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Publication details, including author guidelines

URL: <https://jurnal.konselingindonesia.com/index.php/jkp/about/submissions#authorGuidelines>

Editor: Mufadhal Barseli

Article History

Received: 25 Feb 2025

Revised: 29 Oct 2025

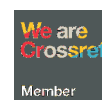
Accepted: 30 Oct 2025

How to cite this article (APA)

Fransisca, F. & Khoiriyati, A. (2025). Mobile app-based education for CAPD self-care in CKD patients: insights from a scoping review. Jurnal Konseling dan Pendidikan. 13(3), 193-206. <https://doi.org/10.29210/1142700>

The readers can link to article via <https://doi.org/10.29210/1142700>

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Jurnal Konseling dan Pendidikan

ISSN 2337-6740 (Print) | ISSN 2337-6880 (Electronic)





Mobile app-based education for CAPD self-care in CKD patients: insights from a scoping review

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ABSTRACT

Chronic Kidney Disease (CKD) requires optimal self-management, especially for patients undergoing Continuous Ambulatory Peritoneal Dialysis (CAPD), where education and adherence play a central role in treatment success. Although the use of mobile health technologies has increased, evidence regarding their educational potential in CAPD care remains fragmented. This scoping review aimed to identify and synthesize existing evidence on mobile app-based educational interventions for CAPD self-management in CKD patients, focusing on the most effective features, learning outcomes, and implementation barriers. A comprehensive literature search was conducted through PubMed, Cochrane Library, ScienceDirect, and Google Scholar for studies published in English from 2014 to 2024, following PRISMA-ScR guidelines. Twenty studies met the inclusion criteria, consisting of eight quantitative, seven qualitative, and five mixed-method designs. The review found that mobile app-based education improved patients' knowledge, adherence to dialysis procedures, and self-monitoring behavior. The most effective features included interactive educational modules, personalized care reminders, symptom-tracking tools, and two-way communication between patients and healthcare providers. Nevertheless, several challenges were identified, such as limited digital literacy, inconsistent app usability, and lack of integration with clinical systems. These findings indicate that mobile educational applications have strong potential to enhance CAPD self-management by providing accessible, interactive, and patient-centered learning tools, while emphasizing the need for standardized evaluation frameworks and longitudinal studies to assess their long-term effectiveness and clinical impact.

Keywords:

Digital health
Mobile apps for CAPD
education
Patient engagement
Peritoneal dialysis
Self-management

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Introduction

Chronic Kidney Disease (CKD) is a progressive and debilitating condition that affects approximately 13.4% of the global population and continues to rise due to aging populations and the global increase in diabetes and hypertension (Mullerpatan et al., 2023). The disease is often accompanied by complications such as cardiovascular disorders and metabolic imbalances that further complicate its management. When CKD is not optimally managed, it can progress to end-stage renal disease (ESRD), requiring renal replacement therapies such as hemodialysis, peritoneal dialysis, or transplantation each of which imposes significant financial, physical, and psychological burdens on patients and healthcare systems. Therefore, the cornerstone of CKD management lies in effective self-management, where patients actively engage in disease monitoring, medication adherence, and lifestyle adjustments to slow disease progression and improve clinical outcomes.

Continuous Ambulatory Peritoneal Dialysis (CAPD) represents one of the most common home-based renal replacement therapies that enables patients to perform dialysis independently (Rini et al., 2021). However, CAPD procedures are complex and require strong patient commitment to maintain sterile techniques, monitor fluid balance, and recognize early signs of infection. Patient education thus plays a critical role in ensuring treatment success, preventing complications, and enhancing quality of life (Brown et al., 2023). Evidence shows that structured self-management interventions can significantly improve knowledge, adherence, and overall health-related quality of life among CKD patients (Mohammed et al., 2020; Korzh et al., 2022). Despite these benefits, studies consistently reveal that many patients still exhibit poor self-management behaviors, low treatment compliance, and insufficient understanding of CAPD procedures (Schrauben et al., 2022; Suarilah & Lin, 2022).

