Review Article

Continuous ambulatory peritoneal dialysis telemonitoring and education: A scoping review

ABSTRACT

The risk of peritonitis complications in continuous ambulatory peritoneal dialysis (CAPD) can be prevented or reduced by providing proper education and continuous monitoring. Telemedicine and telemonitoring are methods that enable remote monitoring and patient care. This study aimed to determine the success and factors affecting telemonitoring in CAPD patient care. This study is a scoping review (ScR) using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses-ScR method. Article searches were carried out on ProQuest, PubMed, and ScienceDirect with a time range of 2018–2023. Data extraction was performed regarding knowledge level, quality of life, clinical outcomes (peritonitis), and risk of hospitalization. Of the 12 articles and studies included, 6 articles were related to the effect of telemonitoring on CAPD patient outcomes, and 6 articles were associated with the effect of education on CAPD patient outcomes. Education provided to patients can improve patient understanding of therapeutic modalities for renal disorders, reduce the potential for peritonitis and dialysis complications, and improve the quality of life of patients with CAPD. CAPD patients who received telemonitoring had a better quality of life, good clinical outcomes, and a lower risk of hospitalization than those who did not receive telemonitoring and had fewer health-care visits. In summary, the implementation of telemonitoring and education in chronic kidney disease patients with CAPD modality therapy has been proven effective in improving quality of life and reducing dialysis-related risks.

Keywords: Clinical outcome, continuous ambulatory peritoneal dialysis, education, peritonitis, quality of life, telemonitoring, chronic kidney disease

INTRODUCTION

Chronic kidney disease (CKD) is one of the chronic diseases with an increasing number every year.[1] CKD can be caused by several other chronic diseases such as diabetes, hypertension, and obesity. In end-stage renal disease, the kidneys cannot filtrate the blood, so several metabolic wastes cannot be discharged out of the body.[2] This condition causes the patient to experience symptoms of uremia and bilirubinemia, which can lead to a coma and even death. The main treatment for removing metabolic waste in CKD patients is dialysis.[3]

One of the dialysis methods that can help CKD patients with dialysis is continuous ambulatory peritoneal dialysis (CAPD). Unlike the dialysis method using a hemodialysis machine, in patients who use CAPD to remove metabolic waste from the body, CAPD is carried out independently by patients at home.[4] This condition requires patients to be more independent in performing dialysis. Some studies suggest that CAPD provides a better quality of life for CKD patients than hemodialysis.[5] However, CAPD also has one complication, namely peritonitis. Several studies state that peritonitis in CAPD patients can occur due to improper care of the insertion area or malnutrition in patients.[6-9] The

Muhammad Syamsul BAKHRI[1,2], Yulian Wiji UTAMI[1], Dina Dewi Sartika Lestari ISMAIL[1]

[1]Nursing Department, Faculty of Health Sciences, Brawijaya University, Malang, Indonesia; [2]Dialysis Department, RSUD Dr. Saiful Anwar, Malang, Indonesia

Address for correspondence: Muhammad Syamsul BAKHRI, Faculty of Health Sciences, Brawijaya University, Malang 65145, Indonesia.
E-mail: muhsyamsul@gmail.com

Submitted: 25-Sep-2023 **Revised:** 16-Jan-2024
Accepted: 24-Jan-2024 **Published:** 27-Mar-2024

Access this article online	
Website: https://journals.lww.com/jinm	Quick Response Code
DOI: 10.4103/jin.jin_121_23	

How to cite this article: Bakhri MS, Utami YW, Ismail DD. Continuous ambulatory peritoneal dialysis telemonitoring and education: A scoping review. J Integr Nurs 2024;6:62-8.

risk of peritonitis complications in CAPD can be prevented or reduced by providing proper education and continuous monitoring. Another thing that must be considered in the care of CAPD patients is dialysis adequacy. This condition also requires proper knowledge and skills of CAPD patients in performing independent dialysis at home.

