Usage of Smartphone Apps in Self-care of Patients Undergoing Hemodialysis: A Scoping Review

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Abstract

Aim: Using smartphone apps can be a valuable tool for self-managing dialysis patients. This study aimed to review the usage of smartphone apps in the self-care of patients undergoing hemodialysis.

Method: Resources were searched on three bibliographic databases, including PubMed, Scopus, and CINAHL, investigated from May 2005 through May 2021, using key terms, such as smartphone apps, mobile health, hemodialysis, chronic kidney disease, self-care, and self-management. Selecting articles were based on the PRISMA flow diagram.

Results: The smartphone apps used for undergoing hemodialysis patients were categorized into five main categories. These categories included dietary monitoring, treatment adherence, lifestyle management, symptoms monitoring, and patient training.

Conclusion: Smartphone apps must be developed by cooperation and supervision of healthcare agencies to improve patient adoption and ensure confidentiality. Further research efforts are needed to assess the impact of apps on quality of life outcomes through randomized controlled trials and cohort studies. In developing apps, the needs and preferences of patients must be considered.

Keywords: Smartphone; Mobile Application; Hemodialysis; Self-care; Self-management

Hemodialysis is one of the regular therapies for patients with chronic kidney disease. Patients need hemodialysis once or three times a week, depending on the severity of the kidney failure. Hemodialysis has many short and long-term side effects for these patients. Since hemodialysis is a long-term process, patients undergoing hemodialysis are faced with many problems in physical and psychological functions and restrictions on daily routine activities (1-3). These patients have suffered a miss of independence by spending more time on treatment in dialysis centers (4, 5). Hence, they should capably develop skills and capabilities to reduce disease progression and decrease the dialysis complications in their lives for active involvement in their care process (6, 7). Successful management of hemodialysis treatment can depend on the self-care efforts of patients through effectively managing medications and making lifestyle modifications (8-10). Hemodialysis patients need to apply self-care for handling their dietary and fluid intake, vascular access care, and control of hypertension (11, 12). Self-care is defined as the ability of patients to meet their needs and related care to continue life (13).

Tsay and Healstead stated that patients with renal failure who have higher self-care can face the disease much better (14).

On the other hand, healthcare providers cope with challenges in optimal care delivery for hemodialysis patients (7). Thus, they require tools to educate and enable patients to improve medication and dietary adherence, blood pressure control, and lifestyle changes (10-12).

Smartphone technologies provide many opportunities for healthcare professionals to communicate in a real-time situation with patients involved in disease management (15, 16). A smartphone is a mobile phone with highly advanced features having an operating system and the ability of software apps to run (17).

Research results have indicated that interventions related to smartphone apps can be considered a valuable and helpful tool, including empowering patients with chronic diseases in self-care, facilitating communication with health care providers, and reducing care costs (18-20). The apps promote the patients` self-care through education, monitoring, feedback, and support programs outside a healthcare setting (19-21).

The apps proved to be a tool helping motivate and reinforce medication management and lifestyle modifications that hemodialysis patients need during treatment (22, 23). Self-care is extraordinarily important in hemodialysis patients. Also, the role of smartphone apps is very important in this regard. Accordingly, this review was conducted to identify the usage of smartphone apps in the self-care of patients undergoing hemodialysis.

Method

A literature review was conducted on three bibliographic databases, including PubMed, Scopus, and CINAHL, which were investigated from May 2005 through May 2021. This review was performed using a combination of terms, including smartphone apps, mobile health, hemodialysis, CKD, self-care, and self-management. The papers which studied smartphone apps interventions and were in the English language were included in the review. In total, 130 articles were extracted from the three databases. First, 54 articles were removed due to duplication. Then, the titles and abstracts of the articles were evaluated and screened according to the inclusion and exclusion criteria. In this step, 41 studies were obtained, eight articles of which were not retrieved. Then, seven, five, and three articles were removed due to non-interventional apps, non-English publications, and review articles, respectively. Finally, 18 articles were included for the final review. Figure 1 shows a process of selecting articles according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses(PRISMA) flow diagram.