The rapid advancement of digital health technology presents new opportunities to address these educational and behavioral challenges. Mobile health (mHealth) applications have emerged as promising tools to facilitate self-management by providing interactive learning modules, real-time monitoring, and direct communication with healthcare providers (Dey et al., 2016). These platforms allow patients to access personalized information anytime and anywhere, making education more continuous and adaptable to individual needs. However, despite growing interest, research on mobile application-based education for CAPD patients remains fragmented and methodologically diverse. Most existing studies focus on general CKD management or telemonitoring functions, with limited emphasis on patient-centered educational design specific to CAPD (Lew et al., 2017; Talbot et al., 2022; Wahab et al., 2023). Moreover, many interventions are not grounded in theoretical models such as the Individual and Family Self-Management Theory (IFSMT) or the Health Belief Model (HBM), which are crucial to understanding how technology influences patients' motivation, self-efficacy, and behavioral change.

This theoretical and empirical gap highlights the need to systematically map current evidence and identify how mobile applications are being developed, implemented, and evaluated for CAPD education. Understanding which design elements and educational strategies contribute most effectively to patient engagement and self-care can guide future innovation in this field. Therefore, this scoping review aims to comprehensively synthesize existing literature on mobile app-based CAPD education, identify prevailing conceptual frameworks, evaluate their reported benefits and limitations, and provide practical insights for optimizing digital education interventions to support CAPD self-management in CKD patients.

Method

This scoping review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews (PRISMA-ScR) guidelines. The review aimed to systematically identify, map, and synthesize existing evidence on mobile app-based education for Continuous Ambulatory Peritoneal Dialysis (CAPD) patients. Data sources included four major electronic databases: PubMed, Cochrane Library, ScienceDirect, and Google Scholar. The search strategy employed a combination of controlled vocabulary and free-text terms using Boolean operators (AND, OR) to maximize sensitivity and specificity. The final Boolean structure used was: ("Continuous Ambulatory Peritoneal Dialysis" OR "CAPD") AND ("mobile application" OR "mobile app") AND ("education" OR "patient education"). Searches were limited to studies published in English between January 2014 and December 2024 to capture recent developments in digital health interventions.

Inclusion criteria comprised (1) studies focusing on CAPD education supported by mobile applications, (2) studies involving adult CKD patients undergoing CAPD, (3) publications in English, and (4) original research articles, reviews, or mixed-method studies. Exclusion criteria included (1) studies unrelated to CAPD education, (2) interventions not involving mobile apps, (3) non-English publications, and (4) articles published before 2014.

The study selection process followed five PRISMA-ScR stages: (1) identification, (2) screening, (3) eligibility, (4) inclusion, and (5) data charting. All identified records were imported into a reference management system to remove duplicates. Two independent reviewers conducted title and abstract screening, followed by full-text assessment of potentially eligible articles. Reasons for exclusion were recorded at each stage. To ensure the quality and validity of the included studies, methodological rigor was assessed using appropriate critical appraisal tools according to study design: the Joanna Briggs Institute (JBI) checklist for qualitative and cross-sectional studies, and the Mixed Methods Appraisal Tool (MMAT) for mixed-method designs.

Data extraction was performed using a standardized form capturing key study characteristics (author, year, country, design, population, objectives, type of mobile intervention, educational features, and main outcomes). Extracted data were categorized thematically into domains such as educational content, user engagement features, outcome measures (knowledge, adherence, quality of life), and implementation challenges. Qualitative findings were analyzed through thematic synthesis to identify recurring patterns and insights, while quantitative data were summarized descriptively using frequency and percentage distributions. Inter-rater reliability was calculated using Cohen's kappa (κ) to evaluate agreement between the two reviewers during article selection and data extraction, with discrepancies resolved through discussion or consultation with a third reviewer.

This structured and transparent approach ensured methodological rigor, reproducibility, and comprehensive coverage of the existing literature on mobile application-based education for CAPD patients.

