

The Effect of Animated Video Education on Fluid Management Knowledge in Hemodialysis Patients: A Pre-Experimental Study

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Abstract

Background: Chronic kidney disease (CKD) is a progressive condition that often requires hemodialysis as renal replacement therapy. Patients undergoing hemodialysis must adhere to strict fluid intake restrictions to prevent fluid overload. Inadequate fluid management may lead to increased interdialytic weight gain (IDWG), hypertension, and cardiovascular complications. One contributing factor to poor fluid control is limited patient knowledge of fluid management. **Aims:** This study aimed to analyze the effect of health education on patients' knowledge regarding fluid intake management among CKD patients undergoing hemodialysis. **Methods:** This study employed a pre-experimental design with a one-group pretest-posttest approach. The sample comprised 30 CKD patients undergoing routine hemodialysis, selected through a total sampling approach. Knowledge levels were measured using a structured questionnaire before and after the health education intervention. Data analysis was conducted using the Wilcoxon signed-rank test. **Results:** The mean knowledge score increased from 12.23 ± 1.455 before the intervention to 14.33 ± 0.922 after the intervention. Statistical analysis using the Wilcoxon signed-rank test showed a significant difference between pretest and posttest knowledge scores ($Z = -4.941$, $p < 0.001$), with a large effect size ($r = 0.902$). **Conclusion:** Health education significantly improved patients' knowledge regarding fluid intake management among CKD patients undergoing hemodialysis. Educational interventions are recommended as part of routine nursing care to support effective fluid management.

Keywords: hemodialysis; fluid management; animated video; patient education; knowledge



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Introduction

Chronic Kidney Disease (CKD) is a progressive and irreversible condition characterized by a permanent decline in renal function, resulting in the kidneys' inability to maintain metabolic, fluid, and electrolyte balance (Novandra et al., 2025). As kidney function deteriorates, metabolic waste products accumulate, leading to uremic syndrome and eventually chronic renal

failure when the remaining functional nephrons can no longer maintain internal homeostasis (Akbar et al., 2025).

Globally, CKD represents a major public health burden. Data from the Global Burden of Disease reported 1.4 million CKD-related deaths worldwide in 2019, making CKD one of the fastest-growing causes of mortality (Fairuz et al., 2024). In Indonesia, the prevalence of CKD increased from 0.2% in 2013 to 0.38% in 2018 (Fairuz et al., 2024). The Indonesian Renal Registry documented a substantial increase in the number

of patients undergoing hemodialysis, from 77,892 in 2017 to 185,901 in 2019 (Novandra et al., 2025). In West Java Province, CKD prevalence reached 0.48%, with a continuous increase in the number of active hemodialysis patients (Kemenkes RI, 2018).

Hemodialysis is a lifelong renal replacement therapy required by patients with advanced CKD, typically performed two to three times per week for four to six hours per session (Ariyani et al., 2019; Novandra et al., 2025). Although essential for survival, hemodialysis significantly affects patients' physical, psychological, and social well-being, often leading to reduced quality of life (Novandra et al., 2025). One of the most critical complications associated with hemodialysis is excessive interdialytic weight gain (IDWG), which reflects inadequate fluid intake control and increases the risk of fluid overload and cardiovascular complications. In Tasikmalaya City, more than 30% of hemodialysis patients were reported to have IDWG $\geq 5\%$, indicating a high risk of fluid-related complications (Rosdiana et al., 2018).

Inadequate fluid management among hemodialysis patients is closely associated with limited self-care ability and insufficient knowledge regarding fluid restriction (Putri et al., 2022). Poor understanding of daily fluid allowance, sources of hidden fluids, and effective thirst management strategies often leads to non-adherence, recurrent complications, and increased morbidity (Iswoyo et al., 2025; Putri et al., 2022). Preliminary observations and informal interviews with nurses at RSUD dr. Soekardjo Tasikmalaya reported that many patients still have low levels of knowledge regarding fluid management. Although general education regarding complications of excessive weight gain has been provided, the absence of structured and standardized educational guidelines limits patients' ability to independently control fluid intake effectively (Rosdiana et al., 2018).

Nurses play a pivotal role as educators in improving patients' knowledge and self-management behaviors (Bolon, 2021). However, conventional educational methods are often less effective in the current digital era, highlighting the need for more engaging and interactive educational approaches. Animated video education has emerged as a promising medium because it integrates visual, audio, and animated elements that facilitate understanding of complex topics such as fluid management (Akbar et al., 2025). Previous studies have demonstrated that video-based education is more effective than printed materials in improving knowledge and adherence to fluid restriction among hemodialysis patients (Azzahra & Herlina, 2024). Nevertheless, research focusing on animated video education specifically targeting fluid management in hemodialysis patients remains limited (Iswoyo et al., 2025). Therefore,

this study aimed to analyze the effect of animated video education on patients' knowledge of fluid management during hemodialysis.

