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Original Investigation

Educational Interventions for Patients With CKD: A Systematic Review

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Background: Preventing progression from earlier stages of chronic kidney disease (CKD) to end-stage kidney disease and minimizing the risk for cardiovascular events and other complications is central to the management of CKD. Patients' active participation in their own care is critical, but may be limited by their lack of awareness and understanding of CKD. We aimed to evaluate educational interventions for primary and secondary prevention of CKD.

Study Design: Systematic review. Electronic databases were searched to December 2015, with study quality assessed using the Cochrane Collaboration risk-of-bias tool.

Setting & Population: People with CKD stages 1 to 5 in community and hospital settings (studies with only patients with CKD stage 5, kidney transplant recipients irrespective of glomerular filtration rate, or patients receiving dialysis were excluded).

Selection Criteria for Studies: Randomized controlled trials and nonrandomized studies of educational interventions.

Interventions: Educational strategies in people with CKD.

Outcomes: Knowledge, self-management, quality-of-life, and clinical end points.

Results: 26 studies (12 trials, 14 observational studies) involving 5,403 participants were included. Risk of bias was high in most studies. Interventions were multifaceted, including face-to-face teaching (26 studies), written information (20 studies), and telephone follow-up (13 studies). 20 studies involved 1-on-1 patient/educator interaction and 14 incorporated group sessions. 9 studies showed improved outcomes for quality of life, knowledge, and self-management; 9 had improved clinical end points; and 2 studies showed improvements in both patient-reported and clinical outcomes. Characteristics of effective interventions included teaching sessions that were interactive and workshops/practical skills (13/15 studies); integrated negotiated goal setting (10/13 studies); involved groups of patients (12/14 studies), their families (4/4 studies), and a multidisciplinary team (6/6 studies); and had frequent (weekly [4/5 studies] or monthly [7/7 studies]) participant/educator encounters.

Limitations: A meta-analysis was not possible due to heterogeneity of the interventions and outcomes measured.

Conclusions: Well-designed, interactive, frequent, and multifaceted educational interventions that include both individual and group participation may improve knowledge, self-management, and patient outcomes.

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INDEX WORDS: Chronic kidney disease (CKD); patient education; health education; health knowledge; health literacy; self-care; self-management; educational interventions; disease progression; end-stage renal disease (ESRD); systematic review.

Individuals with chronic kidney disease (CKD) have greater risk for cardiovascular events, including myocardial infarction, stroke, heart failure, and peripheral vascular disease, as well as the risk for progression to end-stage kidney disease, and early death.[1-11] The 1999 to 2008 National Health Survey showed that up to 90% of participants with 2 to 4 markers of CKD, including hyperkalemia, hyperphosphatemia, acidosis, increased blood urea nitrogen level, albuminuria, anemia, and hypertension, were unaware of their disease when surveyed.[12] Similarly, patients with more advanced stages of CKD also showed poor knowledge regarding their treatment options.[13]

In addition to older age and lower socioeconomic status and education level, risk factors associated with CKD include smoking, hypertension, and a sedentary lifestyle.[14,15] Patient education about these risk factors for CKD and its management to ensure effective primary and secondary prevention is widely accepted as an essential element of the care of people with CKD.[16-20] Systematic reviews, focused on diet and fluid management, have shown that educational interventions may be effective in predialysis and dialysis patients,[21] and self-management programs in

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CKD stages 1 to 4 have shown some improvement in knowledge and quality of life (QoL).[22] However, previous systematic reviews were primarily focused on dialysis patients or were limited to self-management interventions, rather than educational interventions more broadly.

The aim of our study was to evaluate the effectiveness of education interventions for patients with CKD, including their effects on knowledge and clinical outcomes, and then identify characteristics of the more effective educational interventions.

METHODS

We conducted a systematic review reported in accordance with Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA).[23]

Selection Criteria

We included randomized controlled trials and nonrandomized studies of educational interventions for the primary and secondary prevention and management of CKD. Although the population of interest was patients with CKD stages 1 to 3, due to the limited number of studies with this specific population, we also included studies involving patients with CKD stages 4 to 5. Studies that included only patients with CKD stage 5, kidney transplant recipients irrespective of glomerular filtration rate (GFR; ie, CKD stages 1T-5T), or patients receiving dialysis were excluded. Interventions targeting conditions such as diabetes or hypertension were included only if they were in the context of CKD prevention and management. Citations were not excluded on the basis of language.