Result and Discussion

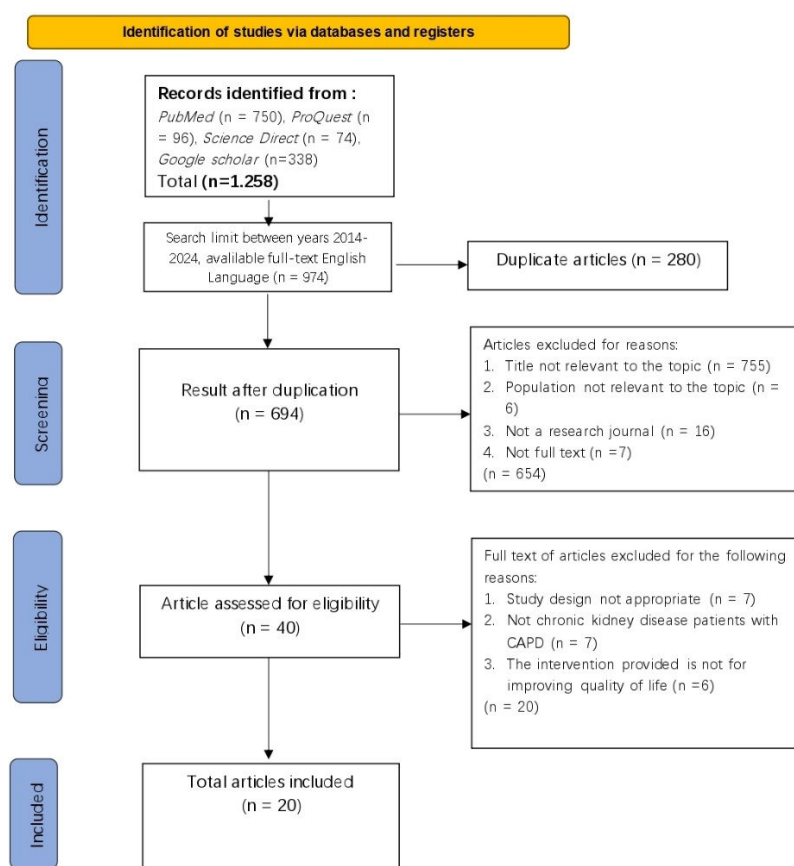


Figure 1 Article Search

The initial search yielded 1,258 articles from various scientific databases, with the following distribution: PubMed (750 articles), ProQuest (96 articles), Science Direct (74 articles), and Google Scholar (338 articles). After title screening, 974 articles were eligible after articles irrelevant to the study population were eliminated. Next, duplications were removed, which resulted in the remaining 694 articles. The next process was abstract and full-text screening, where 654 articles were eliminated because they did not match the topic, population, journal type, or text format. From this stage, 40 articles are still relevant. A quality assessment was carried out to ensure the quality of the selected articles, which resulted in 20 articles that met the criteria. Procedures for searching and reviewing literature can be seen in Figure 1.

Study Characteristics

This study involved 20 research articles with cross-sectional (n=4), observational (n=6), experimental (n=2), qualitative (n=1), pilot study (n=5), and mixed (n=1). The geographical distribution of research is spread across various regions, with Southeast and South Asia being the most numerous, including the Philippines, Indonesia, Malaysia, Singapore, and India. Followed by two countries in the Middle East, namely Saudi Arabia and Cyprus. South Africa and Europe by Portugal represent Africa. Meanwhile, Latin America is represented by two countries, namely Mexico and Brazil.