Methods

This study employed a quantitative pre-experimental design using a one-group pretest-posttest approach. The study was conducted among patients undergoing routine hemodialysis at a hospital hemodialysis unit. The study population consisted of patients with chronic kidney disease receiving regular hemodialysis. A total sampling technique was applied to recruit all eligible patients who met the inclusion criteria. The inclusion criteria were patients undergoing routine hemodialysis, able to communicate effectively, and willing to participate in the study. Patients with cognitive impairment or unstable clinical conditions were excluded.

Data were collected using a structured multiple-choice questionnaire consisting of 15 items designed to assess patients' knowledge regarding fluid management. The questionnaire covered principles of fluid restriction, daily fluid allowance, signs of fluid overload, and the consequences of excessive fluid intake. Each correct answer was scored 1, and each incorrect answer was scored 0, resulting in a total score ranging from 0 to 15. Higher scores indicated better knowledge regarding fluid management. Prior to data collection, the questionnaire was tested for validity and reliability. All items met the validity criteria ($r > 0.361$), and the instrument demonstrated good reliability with a Cronbach's alpha value of 0.823.

The intervention consisted of a two-dimensional animated educational video approximately 3 minutes long. The video contained information regarding fluid management in patients undergoing hemodialysis, including the purpose of fluid restriction, the consequences of fluid overload, and strategies for controlling daily fluid intake. The educational intervention was delivered once during the participants' scheduled hemodialysis visit, before the posttest assessment. Knowledge levels were measured before (pretest) and after (posttest) the educational intervention. Data were analyzed using descriptive statistics and inferential analysis. As the data were not normally distributed, the Wilcoxon signed-rank test was used to analyze differences in knowledge scores before and after the intervention. Statistical significance was set at <0.05 . Ethical approval was obtained, and informed consent was secured from all participants prior to data collection.

Results

The participants' characteristics indicated that the majority were female (60.0%), were in the middle-

adulthood age group (83.3%), had a basic-to-secondary level of education (96.7%), and had been undergoing hemodialysis for ≤ 6 months (73.3%). In contrast, smaller proportions of the participants were male (40.0%), in the older adulthood age group (16.7%), had attained higher education (3.3%), and had been receiving hemodialysis for > 6 months (26.7%) (Table 1).

Table 1. Characteristics of Respondents (n = 30)

Characteristics	n	%
Sex		
Male	12	40.0
Female	18	60.0
Age Group		
Middle adulthood	25	83.3
Older adulthood	5	16.7
Educational Level		
Basic-secondary	29	96.7
Higher education	1	3.3
Duration of Hemodialysis		
≤ 6 months	22	73.3
> 6 months	8	26.7

The mean pretest knowledge score was 12.23 (SD = 1.455), whereas the mean posttest knowledge score increased to 14.33 (SD = 0.922). These findings indicate a 2.10-point increase in the mean knowledge score following the intervention. Furthermore, the lower standard deviation observed in the posttest suggests reduced variability in participants' knowledge scores after the intervention, indicating a more homogeneous distribution of knowledge levels (Table 2).

Table 2. Comparison of Knowledge Scores Before and After Intervention

Variable	Mean	SD
Pretest knowledge	12,23	1,455
Posttest knowledge	14,33	0,922

The Wilcoxon signed-rank test showed a statistically significant difference between pretest and posttest knowledge scores ($Z = -4.941$, $p < 0.001$). The effect size was 0.902, indicating a large effect. These findings suggest that animated video education was effective in improving patients' knowledge regarding fluid management (Table 3).

Table 3. Effect of Animated Video Education on Knowledge Scores

Variable	MD	Z	p-value	r
Knowledge score	2.10	-4.941	<0.001	0.902

Discussion

Animated Video Education on Fluid Management Knowledge

The findings from the study on animated video education for hemodialysis patients align with broader research indicating that multimedia educational interventions significantly enhance patient knowledge and self-management skills. Specifically, animated videos have been shown to improve health information recall, with a meta-analysis revealing a positive effect size ($d = 0.35$) across various health contexts, including chronic conditions such as diabetes and surgery (Feeley et al., 2022). Additionally, a systematic review reported that 73% of studies found significant improvements in health information recall with animation compared with traditional methods (Hansen et al., 2024). Furthermore, tailored educational interventions, such as those incorporating video training, have been effective in reducing symptom burden and improving quality of life among hemodialysis patients (Duman & Karadakovan, 2024). These findings underscore the importance of engaging educational strategies that cater to patients' learning needs, ultimately fostering better health outcomes in chronic disease management (Jagodage et al., 2025; Leong et al., 2023).

The substantial effect size observed in this study (0.902) indicates that the educational intervention significantly improved participants' knowledge, particularly through animated videos. These videos integrate both visual and auditory elements, which have been shown to enhance the comprehension and retention of complex information across various healthcare contexts. For example, a meta-analysis reported an overall positive effect ($d = 0.35$) of animated videos on learning outcomes, particularly among patient populations (Feeley et al., 2022). Furthermore, disease-specific studies have demonstrated that animated educational resources effectively improve patients' knowledge and promote greater engagement in health-related decision-making, such as in the context of pancreatic cancer (Munigala et al., 2022). In addition, animated videos have been recognized as valuable educational tools in clinical settings, contributing to higher caregiver satisfaction and reducing unnecessary postoperative inquiries (Roy et al., 2025). Collectively, these findings underscore the effectiveness of animated videos as a robust educational modality for enhancing knowledge acquisition and supporting patient education in healthcare settings (Doheny et al., 2023; Hall et al., 2025).