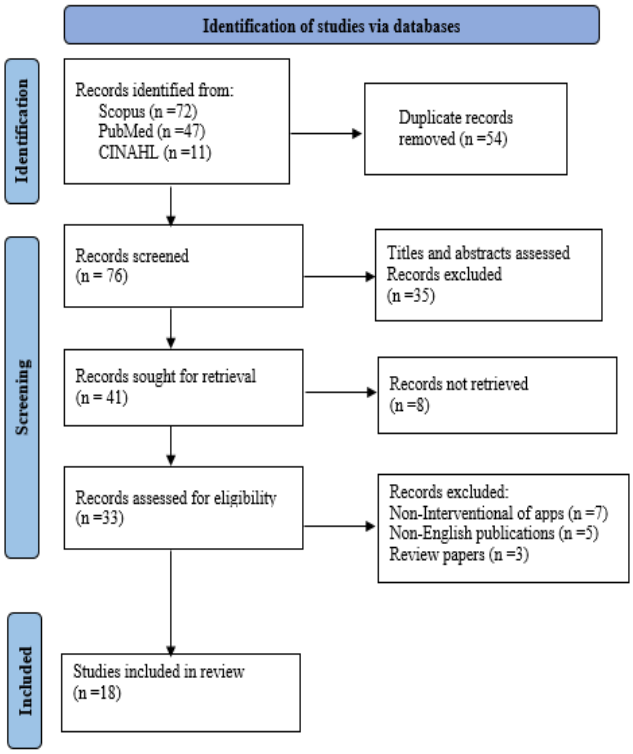

Figure 1: Flow diagram of selecting studies for the review

Results

The results are reported based on the usage of

smartphone apps in self-care of patients undergoing hemodialysis fall into five main categories:

1. Dietary monitoring

Patients undergoing dialysis are often required to make necessary changes in their dietary intake for dry weight management (24). Diet and fluid restrictions are among the most challenging aspects of dialysis treatment (25). The results of several studies have indicated that using mobile apps for dietary self-monitoring empowered hemodialysis patients to adapt their nutrition prescription and had a significant effect on dietary and protein, phosphorus, potassium, liquids intake when compared with the control intervention (24-30). For example, the research of El Khoury et al. showed that the development of a nutritional smartphone app for hemodialysis patients improved by 89% weight control before and after dialysis and also improved by 78% serum potassium and phosphorus concentrations (28).

2. Treatment adherence

Previous studies have shown that non-adherence to the recommended therapies is widely high among hemodialysis patients (31-33). The results of the studies have indicated that hemodialysis patients using smartphone apps have more motivation in self-management of their illnesses and greater adherence to their care than patients who did not use it (23, 31-35). Morawski et al. performed a randomized clinical trial to determine if the Medisafe smartphone app improves medication adherence and blood pressure control. They found significant improvement in medication adherence but no difference in systolic blood pressure between the intervention and control groups (32).

3. Lifestyle management

Hemodialysis patients require lifestyle changes and behavioral limitations (36). They have significantly less physical activity and experience poor quality of sleep (37).

Empowerment of patients is a model of intervention used to facilitate decision-making and self-care (7). The utility of smartphone apps to enhance hemodialysis patients' lifestyle patterns have the potential to motivate them to remain healthy and increase the quality of life outcomes (38, 39). Patients could receive education and reminders on the required lifestyle choices at the most appropriate times to modify their lifestyle behaviors (10, 36-39).

4. Symptom monitoring

The recognition of changes in signs and symptoms was particularly difficult for most hemodialysis patients (40). Smartphone apps may be used to monitor symptoms and risk factors through biomarkers and test results records. These apps could help patients follow the disease progression and keep track of their health (25, 40-43).

5. Patient training

Patients should be able to develop skills for active involvement in their care process to achieve high levels of self-care (7). Thus, they need to train for managing the disease and adapting to the disease complications (23). The smartphone apps can be used as an appealing tool to motivate patients to learn self-care (31). The apps must be developed based on the patients' needs (38). The result of research indicated that the apps are beneficial for patient training. Also, it can affect improving self-care behavior and health-related outcomes (43-45).

The scoping review in this study had limitations. The English language publications were only reviewed, thus articles from other languages may have been missed.

Conclusion

The main functions of the smartphone apps that are used for patients undergoing hemodialysis included diet monitoring, treatment adherence, lifestyle management, symptoms monitoring,

and patient training. Smartphone apps must be developed by cooperation and supervision of healthcare agencies to improve patient adoption and ensure confidentiality. Further research efforts are required to assess the impact of apps on quality of life outcomes through randomized controlled trials and cohort studies. In developing apps, the needs and preferences of patients must be considered.

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