Table 1. Study Characteristics

Author, year, location	Title	Study design	Sample	Result
Marcos Antonio Mart ´nez Garc´a et al., 2018, Mexico	Telemonitoring system for patients with chronic kidney disease...	a descriptive, prospective, longitudinal, and observational	24 patients CAPD	patients were satisfied with the functionality of the tested systems. CAPD and APD data exchange services received the highest marks, followed by alert creation services and notification search services (except display, instruct, and communicate)
Chae & Kim, 2024, Korea	Effects of a mobile application on improving self-management of adult patients ...	A randomized controlled trial	53 patient CAPD	Significant improvements in PD-related health knowledge and behavior indicate that the Inform and Record functions are effective.
Sriyuktasuth et al., 2023, Bangkok	Telehealth Service for Patients Receiving Continuous Ambulatory Peritoneal Dialysis...	pilot study	104 CAPD	Telehealth PD services are feasible and well-accepted for providing care to patients receiving CAPD.
Imtiaz et al., 2017, Ottawa, Japan	A pilot study of Okkidney...	pilot study	10 CAPD	Patients show satisfaction with OkKidney. This research shows OkKidney's potential to help DP patients manage phosphate levels.

Author, year, location	Title	Study design	Sample	Result
Kitrenu et al, 2023, Songkhla, Thailand	Effects of a community health nurse telehealth care...	quasi-experimental study	62 CAPD	The CHNTC program is useful for providing home remote dialysis therapy and PD self-management support for CKD patients, helping them maintain good independence while ensuring good outcomes.
Talbot et al, 2022, Sydney, Australia	Patient and clinician perspective...	Qualitative design	14 (5 clinicians [2 nephrologists, 3 PD nurses] and 9 patients CAPD)	RPM has the potential to improve the quality of life of DP patients. However, addressing the challenges associated with RPM implementation, such as data governance, patient engagement, and workload, is important.
Nayak et al., 2016, Southern California	Telemedicine and remote monitoring...	Retrospective study	246 CAPD	Telemedicine has the potential to be a solution to improve health care for DP patients in rural areas who may have limited access.
Cao et al., 2018, China	Application of instant messaging software ...	A randomized controlled trial	160 dalam 2 grup	The QQ intervention improved patient health and satisfaction compared with controls. Patients who received this intervention had higher serum albumin and hemoglobin levels, as well as better levels of satisfaction. This intervention also reduced levels of phosphorus and calcium-phosphorus products. There were no differences between the two groups regarding kidney transplantation, switching to hemodialysis, or serum calcium levels.
Dey et al., 2016, UK	Telehealth: Acceptability, clinical interventions ...	A cross-sectional study	22 on CAPD therapy	There was no significant improvement in quality of life or satisfaction with Assistive Technology.
Kiberd et al., 2018, Canada	Effectiveness of a web-based eHealth portal...	a single-arm pilot study	27 patients on CAPD	(1) The majority of participants were satisfied with the service. (2) There was no significant improvement in quality of life, and it is difficult to assess user acceptance due to the

Author, year, location	Title	Study design	Sample	Result
				limited sample size. (3) There is no significance in the measured consumer quality index.
Martínez García et al., 2018, Mexico	Telemonitoring system for patients with chronic kidney disease...	Quasi-experimental design (A case study)	24 patients on CAPD therapy	Most participants were satisfied with the application. Satisfaction rates were 94.5% among Automatic Peritoneal Dialysis (DPA) patients and 92.3% among Continuous Ambulatory Peritoneal Dialysis (CAPD) patients. Overall, acceptance of the app was high, with 89.5% of participants approving its use.
Olivares-Gandy et al., 2019, Mexico	A telemonitoring system for nutritional intake...	Observational Descriptive (A case study)	one patient & one nutritionist	patients find the app easy to use and useful in helping them.
Polanco et al., 2021, Mexico	A COVID-19 pandemic-specific...	Observational Analytic Designs (An observational prospective-longitudinal study)	946 patients with CAPD therapy	Rates of peritonitis, transition to hemodialysis, and hospitalization did not differ significantly between groups.
Viglino et al., 2020, Italy	Videodialysis: a pilot experience...	observational prospective-longitudinal study)	the intervention group (n=15) the control group (n=62)	Patients showed a high level of satisfaction with the self-confidence-building app, which proved effective in increasing their self-confidence. The majority of patients feel more confident after using this application.
Xu et al., 2022, China	Telemedicine and clinical outcomes in peritoneal dialysis	Observational Analytic Designs (A Propensity Matched Study)	Participants (n=7539)	Compared with the control group, the intervention group showed a significant reduction in the risk of death and PD-related complications, better efficacy in fluid management and solute clearance, and a higher level of safety in catheter use.
Hayashi et al., 2017, Japan	Testing the feasibility and usability of a novel smartphone-based...	Pilot study	9 participants	SMART-D shows moderate functionality in helping patients manage their health. This system focuses on data recording, automatic evaluation, and data display