Currently, patients only receive information from nurses and health workers on duty at health facilities. In addition, patient companions often do not have sufficient knowledge regarding the care of patients undergoing CAPD. This makes patients less likely to have access to information about CAPD procedures. This can be one of the causes of some problems that arise, such as infection.

Telemonitoring is a form of health care in which patients can be monitored remotely using information and communication technologies such as telephone, text messaging, or videoconferencing. Telemonitoring has several advantages in health care, including increasing patient accessibility to care, reducing treatment costs, improving patient quality of life, and increasing the efficiency of health services.[10] In the field of nephrology and hemodialysis, telemonitoring can provide patients with the convenience of communicating with health personnel and monitoring either during dialysis procedures or outside the dialysis period by providing question-and-answer services or reminders of action schedules.[11]

Education is one of the essential treatments for CAPD patients.[12] Some studies suggest that education in predialysis patients can reduce the risk of peritonitis infection.[13,14] In the case of patients undergoing independent CAPD, telemonitoring technology is intended to prevent infection and monitor the implementation of independent CAPD. Providing education and monitoring through digital technology or telemonitoring is expected to provide information directly to patients without having to visit a health facility. For this reason, it is important to prepare this scoping review (ScR) as a source of information and education for CAPD patients. Therefore, it is necessary to review or reorganize related ScRs on the effect of telemonitoring and education on patients undergoing CAPD. This study aimed to determine the success and factors affecting telemonitoring in CAPD patient care using ScR as a source of information and education for CAPD patients.

METHODS

Protocol and registration

This study is a ScR using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses-ScR (PRISMA-ScR) method. The flow of literature search can be seen in the PRISMA-ScR flow diagram [Figure 1]. Sampling was conducted through electronic searches on databases, focusing on articles published between 2018 and 2023. Article searches were conducted on ProQuest, PubMed, and ScienceDirect using the keywords telemonitoring, education, CAPD, and CKD.

The selection criteria used the Participant, Intervention, Comparators, and Outcomes (PICO) framework. Participant: the participants of this study are subjects/patients with CKD. Intervention: subjects who underwent CAPD receive education and telemonitoring about CAPD. Comparators: subjects who underwent CAPD did not receive education and telemonitoring about CAPD. Outcomes: knowledge level, quality of life, clinical outcomes (peritonitis), and risk of hospitalization.

Inclusion and exclusion criteria

Inclusion criteria were articles in English, original papers or literature reviews, and full-text, open-access, articles from the past 5 years and contain each PICO criteria. The study excluded articles from various sources, including books or modules, theses, dissertations, scientific papers published more than five years ago, articles categorized as subjects for debate, editor letters, protocols, pre-reviews, and articles that were inaccessible or lacked full text.

Quality assessment

Research articles meeting the inclusion criteria will be assessed for their evidence-based level according to the categories outlined by the National Health and Medical Research Council. In the case of randomized controlled trials, the evaluation of quality and risk of bias (RoB) will be conducted using the Cochrane Collaboration RoB 2.0 tool. The resulting assessment will be categorized as follows: low RoB, moderate RoB/multiple considerations, and high RoB, as outlined in the Cochrane manual.

In instances of case studies featuring a control group, the assessment of quality and risk will adhere to the guidelines provided by the National Institutes of Health (NIH) quality assessment tool for case series studies (interventional). For case studies lacking a control group, the evaluation will follow the guidelines set forth by the NIH quality assessment tool for before–after (pre–post) studies with no control group. The final assessment for these cases will be scored as good, moderate, or poor. Regarding case reports, there are currently no established guidelines for evaluating the quality of such reports.

