (Lopez-Vargas et al., 2016). Furthermore, the primary search process highlighted the limited amount of primary research focused on CKD self-management in comparison with the research focused on other chronic illnesses. Because of these limitations, our findings are not generalizable to other study populations or healthcare settings. Therefore, this integrative review highlights the need for additional primary research on individuals with CKD, which will provide a better foundation for the development of more comprehensive and effective CKD self-management programs. Further, we recommend the development of culturally specific self-management interventions for individuals with CKD, as three of the interventional studies and systematic reviews featured in this review were conducted in Western countries and two was conducted in Asian populations from Hong Kong and South Korea respectively.

CONCLUSION

This review on the effects of CKD self-management programs on the biomedical, psychological, and behavioral outcomes of individuals with CKD revealed that the interventions generally had beneficial effects. However, no best practice has been determined regarding the clinical provision of self-management interventions for individuals with CKD, despite existing evidence of the beneficial effects of such interventions in terms of improving the participants' BP, HRQoL, self-efficacy, CKD knowledge, self-management techniques, and adherence to self-care regimens and treatments. A self-management program that could provide better education and guidance for individuals with CKD is needed, as this would improve the provision of resources and preparations for foreseeable and avoidable CKD complications. Clinically, a standardized program design would facilitate the implementation and utilization of the program in clinical practice settings. Moreover, a comprehensive and standardized CKD intervention program would better enable research evaluations of the efficacy of such an intervention. In the future, high-quality RCTs are needed to examine the beneficial effects of psychosocial interventions on various outcomes. Nurses should be more strongly encouraged to participate in these interventions,

as their contributions would benefit more individuals with renal disease. Additionally, these programs would provide a space for nephrology nurses to exhibit their expertise and advocate for improvements in the field of nephrology care.

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APPENDIX A

OVID MEDLINE(R) EPUB AHEAD OF PRINT, IN-PROCESS AND OTHER NON-INDEXED CITATIONS AND OVID MEDLINE(R)[1946 TO PRESENT]

1. exp Renal Insufficiency, Chronic/
2. exp Kidney/
3. (chronic kidney disease* or CKD or chronic renal disease* or chronic kidney failure or chronic renal failure or end?stage kidney disease* or end?stage renal disease* or ESRD).tw.
4. ((chronic or end stage) adj3 (kidney or renal) adj3 (disease* or illness* or failure or insufficien*)).tw.
5. or/1-4
6. exp Kidney Function Tests/
7. (glomerular filtration rate or GFR or glomerul*).tw.
8. or/9-10
9. exp Self Care/
10. exp Patient Care Management/
11. (self adj4 (manage* or car* or treat* or monitor* or administ* or control*)).tw.
12. (risk factor* adj5 manage*).tw.
13. or/12-15
14. exp Patient Education as Topic/
15. exp Consumer Health Information/
16. exp Self Concept/
17. exp Attitude to Health/
18. social cognitive theory.mp.
19. Chronic Disease Self Management Program*.mp.
20. group visit*.mp.
21. exp Self Help Groups/
22. exp Counseling/
23. exp Social Environment/
24. (manage* or educat* or workbook* or informati* or web* or online* or tele* or computer* or video* or behavio?r* or psycholog* or psychosocial* or biopsychosocial* or medic* or prevent* or rehabilitat* or exercise* or train* or counsel* or nurs*) adj3 (program* or intervention* or strateg* or session* or therap* or course* or class*).tw.
25. (self help* or support group* or social support*).tw.
26. or/17-28
27. exp Community Health Nursing/
28. exp Patient Discharge/
29. exp Home Care Services/
30. (communit* or outpatient* or out patient* or home*).tw.
31. (discharg* adj3 hospital*).tw.
32. or/30-34
33. (biomedical, psychosocial and behavio?ral outcome*).mp.
34. exp "Quality of Life"/
35. exp Depression/
36. exp "Outcome Assessment (Health Care)"/
37. or/ 36-39
38. 16 or 29 or 35
39. 5 and 11 and 40 and 41