Author, year, location	Title	Study design	Sample	Result
Nicdao et al., 2016, Australia	'My Home Hemo'app-a new telehealth tool...	Retrospective Cohort	74 patients	to help patients monitor their health status. HHD-RMS shows moderate functionality in helping patients manage their health. This system focuses on data recording, display, and direct communication between patients and medical staff. This system has limitations in terms of information, instructions, reminders, and direct guidance.
Liu et al., 2017, Australia	Remote monitoring systems for chronic patients...	Mix method	74 patients	The proposed mechanism increased feelings of connection with the clinician for patients, improved adherence to their treatment and dialysis schedule, and improved patients' emotional well-being.
Harrington et al., 2014, USA	The use of a tablet computer platform to optimize the care of patients...	Pilot study	6 patients	A tablet computer platform is viable for continuous ambulatory PD, providing flexibility, advanced infrastructure, two-way communication, and real-time interaction.
Lew et al., 2017, USA	Adoption of telehealth: Remote biometric monitoring...	Adoption of telehealth: Remote biometric monitoring among peritoneal dialysis patients in the United States	261 participants	Remote biometric monitoring is positively associated with patient compliance in monitoring peritoneal dialysis (PD)--related blood pressure and weight. This system facilitates more effective patient and PD clinical staff communication through real-time patient data. This situation can increase patient compliance with treatment and produce better outcomes.

Based on the recapitulation table of application functionality in 20 articles, we found that the majority of applications intended for Continuous Ambulatory Peritoneal Dialysis (CAPD) patients have functions to provide information (95%), record data (75%), and display data (65%). Most apps offer guidance (60%) and reminder features (55%). However, only a few applications have features to provide instructions (15%). The functionality of each application is explained in detail in Table 2.

Table 2. Details of application functionality interpretation

No article	Inform	Instruct	Record	Display	Guide	Remind/Alert	Communicate
1	✓		✓		✓	✓	
2	✓		✓				
3	✓		✓	✓	✓	✓	✓
4	✓		✓		✓	✓	
5	✓		✓				✓
6	✓		✓	✓	✓	✓	✓
7	✓		✓	✓	✓	✓	✓
8	✓	✓	✓	✓	✓	✓	✓
9	✓	✓	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓	✓	✓
12	✓	✓	✓	✓	✓	✓	✓
13	✓	✓	✓	✓	✓	✓	✓
14	✓	✓		✓	✓		✓
15	✓	✓	✓				✓
16			✓	✓	✓		
17			✓	✓			✓
18			✓	✓	✓	✓	✓
19		✓	✓	✓			✓
20			✓			✓	✓

Self-management approach in CAPD education

The self-management approach to CAPD education aims to provide patients and families with the knowledge, skills, and support they need to manage CAPD care independently. Patient-centered education is at the heart of this approach, where patients are provided with relevant and easy-to-understand information about CAPD, including the therapy process, potential complications, and how to manage them. In addition, practical training is also an important part of this approach, providing patients with instructions on performing fluid exchanges correctly and dealing with problems that may arise. The self-management approach also involves collaboration between the patient, family, and health team. Patients are encouraged to actively participate in decisions about their care actively, thereby increasing their sense of ownership and control over their health condition. Additionally, emotional support is also provided to patients to help them cope with the stress and anxiety associated with chronic illnesses such as CAPD (Pungchompoo et al., 2020).