Data management and data extraction

Articles were managed using the Mendeley reference processor (version 1083). Reviewers screened the identified articles based on title and abstract evaluation. After screening

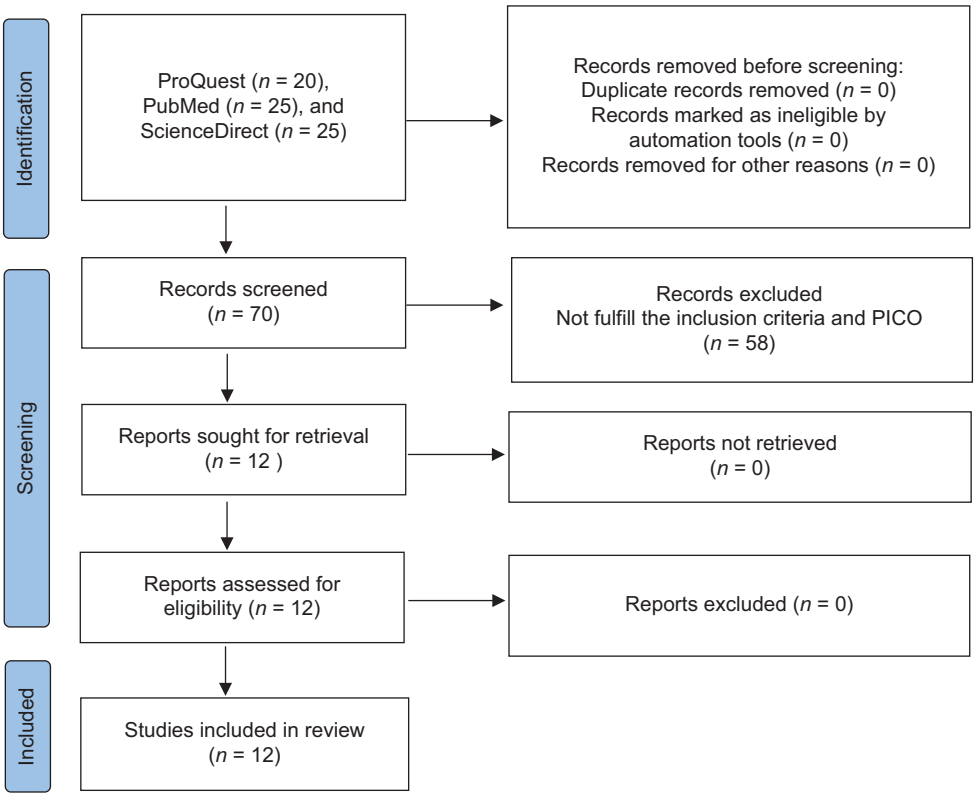

Figure 1: Diagram of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Scoping Review

for duplication, the full text of the article was subjected to a final assessment for eligibility for inclusion in the study. After going through screening, eligibility, quality assessment, and data extraction from all selected articles, important findings from the articles were written down so that the results of this extraction could then proceed to the next stage, namely data synthesis.

RESULTS

Based on the search of articles from the databases, 70 articles were retrieved, including the data from ProQuest (n = 20), PubMed (n = 25), and ScienceDirect (n = 25). After going through the process of identification, screening, and conformity with the inclusion criteria, 12 articles were selected to be included in the ScR [Figure 1]. This ScR will discuss telemonitoring and education in CAPD patients. Of the articles that met the criteria, five articles discussed the importance of education, and five articles addressed telemonitoring in CAPD patients. Based on the RoB assessment, overall, the references had low RoB. This study has low RoB on random sequence generation (selection bias), allocation concealment (selection bias), blinding of participants and personnel (performance bias), blinding of outcome assessment (detection bias), incomplete outcome data (attrition bias), and selective reporting (reporting bias) [Figure 2].

From the articles found in the databases, six articles were found to show the importance of education for CAPD patients in terms of several outcomes.[15-20] According to the articles, patient education can reduce the potential for peritonitis and dialysis complications and improve the quality of life of patients with CAPD. In addition, CAPD patient education also improves patients' understanding of therapeutic modalities that can be used in the treatment of kidney disease and patients' self-management skills [Table 1].