CINAHL COMPLETE

(MH "Renal Insufficiency, Chronic+")
TX chronic kidney disease* OR CKD OR chronic renal disease* OR chronic kidney failure OR chronic renal failure OR end?stage kidney disease* OR end?stage renal disease* OR ESRD
TX (chronic OR end stage) N3 (kidney OR renal) N3 (disease* OR illness* OR failure OR insufficien*)
S1 OR S2 OR S3
(MH "Renal Replacement Therapy+")
(MH "Kidney Transplantation+")
TX kidney transplant* OR renal transplant*
S5 OR S6 OR S7
TX kidney function test* OR glomerular filtration rate OR GFR OR glomerul*
(MH "Self Care+")
TX self N4 (manage* OR car* OR treat* OR monitor* OR administ* OR control*)
TX risk factor* N5 manage*
S10 OR S11 OR S12
(MH "Self Assessment")
(MH "Self Concept+")
(MH "Health Knowledge")
(MH "Patient Education+")
(MH "Health Information+")
(MH "Quality of Health Care+")
(MH "Patient Care+")
(MH "Support Groups")
(MH "Managed Care Programs+")
TX (manage* OR educat* OR workbook* OR informati* OR web* OR online* OR tele* OR computer* OR video* OR behavio?r* OR psycholog* OR psychosocial* OR biopsychosocial* OR medic* OR prevent* OR rehabilitat* OR exercise* OR train* OR counsel* OR nurs*) N3 (program* OR intervention* OR strateg* OR session* OR therap* OR course* OR class*)
TX self help* OR support group* OR social support*
S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24
(MH "Community Health Services+")
(MH "Patient Discharge+")
(MH "Home Health Aides")
TX communit* OR outpatient* OR out patient* OR home*
TX discharg* N3 hospital*
S26 OR S27 OR S28 OR S29 OR S30
(MH "Outcome Assessment (Health Care)") OR (MH "Treatment Outcome") OR (MH "Outcome and Process Assessment (Health Care)")
TX biomedical, psychosocial and behavio?ral outcome*
S32 OR S33
S13 AND S25 AND S31
S4 AND S9 AND S34 AND S35