The benefits of a self-management approach in CAPD education are very diverse. Patients who feel more informed and empowered tend to be more motivated to follow their care instructions correctly. This condition may improve adherence to CAPD therapy, which in turn may improve health outcomes. Additionally, patients who actively manage their health experience an increased sense of responsibility and control over their care, which positively impacts their quality of life. Although the self-management approach has many benefits, some challenges must be considered. Differences in patient skills and literacy can hinder the implementation of this approach. In addition, access to information and resources needed to implement self-management must also be considered. Therefore, appropriate support from the healthcare team, including adequate training and guidance, is critical to the success of a self-management approach in CAPD education (Cao et al., 2023).

Benefits of Mobile Application-Based Education for CKD Patients on CAPD Therapy

The mobile application allows patients to access information about CAPD anytime and anywhere. This tool helps patients understand the CAPD procedure, disease management, and possible complications. A study by Chae & Kim (2024) found that CKD patients who used the CAPD app showed a significant increase in their knowledge of CAPD compared to the control group. Various multimedia

formats such as text, images, video, and animation can be used by mobile applications to convey information about CAPD interestingly and interactively. This feature helps patients more easily understand and remember the information provided. The mobile application can be personalized according to the patient's needs and level of knowledge.

Comprehensive education about CAPD can increase patient self-efficacy in managing CAPD therapy. A study by showed that CKD patients who used the CAPD app were more confident in making decisions about their care. The app can provide step-by-step guidance on CAPD procedures, allowing patients to perform treatment independently with more confidence (Nayak et al., 2016). Penggunaan aplikasi memungkinkan pasien untuk melacak kondisi mereka sendiri, seperti tekanan darah dan berat badan, memberikan umpan balik langsung tentang efektivitas perawatan mereka, yang dapat meningkatkan kepercayaan diri dalam mengelola CAPD (Shaw et al., 2020).

Mobile applications can increase patient compliance with CAPD therapy because the applications provide regular reminders about treatment schedules and medical follow-ups. Patients can receive notifications from taking medication or undergoing CAPD procedures on schedule, which helps them not to miss the right time (Sriyuktasuth, Puwarawuttipani, et al., 2023). Additionally, the app can track and record medication use and CAPD procedures, providing better monitoring for patients and medical teams, which can increase patient accountability for their care. By having clear and organized records, patients can see their progress in CAPD therapy, motivating them to adhere to treatment.

CAPD mobile applications can provide significant benefits in improving patient quality of life. The app offers easy and fast access to relevant health information, such as disease management and health condition monitoring, which can improve patients' knowledge and understanding of their condition (Yang et al., 2020). By providing reminders and notifications to maintain treatment schedules, the app helps reduce the anxiety and stress associated with remembering treatment schedules and procedures (Sridharan et al., 2018). Apps can provide psychosocial support, such as guidance and information on managing stress and emotions related to health conditions, which can improve patients' psychological well-being (Lophongpanit et al., 2019). Thus, the CAPD mobile application can play an important role in improving patients' quality of life with CAPD through a holistic and integrated approach.

The CAPD mobile application significantly contributes to reducing the workload of medical personnel. By facilitating patients to manage their care, including recording health data and accessing CAPD-related information, this application reduces the need for direct interaction with medical personnel. A study by Sinuraibhan et al. (2020) found that using mobile applications in CAPD management can reduce the time medical personnel require to provide support and education to patients, thereby increasing the efficiency of health services. Thus, the CAPD application not only benefits patients but also helps reduce the workload of medical personnel, improving service quality and efficiency in managing CAPD therapy (Devia et al., 2022).

Application Functionality

The CAPD educational mobile app offers a variety of functionality designed to help patients learn about CAPD therapy, self-manage their care, and improve their quality of life.