The role of telemonitoring in CAPD patients can be assessed from several outcomes such as quality of life and clinical outcomes. Based on the quality of life parameters, CAPD patients who received telemonitoring had a better quality of life than those who did not receive telemonitoring. Furthermore, telemonitoring in CAPD patients was also shown to have good clinical outcomes. Clinical outcomes observed include no difference in hematocrit, albumin, and phosphate levels. CAPD patients who received telemonitoring also had a lower risk of hospitalization than those who did not receive telemonitoring and had fewer health-care visits.[21-26]

DISCUSSION

This ScR is written to evaluate the effect of education and telemonitoring in CAPD patients on several outcomes such

Table 1: The effect of telemonitoring and education on the outcome of continuous ambulatory peritoneal dialysis patients

Literature	Types of articles	Outcome
Nopsopon *et al*.[15]	Review articles	Education of dialysis patients by the nurse practitioner regarding dialysis complications and improves the patient's sleep quality
Hsu *et al*.[16]	Research	Pre-education in peritoneal dialysis patients lowers the risk of peritonitis
Bonnal *et al*.[17]	Research	Hand-on combination educational modalities in peritoneal dialysis patients reduce the risk of peritonitis
Mirza *et al*.[18]	Research	Education in patients with kidney failure improves patient knowledge in choosing renal treatment modalities
Cao *et al*.[19]	Research	Education for patients undergoing peritoneal dialysis increases the patient's knowledge, quality of life, and independent skills
Zhao *et al*.[20]	Research	Patient's education on the nutrition during PD increases the number of nourishing patients The levels of hemoglobin, albumin, and prealbumin in patients in the study group were significantly increased and after 6 months posteducation
Lunney *et al*.[21]	Review articles	Quality of life: Patients who received telemonitoring had better QoL than those who did not receive telemonitoring Risk of hospitalization: Patients who received telemonitoring had a lower risk of hospitalization than those who did not receive telemonitoring
Milan Manani *et al*.[22]	Research	Quality of life: There was no difference in QoL between patients who received telemonitoring and those who did not Treatment due to overhydration: Patients who received telemonitoring had fewer health-care visits Risk of hospitalization due to complications: Patients who received telemonitoring had a lower percentage of hospitalizations than those who did not receive telemonitoring
Sriyuktasuth *et al*.[23]	Research	Quality of life: Patients who used telemedicine had better QoL than those who did not Clinical outcomes: No difference in hematocrit, albumin, and phosphate levels
Biebuyck *et al*.[24]	Research	Quality of life: NA Risk of hospitalization due to complications: Patients who received telemonitoring had a lower percentage of hospitalizations than those who did not receive telemonitoring Number of health worker visits: Patients who received telemonitoring had a lower percentage of visits than those who did not receive telemonitoring
Scarpioni *et al*.[25]	Case reports	Quality of life: NA Risk of hospitalization: Telemonitoring reduces the risk of hospitalization in dialysis patients during the COVID-19 pandemic
Uchiyama *et al*.[26] (2022)	Research article	Quality of life: Patients who receive monitoring have higher HRQOL Number of health-care consumption: Patients who receive monitoring have lower health-care consumption compared to patients who do not receive monitoring Clinical laboratory: Patients who receive monitoring have greater clinical laboratory (ultrafiltration volume)

QoL: Quality of life, PD: Peritoneal dialysis, HRQOL: Health-related QoL, NA: Not available

