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Tele Nursing in Dialysis: A Systematic Review

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Abstract

Background: Chronic dialysis treatment requires continuous monitoring and high levels of patient adherence. While telehealth has emerged as a supportive tool, its specific impact through nursing-led interventions (telenursing) requires systematic evaluation. This review aims to synthesize the effects of telenursing on clinical and psychosocial outcomes for patients undergoing dialysis.

Methods: A systematic literature search was conducted across PubMed, Scopus, Web of Science, ScienceDirect, Medline, OVID, and the Cochrane Database between December 2023 and February 2024. Keywords included "hemodialysis," "peritoneal dialysis," "telenursing," and "telehealth." The review was registered in PROSPERO (CRD42024511212). Study quality was assessed using the Joanna Briggs Institute (JBI) checklists and the Mixed Methods Appraisal Tool (MMAT).

Results: Fifteen studies met the inclusion criteria. The findings indicate that telenursing interventions significantly increase patients' quality of life and treatment satisfaction while supporting therapy adherence. Furthermore, telenursing was found to reduce levels of depression, anxiety, and stress. Improvements were also noted in clinical follow-up parameters, laboratory values, self-care capabilities, and self-management behaviors.

Conclusion: Telenursing and technology-supported remote care interventions may contribute to improving care management, treatment adherence, self-care behaviors, and psychological outcomes among patients undergoing dialysis. However, the heterogeneity of intervention models, including nurse-led, multidisciplinary, and technology-assisted approaches, limits definitive conclusions regarding their effectiveness. Further standardized experimental studies are needed to determine the effectiveness and applicability of structured telenursing interventions in dialysis care.

Keywords: patients on dialysis, telenursing, care

Backround

Chronic kidney disease is a global public health problem associated with high morbidity, mortality and health expenditures. In the hemodialysis process, it is extremely important to evaluate patients from a holistic perspective and to manage homeostatic balancing processes meticulously. In order to fulfill these functions, nurses need to be in contact with patients both inside and outside the hospital. Technological developments enable nurses to perform remote care management, education and other nursing roles. These possibilities include easier access to patient data, effective use of human resources, reducing employee burnout caused by nurse shortages as much as possible, and keeping the nursing profession in step with the times.

Introduction

Recent technological advances have provided health care professionals with the opportunity to successfully perform care, education, and many other functions remotely. Telehealth plays a particularly important role in managing nursing processes and providing effective nursing services to patients in remote areas (1). It refers to the use of computers, the internet, telephones, remote monitoring devices, and digital assessment tools in the planning, implementation, and evaluation of telenursing care practices. According to the American Nurses Association (2021), telenursing is a technology-based nursing service developed to facilitate the delivery of health care services to patients (2). Studies examining the effects of telenursing on chronic diseases have highlighted that it is an effective strategy in terms of educational, clinical, psychological, and economic aspects. It has also been reported to facilitate symptom control in patients and to help them develop self-care behaviors. Accordingly, telenursing has been emphasized to contribute to quality of life by generating behavioral changes in individuals (3-6).

Chronic kidney disease (CKD) is a global health problem associated with significant morbidity and mortality and excessive health care expenditure. Studies have shown that the prevalence of CKD is 20 times higher than that of human immunodeficiency virus and acquired immunodeficiency syndrome, and the disease is projected to become the fifth leading cause of death by 2040 (7,8). Dialysis is widely used in the treatment of CKD, playing a vital role in sustaining life. However, it can have a significant negative impact on patients' biophysiological balance and lifestyle (7, 9). Therefore, it is essential to assess patients undergoing hemodialysis from a holistic perspective and to carefully manage the dialysis treatment process. To this end, nurses must provide support and counseling during preparation before hemodialysis, initiation of hemodialysis, monitoring of patients during hemodialysis, termination of hemodialysis, and management after hemodialysis (10). To fulfill these functions, nurses need to communicate with patients both inside and outside the hospital. Telenursing aims to ensure continuity of care, reduce transport costs, and shorten waiting times, consequently improving patients' self-efficacy and quality of life. This study aimed to systematically investigate the use of telenursing interventions in the care of patients on dialysis.