Inform

The Inform function in the app for CKD patients on CAPD therapy has several significant benefits. For patients, this function provides CAPD-related information, such as procedures, health education, and disease management, which can increase their knowledge and understanding of the condition and therapy they are undergoing. This feature, which serves as a source of information, also helps patients make informed decisions about their care. CKD patients who used the CAPD app were more confident in making decisions about their care compared to the control group (citation). For medical personnel, this function facilitates the delivery of information about CAPD to patients and their families. It assists in patient education, which can improve overall patient compliance with CAPD therapy.

Instruct

The Instructional function of the CAPD education mobile application is important in helping patients understand and carry out the CAPD therapy process. The app provides step-by-step guidance on performing a CAPD fluid exchange, including preparation, catheter placement, filling and emptying the fluid bag, and catheter removal. The steps are arranged correctly, and the ideal duration for each step is shown and accompanied by pictures and videos to help patients better visualize the process. This function provides specific instructions for situations that may arise during fluid exchange. For example, in case of catheter leakage, discomfort, or other technical problems, the app provides step-by-step solutions, preventive tips, and corrective steps. Patients can also seek solutions based on the symptoms or issues they are experiencing.

Record

The Record function in the CAPD educational mobile application allows patients to record and monitor their health data independently. With this feature, patients can easily record important information such as body weight, blood pressure, body fluid levels, and the symptoms they experience. They can also record additional information such as food intake, medications taken, and physical activity undertaken. By recording their health data, patients can identify patterns and trends in their health condition over time.

In addition, Record also provides data visualization that helps patients understand their health information better. The app's graphs, tables, and diagrams allow patients to see their progress and visually identify areas needing improvement. This data visualization also gives the health team a clearer picture of the patient's health, making it easier for them to provide appropriate care. In terms of early detection of complications, the Record helps patients detect potential CAPD problems or complications as early as possible by monitoring changes in their health data. Patients can immediately report any issues they experience to the healthcare team for timely intervention. In this way, Records can prevent serious complications and improve patient health outcomes.

Display

The Display function in the CAPD educational mobile application is important in helping patients visualize and understand their health data in an easy-to-understand way. By presenting health data through engaging and informative graphs, charts, tables, and reports, the display allows patients to see their progress over time, identify potentially dangerous trends, and understand the effectiveness of the CAPD therapy they are undergoing. The graphs and charts presented help patients compare their data visually, while detailed tables and reports summarize their health data.

Guide

The Guide function in the CAPD educational mobile application is important in helping patients make informed decisions about their care. By providing personalized guidance based on patients' health data, treatment history, and preferences, the guide allows patients to consider past complications, medication dosage changes, and therapy adjustments. This feature will enable patients to understand their treatment options and the consequences of each choice, offering relevant and timely solutions to each situation. The guide also provides personalized recommendations based on patients' needs and preferences, including lifestyle, activity level, and health goals. By considering these factors, the guide helps patients develop treatment plans that fit their situation. The guide also provides emotional support to patients throughout their CAPD journey, helping them deal with the stress, anxiety, and depression they may be experiencing, as well as providing resources and information about support groups and mental health services.

Remind/Alert

The Remind/Alert function in the CAPD education mobile application is crucial in helping patients undergo the CAPD treatment schedule with discipline and avoid possible complications. Through timely schedule reminders, patients can be reminded to exchange fluids, take medications, and attend appointments with the healthcare team as scheduled. These reminders can be tailored to each patient's preferences and treatment schedule, helping them stay organized and consistent in their CAPD therapy.

The Remind/Alert function also provides early warning to patients if they miss a fluid exchange or medication dose. By providing alerts about potential complications based on patient health data or detected trends, patients can identify problems as early as possible and prevent serious complications. Patients also have the personalization option to choose their preferred type of reminder, such as pop-up notifications, sound alarms, or text messages, and they can set specific reminder intervals for various care activities, ensuring they receive reminders most effectively.