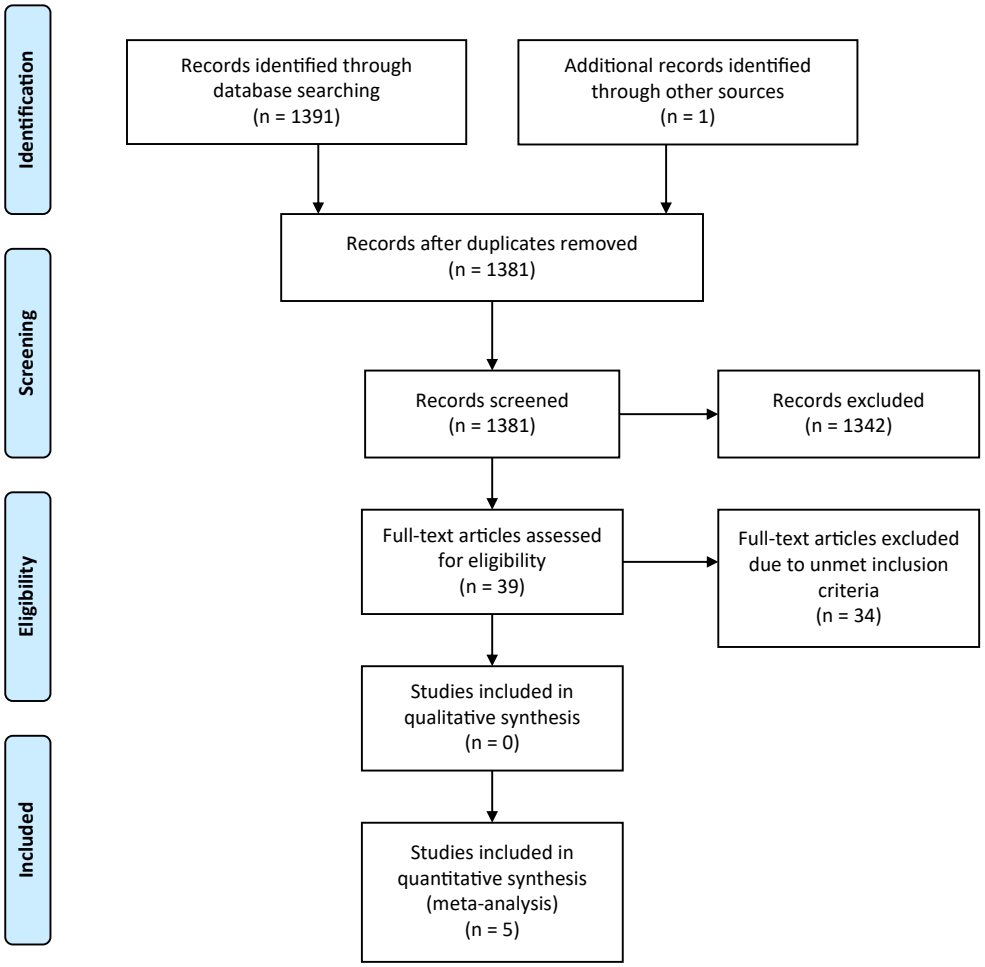
PSYCINFO 1806 TO MARCH WEEK 3 2018

1. exp kidney diseases/
2. (chronic kidney disease* or CKD or chronic renal disease* or chronic kidney failure or chronic renal failure or end?stage kidney disease* or end?stage renal disease* or ESRD).tw.

3. ((chronic or end stage) adj3 (kidney or renal) adj3 (disease* or illness* or failure or insufficien*)).tw.
4. exp chronic illness/
5. exp "chronicity (disorders)"/
6. or/1-5
7. exp disease management/
8. exp client education/
9. exp health literacy/
10. exp self-care skills/
11. exp Self Help Techniques/
12. exp health knowledge/
13. exp risk factors/
14. exp health attitudes/
15. exp health care utilization/
16. (self adj4 (manage* or car* or treat* or monitor* or administ* or control*)).tw.
17. (risk factor* adj5 manage*).tw.
18. or/7-17
19. exp managed care/
20. exp support groups/
21. exp counseling/
22. exp social environments/
23. exp psychosocial factors/
24. (manage* or educat* or workbook* or informati* or web* or online* or tele* or computer* or video* or behavio?r* or psycholog* or psychosocial* or biopsychosocial* or medic* or prevent* or rehabilitat* or exercise* or train* or counsel* or nurs*) adj3 (program* or intervention* or strateg* or session* or therap* or course* or class*).tw.
25. (self help* or support group* or social support*).tw.
26. or/19-25
27. exp community health/
28. exp hospital discharge/
29. exp "quality of care"/
30. exp home care/
31. exp "continuum of care"/
32. (communit* or outpatient* or out patient* or home*).tw.
33. (discharg* adj3 hospital*).tw.
34. or/27-33
35. (biomedical, psychosocial and behavio?ral outcome*).mp.
36. exp "Quality of Life"/
37. exp Treatment Outcomes/
38. exp Treatment Effectiveness Evaluation/
39. exp Major Depression/
40. exp Behavior/
41. or/35-40
42. 18 and 26 and 34
43. 6 and 35 and 41 and 42

APPENDIX B

PRISMA 2009 Flow Diagram



APPENDIX C

TABLE A1. Characteristics of Interventional Studies Included

Reference	Study Design	Participants		Intervention		Outcomes (Measures)	Authors Conclusions
Region Sample Size (IG:CG)		**Target Population; Age (years) ± *SD***	**Intervention Group vs. Control Group (IG vs. CG)**	**Intervention Period; No. of Sessions; Session Duration; Frequency/Study Schedule**	**Model or Framework**		
Kauric-Klein (2012) USA 118 (59:59)	Randomized control trial	Chronic HD patients with 4-week average pre- HD, BP greater than 150 mmHg or diastolic BP greater than 90 mmHg, and could read and speak English; 60 ± NI	Supportive nursing education vs. Standard care	90 days; 15; 10–15 min; Two BP education sessions based on the NKF (2004) clinical guidelines for hypertension in ESRD, 12-weeks of monitoring, goal setting, and reinforcement, and a 30-day postintervention follow-up period	The National Kidney Foundation (2004) clinical guidelines for hypertension in ESRD	Pre-HD and post-HD BP, sodium, weight gain. Adherence to HD regimen and medication regimen	Both systolic and diastolic BP significantly decreased in the intervention group. The exact mechanism of the improvement is not clear but, it appears to be due to BP goal achievement and reinforcement, improved HD adherence, and increased medication changes within the intervention group