Methods

This study was conducted as a systematic review. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol was carefully followed in the conduct and reporting of the study. The study protocol was registered in the PROSPERO database. Literature search, article selection, data extraction, and quality assessment were performed independently by three researchers to minimize the risk of bias. Each stage was reviewed, and consensus was reached via discussion with a fourth researcher. In a meeting attended by four researchers (Ö.D., D.I., E.K., and F.Ö.), key terms relevant to the study were identified, and searches were performed on different databases including PubMed, Scopus, Web of Science, ScienceDirect, Medline, OVID, and Cochrane Database.

A comprehensive screening strategy in line with PRISMA principles was implemented. In the primary screening, the titles and abstracts of studies were reviewed using the databases identified, and screening was conducted using the keyword groups specified in the Appendix. Duplicate studies were excluded as a result of the primary screening. In the secondary screening, the studies were reviewed, and those that could not be accessed in full text, were not written in English, or were published before 2015 were excluded. In the tertiary screening, studies that were not suitable in terms of type and subject, did not involve nursing interventions, involved different patient groups, or involved a patient group not receiving dialysis treatment were excluded. Ultimately, 15 studies that met all criteria were included in the study (Table 1). The procedures for article selection, data extraction, and quality assessment were evaluated in a pilot study on telenursing and dialysis. Differences in opinion and information that arose after the pilot study were addressed and resolved through discussion. It has been reviewed in accordance with guidelines on the reporting of statistics relating to clinical research in the field of urology (44).

Study Selection

Studies were included in this systematic review based on the following PICOS (Population, Intervention, Comparison, Outcomes and Study) framework: population: patients who were receiving dialysis treatment; intervention: patients who were receiving telenursing support; comparison: patients who were not receiving

telenursing support; outcome: care, treatment, or psychological and physical care management of patients on dialysis; and study design: publication in English from 2015 onwards.

In accordance with the PRISMA guidelines, eligibility criteria were defined prior to the literature screening process. During the full-text assessment, studies were excluded if their work type was considered unsuitable for the scope of this review. Unsuitable work types referred to publication formats that did not report original clinical outcomes, including protocol papers, editorials, conference abstracts, and methodological or commentary articles.

Clinical studies evaluating telehealth, telenursing, or technology-supported remote care interventions in patients with chronic kidney disease or dialysis were eligible for inclusion, regardless of whether the intervention was nurse-led, multidisciplinary, or primarily technology-supported.

Studies with unclear methods, studies with inaccessible full texts, and studies in which telenursing was used outside the context of patients on dialysis were excluded.

Studies were identified and selected according to the inclusion and exclusion criteria, following the PRISMA guidelines. The selection process for this systematic review is shown in Figure 1.

Search Strategy

The systematic literature search was conducted from December 1, 2023, to January 15, 2024, on the Cochrane Database, Medline, OVID, PubMed, ScienceDirect, Scopus, and Web of Science. The following keywords were used: (“hemodialysis” OR “peritoneal dialysis” OR “dialysis”) AND (“telenursing” OR “telehealth” OR “telemedicine” OR “telemonitoring” OR “telecare”). The detailed search strategy is presented in Appendix 1.

Data Extraction

A data extraction tool developed by the researchers was used to obtain data for the review (Table 1). This tool was used to collect information on author, publication year, study title, study design, data collection form, sample characteristics, study methods, study outcomes, study recommendations, and evidence levels.

Quality Assessment

The methodological quality of all studies included was assessed using checklists published by the Joanna Briggs Institute (2014) (11). The quality of randomized controlled trials was evaluated using a 13-item checklist (12); quasi-experimental studies, a 9-item checklist (13); qualitative studies, a 10-item checklist (14); and mixed-method and mixed qualitative–quantitative studies, the Mixed Methods Appraisal Tool (15). Each item on these checklists was rated as "yes," "no," "unclear," or "not applicable." The quality of all studies is shown in Table 2. High, moderate, and low risks of bias were considered when ≤49%, 50%–69%, and >70% of responses were positive, respectively (Table 2).