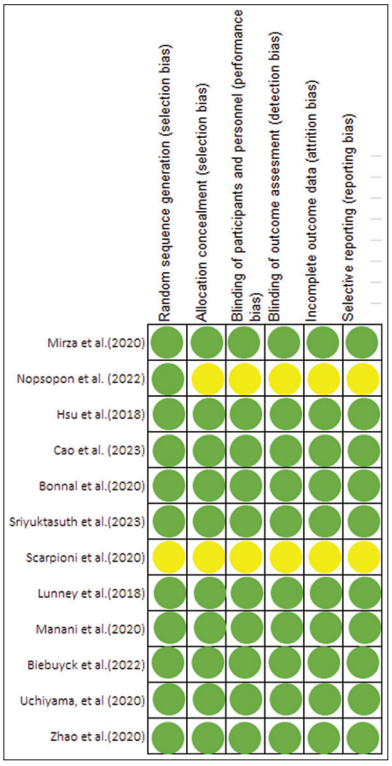

Figure 2: Risk of bias graph: review authors' judgments about each risk of bias item presented as percentages across all included studies

as patient knowledge level, potential peritonitis, dialysis complications, risk of hospitalization, clinical outcomes, and quality of life of CAPD patients. The results of this ScR are expected to illustrate that providing education and telemonitoring can benefit CAPD patients. This is because poor care in CAPD patients leads to serious complications, including peritonitis, exit-site infections, technique failure, and death. Several nurse-based educational interventions have been introduced.[15]

Based on the results obtained, education provided to CAPD patients can lower the risk of peritonitis. This was explained by Hsu *et al*.[16] where multidisciplinary education regarding nutritional information during treatment, lifestyle modification, nephrotoxin prevention, and drugs that can be used by CKD patients decreases the incidence of peritonitis. In addition, surveillance of CKD complications, information about renal replacement therapy, treatment of vascular access or peritoneal access, and guidelines for kidney transplant registration are also given to CKD patients during multidisciplinary education. Bonnal *et al*.[17] also showed that hands-on education in peritoneal dialysis (PD) patients reduced the risk of peritonitis. Education combined with hands-on on how to prevent and manage peritonitis also contributes to less incidence.

Mirza *et al*.[18] stated that education is also necessary to improve the understanding of patients with renal impairment to choose the appropriate treatment modality. Patients with renal impairment who receive education help patients to carry out self-care including CAPD. Providing education is also proven to increase the patient's and family's awareness of the development of the disease they are suffering from.

In addition, education of patients undergoing dialysis can also prevent complications due to dialysis and improve the quality of patients' sleep. Nopsopon *et al.*[15] showed that providing education by nurses improved the patient's quality of life as seen from the improved quality of the patient's sleep. Besides the improved quality of life, Cao *et al*.[19] reported that the education provided increased the patient's independent ability in fluid replacement. Psychosocial interventions and education have been shown to improve patient compliance with dialysis in patients with end-stage renal failure. Education also enhances the patient's ability to control behavior during treatment.

The notion that educating patients on nutrition during PD can enhance the nutritional status of individuals undergoing this treatment is a compelling and clinically relevant concept. According to the study by Zhao *et al*.,[20] nutrition's education is pivotal in helping patients understand the dietary adjustments necessary to support their well-being during PD. This discussion will delve into the potential positive outcomes associated with patient education on nutrition during PD, particularly focusing on the observed increases in hemoglobin, albumin, and prealbumin levels in the study group, as reported 6 months posteducation. First, patient education plays a crucial role in empowering individuals to make informed decisions about their dietary choices. Understanding the specific nutritional requirements during PD is essential for maintaining adequate levels of key markers such as hemoglobin, albumin, and prealbumin. This knowledge enables patients to actively participate in their treatment, promoting a sense of control over their health outcomes. The observed increases in hemoglobin, albumin, and prealbumin levels in the study group 6 months posteducation highlight the direct impact of nutritional education on patients' biochemical markers. Adequate hemoglobin levels are vital for oxygen transport, while albumin and prealbumin are indicators of protein status. Improvements in these markers suggest that patients are better able to meet their nutritional needs, potentially resulting in enhanced overall health and well-being. Furthermore, the 6-month duration posteducation underscores the sustainability of the positive effects of nutritional education. It suggests that patients are not only able to incorporate the learned dietary principles into their routines but also maintain these practices over an extended period. This long-term impact is crucial in ensuring ongoing nutritional well-being and minimizing the risk of complications associated with malnutrition. However, it is important to consider potential challenges in the implementation of nutritional education, such as variations in patient adherence and individualized dietary needs. Tailoring educational programs to address diverse patient backgrounds, preferences, and socioeconomic factors is essential for maximizing their effectiveness.