Literature Search

Medical Subject Heading (MeSH) terms and text words for CKD were combined with MeSH terms and text words related to health education, patient education, self-care, health promotion, primary and secondary prevention, disease progression, and risk factors (Table S1, available as online supplementary material). We searched MEDLINE (1946 to November 12, 2015), EMBASE (1996 to November 12, 2015), Cumulative Index to Nursing and Allied Health Literature (CINAHL; 1982 to November 13, 2015), The Cochrane Library (December 2015), and reference lists of relevant articles and reviews. Studies were first screened according to title and abstract. Those that did not satisfy the inclusion criteria were excluded. Full-text articles were retrieved and assessed for eligibility by 2 independent reviewers (P.A.L.-V. and M.H.).

Data Extraction and Critical Appraisal

Study characteristics relevant to the population, intervention, comparator, and outcomes, as well as sample size, study setting, and duration, were extracted and tabulated.

The risk of bias was performed using the Cochrane tool for randomized studies[24] and the Cochrane Effective Practice and Organisation of Care (EPOC) Review Group criteria[25] for controlled before-and-after studies. Risk-of-bias criteria as described in Ramsay et al[26] and EPOC[25] were used for assessment of the interrupted time series studies. Bias domains included in the assessment were as follows: reporting bias (completeness of outcome reporting), attrition (incomplete outcome data), detection (blinding of investigators and outcome assessors), performance (blinding of participants), and selection bias (random sequence generation and allocation concealment).[24] Other criteria were included in the assessment of controlled before-and-after and interrupted time series studies. Each criterion was assigned a judgment of high, low, or unclear risk of bias. A bias of sufficient magnitude to have a notable effect on the results or conclusion of the study was assigned as high risk, low risk was assigned when the criterion was adequately addressed, and unclear risk was allocated when there was insufficient detail reported to make a reliable judgment.[27] P.A.L.-V. and M.H. assessed studies independently and any disagreements were resolved by discussion.

Synthesis of Results

A detailed analysis of intervention characteristics was made using a taxonomy framework for educational interventions including setting (1-on-1 and group), delivery style (face-to-face, telecommunication, and written), teaching method (didactic, goal setting, and situational), intensity (frequency, number of episodes, and duration), content, and personnel.[28]

Due to the heterogeneity in interventions and outcomes, a formal meta-analysis could not be performed. Effect sizes for primary outcomes and their *P* values, unless reported in the study, were calculated from data provided using Review Manager (RevMan5) software (version 5.2.11; The Nordic Cochrane Centre, Cochrane Collaboration) and expressed as relative risk or mean difference for dichotomous and continuous outcomes, respectively. An intervention was considered effective if it had at least 1 primary outcome that was significantly improved in the intervention group compared to control or from baseline in observational studies.

RESULTS

Literature Search and Study Characteristics

The initial search yielded 2,576 citations, from which we identified 26 eligible studies (n = 5,403 participants; Fig S1). Studies (Table 1) were conducted in Canada,[29-32] Taiwan,[33-39] Australia,[40-42] Spain,[43-45] China,[46] Japan,[47] the Netherlands,[48] United States,[49,50] Brazil,[51] South Korea,[52] New Zealand,[53] and Sweden.[54] There were 12 (46%) randomized trials,[29,30-34,39-42,48,51] including 6 (50%)[29-31,39,41,48] that were multicenter studies. Of the 14 nonrandomized studies,[35-38,43-47,49,50,52-54] which included 1 retrospective cohort, 5 controlled before-and-after studies, and 8 interrupted time series studies, 9 (64%)[36,43-46,49,50,52,54] were conducted in a single center. Median number of participants was 79 (range, 19[43]-1,056 participants[52]) and median study duration was 12 months (range, 3 months[40] to 20 years[30]). Four (15%) studies included CKD stages 1 to 3[36,38,39,53]; 8 (31%),[29,32,34,41,42,47,48,52] CKD stages 1 to 4; and 14 (54%),[30,31,33,35,37,40,43-46,49-51,54] CKD stages 1 to 5.

Five studies had interventions that were based on theoretical frameworks. These included the transtheoretical model,[34,39] health belief model,[41,42] and self-regulation theory.[38] Interventions that incorporated the transtheoretical model and self-regulation theory were more patient specific and targeted to patients' needs. Studies that were based on the health belief model fundamentally relied on participants' beliefs about health and their willingness to act on them. We were unable to assess and compare whether