Data Analysis

The researchers used the data extraction tool utilized during data collection to assess and analyze the data. Each study was independently summarized in a table. The summaries were then compared, and consensus was reached among the researchers. Due to the different types of research and measurement methods of studies included, the relevant data were presented without performing a meta-analysis. The SAMPL guidelines have been reviewed and the study has been reported in accordance with the relevant guidelines (43).

Results

The final dataset consisted of 15 studies: 10 randomized controlled trials, two quasi-experimental studies, two qualitative studies, and one mixed-method study. Four studies were conducted among patients on peritoneal dialysis, six among patients on hemodialysis, two among patients on home dialysis, and three among patients with CKD. The studies were performed in Iran ($n = 5$), the United States ($n = 3$), Japan ($n = 1$), Australia ($n = 1$), China ($n = 1$), Thailand ($n = 1$), Mexico ($n = 1$), Brazil ($n = 1$), and Sweden ($n = 1$). The titles, designs, sample characteristics, findings, and recommendations of all included studies are presented in Table 1.

The studies examined the effects of the use of telenursing on quality of life, satisfaction, vital signs, laboratory values, treatment and diet compliance, self-care, self-management, depression, anxiety, and stress in patients on dialysis.

Quality of Life and Satisfaction

In four studies, patients' satisfaction, quality of life, and self-confidence were found to increase with the use of telenursing (16-19).

Factors Affecting Participation in Telehealth Services

The review included a study investigating the factors affecting participation in telehealth services. The study group consisted of patients on dialysis who received telehealth services. Patients stated that the factors affecting their participation in such services were fearing that they may be unable to do self-physical assessment, not knowing the spoken language, not feeling that they receive remote social support, thinking that some specialists providing telehealth services are reluctant, not using technology properly, preferring a mixed model combining telehealth and face-to-face services, and wanting to have the right to choose (20).

Depression, Anxiety, and Stress

Among the studies reviewed, three examined the psychological status of patients. Different results were obtained among these studies. In one study, telenursing was found to yield low levels of depression, anxiety, and stress, while in another study, it was observed to have no effect (21, 22). The remaining study recommended to conduct investigations on coping styles and emotional support strategies with telenursing models (23).

Sleep and Activity

A study was conducted with patients undergoing haemodialysis treatment three days a week, and the patients were monitored via a tracking device to measure their activity and sleep levels. Patients were asked to report their daily step counts and sleep duration, but only 3% walked more than 10,000 steps per day. It was noted that they walked less on haemodialysis days compared to other days (24).

Clinical Follow-Up, Hospitalization, and Laboratory Values

Three studies evaluated clinical follow-up, hospitalization, and laboratory values among patients on dialysis. Two studies found that patients in the intervention group had more favorable laboratory values than patients in the control group (25, 16). In the study evaluating patients diagnosed with end-stage renal failure undergoing routine peritoneal dialysis, patients did not receive any additional treatment other than peritoneal

dialysis and were followed for one year. Patients in the intervention group had higher serum albumin and haemoglobin levels, lower phosphorus and calcium-phosphorus product levels, and higher satisfaction levels (16). In the study examining patients receiving haemodialysis treatment three times a week, patients did not receive any additional treatment apart from haemodialysis and were followed up for three months. Patients in the intervention group had lower serum potassium, serum creatinine, serum phosphate, and blood urea nitrogen levels, and higher serum calcium, haemoglobin, serum iron, and Kt/V levels (25). In terms of the number of hospitalizations, no significant difference was found between the intervention and control groups (16, 26).

Treatment and Dietary Compliance

In three studies, telenursing positively affected the compliance of patients with treatment and diet (25, 27, 28).

Self-Care and Self-Management

Three studies reported that telenursing positively affected self-management and self-care behaviors (17, 29, 30).