Several studies have shown that telemonitoring improves patients' quality of life and reduces hospitalization and medical visits. It has been shown in some studies that telemonitoring improves the quality of life of patients with renal impairment.[21-23] In the Sriyuktasuth *et al*.'s study,[23] telemonitoring was provided in the form of a mobile application to patients, patient caregivers, and health workers. The information contained in the mobile application consists of (a) daily health and dialysis records, (b) information, (c) health information, (d) reminders, (e) health alerts, (f) social forums, (g) news and management knowledge, and (h) contacts. Providing this information has been shown to improve patients' quality of life by looking at parameters such as body image, pain level, cognitive function, general health level, mental health, physical function, dialysis-related problems, and dietary restrictions.

Lunney *et al*.[21] stated that there are several forms of telehealth including video (synchronous), store and forward (asynchronous), patient monitoring, and mobile health. These techniques can be used by health workers to provide assistance and supervision for patients undergoing self-dialysis. Milan Manani *et al*.[22] showed that monitoring patients with renal failure undergoing self-dialysis compared to those without monitoring had fewer hospital visits due to acute overhydration or other illnesses. The use of telemonitoring includes daily monitoring of patient data by nurses. This allows the patient's data to be monitored daily and can prevent complications. In the manual monitoring method, monitoring is only performed when the patient is on dialysis in the hospital. This makes it possible that some parameters cannot be controlled by medical staff and could potentially cause complications. Telemonitoring also improves patients' quality of life. Patients who receive telemonitoring are faster at self-dialysis than those who do not and can resolve dialysis-related problems (e.g. about dialysis fluid) faster. Several studies have suggested that telemonitoring can reduce the likelihood of hospitalization of patients undergoing self-dialysis.[21-25] This may be associated with a reduced incidence of dialysis complications such as

peritonitis or acute overhydration. Thus, the quality of life of patients undergoing self-dialysis or CAPD may be improved. The study by Uchiyama *et al*.[26] also highlights the essentials in telemonitoring benefit in improving patient's outcome during CAPD. Telemonitoring in patients who have undergone CAPD proves to be highly beneficial for various reasons, making the creation of telemonitoring tools essential. One significant advantage is the notable improvement in the Health-Related Quality of Life for CAPD patients. The continuous remote monitoring offered by these tools enhances patients' sense of security and control over their health, allowing them to engage in their daily activities without frequent hospital visits. In addition, patients receiving telemonitoring exhibit lower health-care consumption compared to their counterparts without such monitoring. The early detection of potential issues through remote monitoring helps prevent complications, reducing the need for emergency room visits or hospitalizations. Another critical aspect is the monitoring of clinical laboratory parameters, such as ultrafiltration volume. Patients under telemonitoring demonstrate greater clinical laboratory outcomes, enabling timely adjustments in treatment plans to prevent complications related to fluid imbalances. The creation and implementation of telemonitoring tools are integral to achieving these benefits, providing a continuous flow of relevant data, and fostering a more patient-centered, efficient, and data-driven approach to health care. The tools not only contribute to customized treatment plans and patient education but also ensure efficient health-care resource allocation while maintaining robust data security and privacy measures.