(*Continued*)

TABLE A1. Characteristics of Interventional Studies Included (*Continued*)

Reference	Study Design	Participants		Intervention		Outcomes (Measures)	Authors Conclusions
Region Sample Size (IG:CG)		**Target Population; Age (years) ± *SD***	**Intervention Group vs. Control Group (IG vs. CG)**	**Intervention Period; No. of Sessions; Session Duration; Frequency/Study Schedule**	**Model or Framework**		
Choi and Lee (2012) South Korea 61 (31:30)	Non-equivalent control group, non-synchronized design	Outpatients diagnosed with CKD, persons who hadn't started renal replacement therapy, 20 years old or over, persons who understood the study process, and were able to communicate; IG: 53.93±13.47 CG: 58.33±12.54	Experimental group vs. general maintenance	8 weeks each for IG & CG; IG: 5CG: 3; Education session: 90 min Consultation: 20 min;IG: 1. Pre-test 2. Small group face-to-face education and individualized consultation 3 weeks later 3. 1 week of self-practice 4. 1st post-test 5. Additional re-enforcement education and consultation 6. 2nd post-test 4 weeks later CG: 1. Pre-test 2. General maintenance 3. Post-test at week 4 4. General maintenance 5. Post-test at week 8	NI	Kidney function: BUN, creatinine, sodium, potassium, calcium, phosphate, hemoglobin and GFR-Knowledge about CKD Self-care practice	Physiological indicators of kidney function were not significantly improved in both groups. Only hemoglobin was slightly improved in the experimental group, but it was not statistically significant. However, level of serum sodium increased in the experimental group significantly. Level of CKD knowledge significantly improved in the experimental group compared to the control group. The experimental group reported continuous increases in knowledge throughout the intervention period. Scores of self-care practice in the experimental group were significantly improved by the face-to-face self-care management program. However, scores of self-care practice four weeks after the re-enforcement education didn't have any significant differences from those 1 week after the face-to-face education.

(*Continued*)

TABLE A1. Characteristics of Interventional Studies Included (*Continued*)

Reference	Study Design	Participants		Intervention		Outcomes (Measures)	Authors Conclusions
Region Sample Size (IG:CG)		**Target Population; Age (years) ± *SD***	**Intervention Group vs. Control Group (IG vs. CG)**	**Intervention Period; No. of Sessions; Session Duration; Frequency/Study Schedule**	**Model or Framework**		
Wong et al. (2010) Hong Kong 98 (49:49)	Randomized control trial	All patients who were on Continuous Ambulatory Peritoneal Dialysis returning to renal centers for clinical follow-up; 62.4 ± NI	Routine care and disease management programme vs. Routine care only	6 weeks; Pre-discharge assessment: 1 Phone calls: 6; No time limit; IG: 1. Initial assessment with the patient based on the Omaha framework 2. Phone calls to the patients every week for 6 weeks to ask about general health condition, monitor changes of specific health concerns, monitor progress, provide health advice, reinforce health self-management behaviors, assess need for referrals, review health goals and set mutual goals, and provide words of encouragement	Disease management model: four-Cs model	Non-adherence, QoL, satisfaction, symptom and complication control, and healthcare utilization	The study has evidence that a CKD management model using a specialty-general nurse model is effective. Results showed improvements in non-adherence to self-care management in diet and continuous ambulatory peritoneal dialysis, aspects of QoL and satisfaction with care.