Discussion

The incidence of CKD requiring dialysis treatment in Türkiye in 2022 was reported to be 160.9 per million population. The annual incidence is higher in men (190.6 per million population) than in women (131.2 per million population) and increases in direct proportion to age (31). Many complications can occur in patients who have developed kidney disease and started dialysis treatment. Heart failure, cerebrovascular events, and anemia are among the most common (31). The care of patients on dialysis should be administered professionally and following scientific principles to prevent such complex and serious complications.

Findings from the reviewed studies on telenursing applications indicate that remote monitoring and messaging methods may contribute to improving the quality of life and satisfaction of dialysis patients (16, 17, 19). In their study, Scofano et al. (2022) reported that all experiences of patients on dialysis were positive but that patients still preferred face-to-face visits (18). In the study by Chu et al. (2023), patients on hemodialysis living alone were shown to prefer a model in which telenursing and face-to-face practices are integrated due to

reasons such as not feeling that they receive remote social support with telehealth, fearing that they may be unable to do self-physical assessment, not knowing the spoken language, and not using technology properly (20). Consistent with the present findings, Fisher et al. (2022) and Javanparast et al. (2021) demonstrated that participants were worried that they might not be able to perform the tasks expected of them (e.g., physical examination) as reliably as health personnel (32, 33). These findings suggest that telenursing practices could be applied together with traditional methods such as face-to-face patient visits, but in-depth studies on this subject are still needed.

In one study, the levels of depression, anxiety, and stress were low among patients on dialysis receiving telenursing services (22). In another study, meditation and yoga were facilitated among patients on dialysis via teleconference, but no change was found in the levels of depression and anxiety (21). Conversely, Durmaz Akyol (2016) found that anxiety did not affect the quality of life of patients on hemodialysis (34). Kavanagh et al. (2015) reported that symptoms of depression were observed in patients on hemodialysis but did not affect functional status (35). Depression is the most common problem after physical problems in patients on hemodialysis and directly affects quality of life. Based on the finding in this literature review that telenursing can reduce stress and anxiety, mental problems should be detected early, and preventive care should be provided using telenursing models.

This review demonstrates that patients are less active on dialysis days; however, it suggests that activity and sleep monitoring should be considered in dialysis patients. Selimoğlu Namoğlu et al. (2023) show that sleep cycles are more favourable when depression and anxiety levels are low (36). A study by Hejazian et al. (2021) also reported that high calcium, phosphate, and parathyroid levels or low vitamin D levels trigger sleep disorders in patients, and that controlling these parameters positively affects the sleep cycle (37). Another study associated sleep quality with restless legs syndrome (38). These findings suggest that symptom management in dialysis patients may improve sleep patterns.

Some studies included in this review suggested that telenursing-based interventions, such as nurse-led telephone follow-up combined with patient education, could contribute to improving patients' adherence to

treatment and dietary regimens (25, 27, 28). In a randomized controlled trial conducted by Arad et al. (2021), the intervention group was reported to exhibit post-intervention improvements in certain laboratory parameters, including serum calcium levels, whereas the control group showed changes in only limited biochemical indicators (25). These results indicate that telenursing-supported follow-up may potentially influence biochemical outcomes associated with calcium–phosphorus metabolism, presumably by reinforcing adherence behaviors. Moreover, Özkurt et al. (2017) reported higher motivation levels among patients with normal phosphorus levels, highlighting a possible link between effective metabolic control and patient motivation (39). Collectively, these findings suggest that telenursing interventions have the potential to support calcium–phosphorus balance, although the variability and limited number of studies warrant caution before generalizing these outcomes to all dialysis populations.

Some studies included in this review showed that care provided through telenursing positively affected treatment and dietary adherence (25, 27, 28). Özkurt et al. (2017) also found that the motivation level was high in patients with normal phosphorus levels, revealing the importance of symptom management (39). When calcium–phosphorus balance is achieved, patients are more likely to feel motivated and therefore comply with treatment. These findings indicate that care provided through telenursing could maintain calcium–phosphorus balance and reinforce compliance with treatment and diet with high motivation.