Based on several positive outcomes known from the literature, providing education to patients undergoing CAPD is important. This is because there is evidence of increased understanding, patient ability to implement fluid replacement, compliance, reduced hospitalization, decreased incidence of peritonitis, and improved quality of life. In the literature obtained, most education is provided by health workers who directly provide education or practice (hands-on) to patients. In the era of technology, telemedicine has also become one of the health instruments that can significantly improve the quality of health services. Thus, telemedicine in the form of telemonitoring is expected to be one way of providing education to CAPD patients. Telemonitoring is expected to reduce geographical barriers so that all patients can be monitored and receive standardized and uniform education. Several studies have also shown that telemonitoring of patients with renal failure has also shown positive results. The use of telemonitoring can improve patient's quality of life and reduce the risk of dialysis-related hospitalizations. Thus, the combination of education provided using telemonitoring instruments is expected to be an effort to improve the quality of life and reduce the risk of developing other dialysis-related diseases in patients undergoing CAPD.

In this ScR, the description of education and telemonitoring used is still general. However, several studies have shown good results in patients undergoing self-dialysis. The selection of educational materials and telemonitoring techniques can be adapted to the conditions of each patient or health facility. This ScR can be used as a collection of scientific evidence regarding the success of education and telemonitoring in CAPD patients by looking at the parameters of patient understanding of dialysis techniques, quality of life, incidence of peritonitis, risk of hospitalization, hospital visits, and patient clinical conditions.

Based on this ScR, future research endeavors should delve deeper into the nuanced impact of education and telemonitoring on CAPD patients. Specifically, investigations could focus on refining the methodologies employed in assessing patient understanding of dialysis techniques, exploring additional facets of quality of life, conducting more detailed analyses of peritonitis incidence and its determinants, further scrutinizing the factors influencing the risk of hospitalization, and examining the dynamics of hospital visits in the context of education and telemonitoring interventions. In addition, there is a need for studies that employ rigorous designs to elucidate the causal relationships between these interventions and improvements in patient clinical conditions. Such targeted research will contribute valuable insights to optimize the implementation of education and telemonitoring strategies in the care of CAPD patients.