TABLE A2. Characteristics of Systematic Review Studies Included

Reference	Study Design	Objectives	Number of Included Studies; Number of Participants	Results	Recommended Intervention Design
Lopez-Vargas et al. (2016)	Systematic review	Evaluate the effectiveness of education interventions for patients with CKD, including their effects on knowledge and clinical outcomes; Identify characteristics of the more effective educational interventions	Twenty-six experimental studies; 5,403 participants	Significant but inconsistent improvements for QoL, psychosocial function, knowledge, self-efficacy, lifestyle modification (exercise and diet), mortality, dialysis therapy initiation, and biochemical (serum albumin, proteinuria, and hemoglobin) outcomes. Very few studies showed improvement in eGFR and blood pressure.	Intervention components that appeared most likely to be effective involved a group and patient family setting, included practical skills, workshops, goal setting together with the patient, frequent patient/educator encounters, and involved a multidisciplinary team including patient volunteers or mentors.Interventions involving a series of lectures delivered by a healthcare professional, telephone follow-up, workshops for practical experience, patient participation, more and frequent teaching episode and an educational program that involves a multidisciplinary team are more likely to be effective.

(*Continued*)

TABLE A2. Characteristics of Systematic Review Studies Included (*Continued*)

Reference	Study Design	Objectives	Number of Included Studies; Number of Participants	Results	Recommended Intervention Design
Bonner et al. (2014)	Literature review	Synthesize and critically appraise self-management interventions for adults with CKD Stages 1–4 on improving adherence, knowledge, CKD progression, health literacy, self-efficacy, HRQoL, and/or hospitalizations	Five experimental studies; 274 participants	Difficult interpretation of findings due to measurement issues and effect of self-management programmes in CKD (Stages 1–4) cannot be conclusively ascertained. The largest effects observed was increases in CKD-specific knowledge and evidence was present for improved HRQoL, particularly cognitive function and vitality. There was only weak evidence that showed the delivery of self-management programmes can improve adherence, as measured objectively through clinical indicators.	Interventions should be implemented in a timely and effective manner to support CKD patients to engage in self-management. Programmes should have a systematic approach that focuses on facilitating, supporting, and sustaining the patients' behaviors. Self-management should be patient-centered and should include family members to support individuals in managing chronic health conditions in everyday life. Self-management programmes which aim at maximizing an individual's confidence to understand, cope, problem-solve, and stay motivated about their adherence to diet, fluids, medications, and follow-up appointments will likely contribute to improved HRQoL, reduced hospitalizations, and mortality. Nurses in primary healthcare should play a leading role in the delivery of self-management programmes for patients with CKD Stages 2–3a.

Appendix D

TABLE A3. Critical Appraisal of Interventional Studies Using TheEffective Public Health Practice Project" Assessment Tool for Quantitative Studies

Reference	Kauric-Klein (2012)	Choi and Lee (2012)	Wong et al. (2010)
Selection bias	Strong	Strong	Strong
Study design	Strong	Moderate	Strong
Confounders	Weak	Strong	Strong
Blinding	Moderate	Weak	Strong
Data collection methods	Strong	Strong	Strong
Withdrawals and drop-outs	Strong	Strong	Strong
Global rating	Moderate	Moderate	Strong

TABLE A4. Critical Appraisal of Systematic Review using Joanna Briggs Institute" Critical Appraisal Checklist for Systematic Reviews and Research Syntheses

Appraisal Questions	Lopez-Vargas et al. (2016)	Bonner et al. (2014)
Is the review question clearly and explicitly stated?	Yes	Yes
Were the inclusion criteria appropriate for the review question?	Yes	Yes
Was the search strategy appropriate?	Yes	Yes
Were the sources and resources used to search for studies adequate?	Yes	Yes
Were the criteria for appraising studies appropriate?	Yes	Yes
Was critical appraisal conducted by two or more reviewers independently?	Yes	Yes
Were there methods to minimize errors in data extraction?	Yes	Yes
Were the methods used to combine studies appropriate?	Yes	Yes
Was the likelihood of publication bias assessed?	No	No
Were recommendations for policy and/or practice supported by the reported data?	Yes	Yes
Were the specific directives for new research appropriate?	Yes	Yes