In this review, care provided through telenursing was found to positively affect self-care (30) and self-management (17). According to Deveci and Tel Aydın (2022), individual training given to patients on hemodialysis positively supports self-management (40). A study has shown that self-management interventions conducted via mobile phone and tablet applications also improve symptom management (41). Taken together, these findings show that care provided through telenursing could improve self-care, self-management, and thus symptom management.

The quality of evidence from the studies included in this review was good. This indicates that the information obtained is reliable. Despite this strength, this study has some limitations. The included studies applied heterogeneous telehealth models, ranging from nurse-led and multidisciplinary care to primarily

technology-supported interventions, which may limit the comparability of the findings. Some of the remote services received by patients on hemodialysis were provided either by health care professionals such as nurses, doctors, and psychologists or through electronic applications. This difference might have affected the patient outcomes. Another limitation is that different measurement tools were used across the studies. The results may differ when patients are assessed using standardized tools and monitored by clinical experts, primarily nurses.

Conclusion and Recommendations

In conclusion, the use of telenursing positively affects the nursing care management of patients on dialysis. A telenursing service designed specifically for these patients can improve patient satisfaction, quality of life, monitoring of physical activity and sleep quality, compliance with diet and treatment, monitoring of laboratory values, self-care, and self-management.

Further studies on the effects of telenursing on depression, anxiety, and stress among patients on dialysis are recommended. Telenursing should be planned by considering the individual characteristics of patients, the environment they live in, their access to and use of technology, the language they use, and their need for face-to-face contact. To mitigate the risk of heterogeneity in future findings, there is an urgent need for standardized studies employing uniform protocols. Establishing a consensus on methodological frameworks will ensure data reproducibility and enhance the robustness of evidence-based recommendations.

Future telenursing interventions for patients undergoing dialysis should be structured as evidence-based nursing care bundles rather than being implemented as isolated telehealth activities. These care bundles may include standardized components such as symptom assessment, monitoring of treatment and dietary adherence, medication management, patient education, psychological support, and individualized feedback through nurse-led remote follow-up. Developing structured telenursing care bundles may improve the reproducibility and implementation of interventions by clearly defining the essential nursing components, intervention processes, and expected outcomes. In addition, evidence-based care bundles may facilitate the integration of telenursing into routine dialysis care by supporting continuity, standardization, and patient-centered care approaches (42). Future