CONCLUSION

Patient education can improve patients' comprehension of therapeutic modalities for renal disorders, reduce the potential for peritonitis and dialysis complications, and improve the quality of life of patients with CAPD. CAPD patients who received telemonitoring had a better quality of life, had good clinical outcomes, had a lower risk of hospitalization than those who did not receive telemonitoring, and had fewer health-care visits. Education provided by telemonitoring is expected to further improve the quality of life of CAPD patients and reduce the incidence of dialysis-related complications.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Zhang L, Wang F, Wang L, *et al.* Prevalence of chronic kidney disease in China: A cross-sectional survey. Lancet 2012;379:815-22.
2. Hill NR, Fatoba ST, Oke JL, *et al.* Global prevalence of chronic kidney disease – A systematic review and meta-analysis. PLoS One 2016;11:e0158765.
3. Roderick PJ, Atkins RJ, Smeeth L, *et al.* CKD and mortality risk in older people: A community-based population study in the United Kingdom. Am J Kidney Dis 2009;53:950-60.
4. Paniagua R, Amato D, Vonesh E, *et al.* Effects of increased peritoneal clearances on mortality rates in peritoneal dialysis: ADEMEX, a prospective, randomized, controlled trial. J Am Soc Nephrol 2002;13:1307-20.
5. Pérez Fontan M, Rodríguez-Carmona A, García-Naveiro R, *et al*. Peritonitis-related mortality in patients undergoing chronic peritoneal dialysis. Perit Dial Int 2005;25:274-84.
6. Szeto CC, Kwan BC, Chow KM, *et al.* Coagulase negative staphylococcal peritonitis in peritoneal dialysis patients: Review of 232 consecutive cases. Clin J Am Soc Nephrol 2008;3:91-7.
7. Banno T, Shima H, Kawahara K, *et al*. Risk factors for peritoneal dialysis withdrawal due to peritoneal dialysis-related peritonitis. Nephrol Ther 2021;17:108-13.
8. Kerschbaum J, König P, Rudnicki M. Risk factors associated with peritoneal-dialysis-related peritonitis. Int J Nephrol 2012;2012:483250.
9. Ling CW, Castelino RL, Sud K. Hospital-acquired peritonitis in patients on peritoneal dialysis: A call to action. Semin Dial 2023;36:273-7.
10. Darkins A, Ryan P, Kobb R, *et al.* Care Coordination/Home Telehealth: The systematic implementation of health informatics, home telehealth, and disease management to support the care of veteran patients with chronic conditions. Telemed J E Health 2008;14:1118-26.
11. Stauss M, Floyd L, Becker S, *et al*. Opportunities in the cloud or pie in the sky? Current status and future perspectives of telemedicine in nephrology. Clin Kidney J 2021;14:492-506.
12. Yu AW, Chau KF, Ho YW, *et al*. Development of the "peritoneal dialysis first" model in Hong Kong. Perit Dial Int 2007;27 Suppl 2:S53-5.
13. Campbell DJ, Johnson DW, Mudge DW, *et al*. Prevention of peritoneal dialysis-related infections. Nephrol Dial Transplant 2015;30:1461-72.
14. Schaepe C, Bergjan M. Educational interventions in peritoneal dialysis: A narrative review of the literature. Int J Nurs Stud 2015;52:882-98.
15. Nopsopon T, Kantagowit P, Chumsri C, *et al.* Nurse-based educational interventions in patients with peritoneal dialysis: A systematic review and meta-analysis. Int J Nurs Stud Adv 2022;4:100102.
16. Hsu CK, Lee CC, Chen YT, *et al.* Multidisciplinary predialysis education reduces incidence of peritonitis and subsequent death in peritoneal dialysis patients: 5-year cohort study. PLoS One 2018;13:e0202781.
17. Bonnal H, Bechade C, Boyer A, *et al.* Effects of educational practices on the peritonitis risk in peritoneal dialysis: A retrospective cohort study with data from the French peritoneal Dialysis registry (RDPLF). BMC Nephrol 2020;21:205.
18. Mirza N, Sheikh KA, Muzaffar S, *et al*. The impact of predialysis patient education counseling on relative frequencies of renal replacement modalities. Cureus 2020;12:e10834.
19. Cao F, Hong F, Ruan Y, *et al*. Effect of patient-empowerment interaction model on self-management ability of peritoneal dialysis patients: A randomized controlled trial. Patient Prefer Adherence 2023;17:873-81.
20. Zhao X, Dong Q, Zhao G, *et al.* Effects of an Omaha system-based continuing nursing program on nutritional status in patients undergoing peritoneal dialysis: A randomized controlled trial. Int Urol Nephrol 2020;52:981-9.
21. Lunney M, Lee R, Tang K, *et al.* Impact of telehealth interventions on processes and quality of care for patients with ESRD. Am J Kidney Dis 2018;72:592-600.
22. Milan Manani S, Baretta M, Giuliani A, *et al.* Remote monitoring in peritoneal dialysis: Benefits on clinical outcomes and on quality of life. J Nephrol 2020;33:1301-8.
23. Sriyuktasuth, A, Chuengsaman P, Kusakunniran W, *et al.* Telehealth service for patients receiving continuous ambulatory peritoneal dialysis: A pilot study. Siriraj Med J 2023;75:46-54.
24. Biebuyck GK, Neradova A, de Fijter CW, *et al*. Impact of telehealth interventions added to peritoneal dialysis-care: A systematic review. BMC Nephrol 2022;23:292.
25. Scarpioni R, Manini A, Chiappini P. Remote patient monitoring in peritoneal dialysis helps reduce risk of hospitalization during COVID-19 pandemic. J Nephrol 2020;33:1123-4.
26. Uchiyama K, Morimoto K, Washida N, *et al.* Effects of a remote patient monitoring system for patients on automated peritoneal dialysis: A randomized crossover controlled trial. Int Urol Nephrol 2022;54:2673-81.