Communicate

The Communicate function in the CAPD educational mobile application is very important to facilitate effective communication between patients and the health team so that CAPD treatment can run smoothly and optimally. Through the direct messaging feature, patients can easily send text or voice messages to nurses, doctors, or other health team members. This feature provides a convenient platform for patients to ask questions, report concerns, or request clarification on care instructions, facilitating asynchronous communication that is flexible and fits the patient's schedule. The video call function allows patients virtual face-to-face consultations with the health team. This feature is useful for more in-depth discussions of health issues, visual monitoring of patient progress, and building stronger patient-doctor relationships. It is ideal when an in-person visit to a healthcare facility is unnecessary.

Based on a review of 20 research results, using mobile applications in CAPD patients has several significant benefits. Most patients who use the CAPD educational mobile application are satisfied with the functionality, ease of use, and benefits. Additionally, apps that provide information and education about CAPD can help patients improve their knowledge and health behaviors related to PD. The app can also improve patients' quality of life by increasing self-confidence, adherence to care, and emotional well-being. Several studies show that using CAPD mobile applications can improve patient health outcomes by reducing the risk of complications, increasing treatment success rates, and helping patients achieve their health goals.

In addition to these general benefits, several app features have proven effective in improving the patient experience. Information and education functions that provide accurate and easy-to-understand information about CAPD can help patients improve their health knowledge and behavior. Data monitoring and logging functions help patients monitor their health data and record important information about their care. Additionally, reminder and guide functions that send timely reminders for fluid exchanges, taking medications, attending appointments, and providing step-by-step guidance on how to perform fluid exchanges have also proven effective in helping patients better adhere to their treatment schedules. Communication functions that facilitate two-way communication between patients and the health team via direct messages, video calls, or community forums are also very useful in improving the quality of communication between patients and the health team.

Although most patients are satisfied with the functionality, ease of use, and benefits of the application, the effectiveness of the application in increasing patient satisfaction is not always significant. Likewise, there is increased patient knowledge and health behavior regarding CAPD, and several studies show significant improvements. Still, the effectiveness of the application in this case can vary depending on the quality of the information and education provided. The same is true for improving patients' quality of life and health outcomes. Some studies show improvement, but the effectiveness of the application in this case may also vary depending on the application features and patient characteristics. Likewise, improving communication between patients and the health team, where the CAPD mobile application can facilitate communication, its effectiveness in enhancing communication depends on the availability of communication features, patient training, and the communication culture within the health team. Additionally, although some studies show increased patient compliance with their treatment schedules, the effectiveness of apps in this regard may also vary depending on the quality of the reminders and guidance provided, as well as patient motivation and discipline. Therefore, to increase the effectiveness of CAPD mobile applications, greater attention

is needed to the quality of information, features, patient training, and integration with other healthcare systems.

Further research is needed to test the long-term effectiveness of CAPD educational apps and identify factors that influence their effectiveness, such as patient characteristics and app features. This variable is important for developing more effective and relevant applications. Additionally, research on the economic impact of app use is needed to assess whether these apps are a cost-effective investment for the healthcare system. Clinical practitioners can introduce CAPD educational apps to patients and monitor their use to provide additional support if needed. Collaboration with application developers can also help in developing applications that are more useful and easy for patients to use. Application developers must focus on creating more comprehensive and user-friendly applications, consider patients' diverse needs, and ensure patient data security and privacy.

Conclusion

Mobile application-based education shows significant potential in enhancing self-management among Chronic Kidney Disease (CKD) patients undergoing Continuous Ambulatory Peritoneal Dialysis (CAPD). However, its effectiveness is context-dependent, influenced by factors such as application design quality, user engagement, digital literacy, and integration with healthcare provider support. The reviewed studies reveal that mobile apps combining educational content with monitoring features, personalized reminders, and patient-clinician communication yield better adherence and clinical outcomes. While digital self-management can empower patients and improve quality of life, these benefits are maximized only when interventions are tailored to individual needs and cultural contexts. Therefore, future studies should evaluate long-term effects, policy frameworks, and evidence-based design principles to ensure that app-based education becomes an equitable, reliable, and sustainable strategy in CAPD management.

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