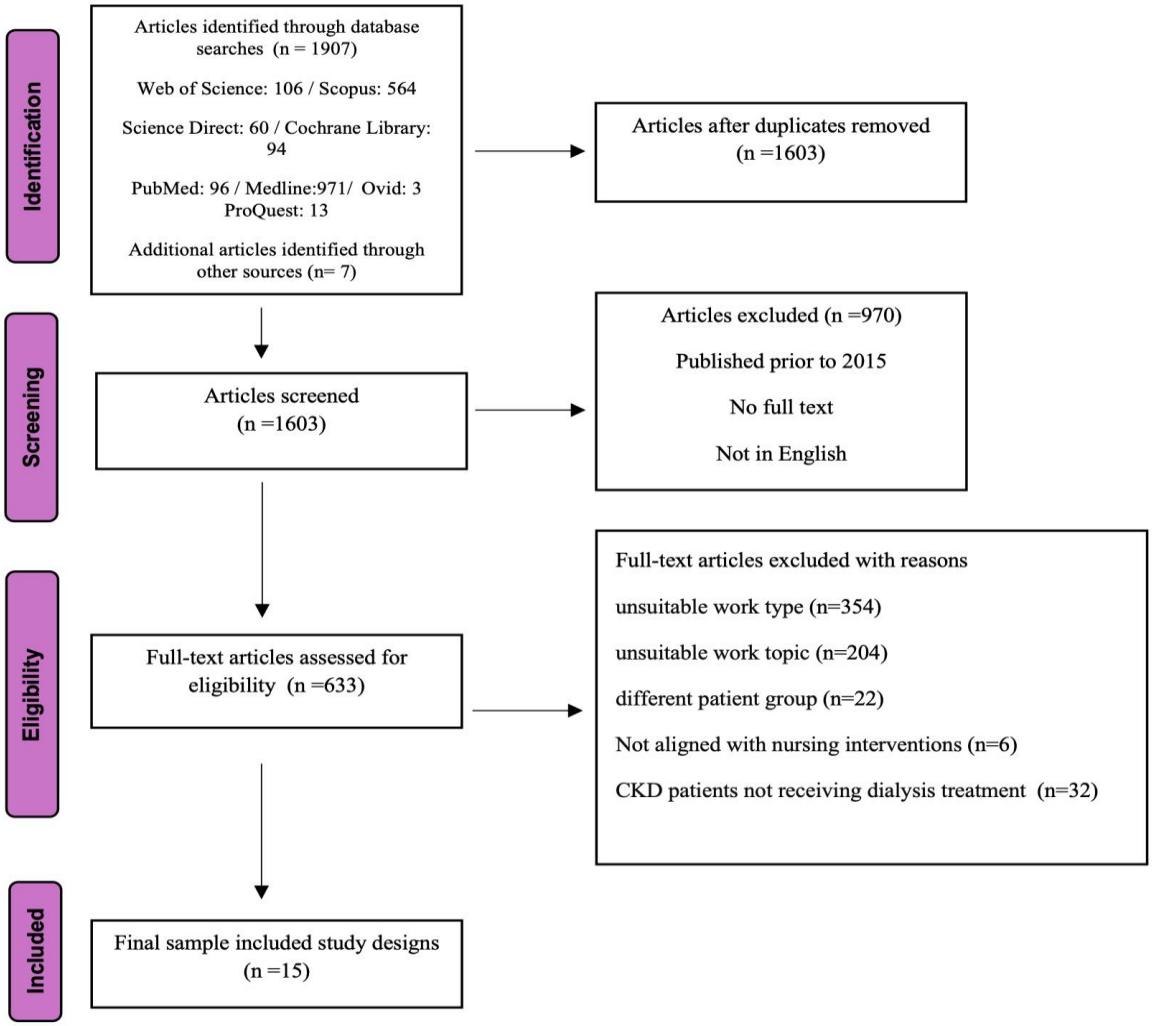
studies should focus on developing and evaluating standardized nurse-led telenursing care bundle models across different dialysis populations and healthcare settings.

Finally, a limitation of this review is the high heterogeneity and multidisciplinary nature of the included interventions. Although our primary focus was on nurse-led telenursing, the scarcity of dialysis-specific literature strictly limited to independent nursing interventions necessitated a broader search strategy. Consequently, concepts such as telehealth, telemedicine, and mHealth were included, where nursing roles often overlap with other healthcare disciplines. While this broad approach ensured a comprehensive overview of current literature, it may limit the ability to draw definitive conclusions solely regarding isolated, nurse-led telenursing practices.

Relevance for Clinical Practice

Technological applications such as tele-nursing should be integrated into routine nursing practices in the hospital, allowing nurses to reach patients outside the hospital. With the use of tele-nursing, the workload of nurses will be reduced and communication will be established between patients and nurses who are far away from each other. With the active use of tele-nursing, the workload of nurses will be reduced and communication will be established between patients and nurses who are far away from each other. By providing access to more patients in a shorter period of time, time management will be facilitated and patients will be able to maintain their care more comfortably and regularly. Follow-up of diseases that require continuous care and follow-up, such as chronic diseases, will continue after discharge and management will be easier. The follow-up and care of the elderly population will be systematized.

Figure 1. Study Selection and Inclusion Process



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DECLARATIONS

Ethics Approval And Consent To Participate

Not applicable

Consent For Publication

Not applicable

Availability Of Data And Materials

The authors confirm that no new data were generated or collected for this systematic review. All data supporting the findings of this study were derived from previously published articles, which are cited within the manuscript. The data extracted and synthesized from the included studies are available within the article and its supplementary materials. All authors have read and approved the final version of the article. Özlem DOĞU has full access to all the data in this study and takes full responsibility for the integrity of the data and the accuracy of the data analysis.

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The authors declare no competing interests.

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Authors' Contributions

All authors contributed to the conceptualisation and design of the study.

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