The effectiveness of animated video-based education in enhancing patients' understanding of complex topics, such as fluid management, is supported by a growing body of evidence that it outperforms traditional information

delivery methods. Animated videos present information in a structured, visually engaging, and easily comprehensible format, thereby significantly improving knowledge retention and information recall among patients. For instance, a systematic review reported that 73% of the included studies found improved recall of health-related information with animated videos compared with conventional educational approaches (Hansen et al., 2024). Similarly, video-based educational interventions have been shown to enhance patient knowledge across a range of chronic diseases, with 75% of studies reporting positive educational outcomes (Deshpande et al., 2023). Furthermore, a randomized controlled trial demonstrated that patients who received animated educational content reported higher satisfaction and better understanding of their treatment plans than those who received standard education (Turkdogan, 2022). Collectively, these findings suggest that animated videos effectively reduce cognitive load, facilitate comprehension of abstract health concepts, and empower patients to participate in self-care and treatment decision-making actively (Knapp et al., 2022; Bånnsgård et al., 2022).

In addition, the results of this study reinforce existing evidence that patient knowledge plays a fundamental role in fluid management among hemodialysis patients. Inadequate knowledge regarding fluid restriction has been associated with excessive interdialytic weight gain, poor treatment adherence, and increased risk of complications (Iswoyo et al., 2025; Putri et al., 2022). By improving knowledge, animated video education may contribute to patients' readiness to adopt healthier self-management behaviors. Although this study did not directly measure behavioral outcomes or clinical indicators such as IDWG, improved knowledge is widely recognized as a prerequisite for behavior change and adherence to treatment recommendations.

Implications for Nursing Practice

From a nursing perspective, the findings of this study highlight the importance of utilizing innovative and patient-centered educational strategies in clinical practice. Nurses play a pivotal role as educators in supporting patients with chronic kidney disease, particularly those undergoing long-term hemodialysis. However, conventional educational approaches, such as verbal explanations or printed materials, may be insufficient due to time constraints, patient fatigue, and variations in literacy levels.

Animated video education offers several practical advantages for nursing practice. First, it enables standardized delivery of educational content, ensuring that all patients receive consistent and accurate

information regarding fluid management. Second, videos can be replayed according to patients' needs, allowing reinforcement of key messages and supporting self-directed learning. Third, the use of audiovisual media may increase patient engagement and motivation, which are essential components of effective education. Integrating animated video education into routine nursing education programs may therefore enhance the quality of patient education and support better self-management among hemodialysis patients (Bolon, 2021).

Study Limitations

Despite the positive findings, several limitations of this study should be acknowledged. The pre-experimental design without a control group limits the ability to draw definitive causal conclusions regarding the effectiveness of animated video education. Other factors, such as prior exposure to information or informal discussions among patients, may have influenced improvements in knowledge.

Additionally, the relatively small sample size and the use of a single hemodialysis unit as the study setting may limit the generalizability of the findings to broader populations. The study also focused solely on knowledge outcomes and did not assess behavioral changes or objective clinical indicators, such as interdialytic weight gain, blood pressure, or hospitalization rates. As a result, the extent to which increased knowledge translates into improved clinical outcomes remains unclear.

Conclusion

Animated video education significantly improved patients' knowledge of fluid management among those undergoing hemodialysis. This educational approach can be integrated into routine nursing education programs in hemodialysis units to enhance patient understanding and support effective fluid management. Further research is recommended to evaluate the impact of animated video education on patient adherence and clinical outcomes. Future research should address these limitations by employing more rigorous study designs, such as randomized controlled trials or quasi-experimental studies with comparison groups. Studies with larger and more diverse samples are needed to enhance the generalizability of findings. Moreover, future research should examine the long-term effects of animated video education on behavioral outcomes, including adherence to fluid restriction and changes in interdialytic weight gain.

Evaluating both knowledge and clinical outcomes would provide a more comprehensive understanding of the effectiveness of animated video education in improving patient care. Additionally, exploring patients' perceptions and experiences with animated video

education may help refine educational content and optimize its implementation in clinical settings. Collectively, such efforts could strengthen the evidence base for integrating animated video education into routine nursing practice for patients undergoing hemodialysis.

Declaration of Conflicting Interest

No conflict of interest to declare.

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Author's Contribution

IAPP: Contributed to the study's conception and design, data acquisition, and data analysis, and wrote the first draft of the manuscript. IR: Revised the final draft and gave final approval of the version to be published. AR: Revised the final draft.

Data Availability Statement

The dataset generated and analyzed during the current study is available from the corresponding author upon reasonable request.

Declaration of Use of AI in Academic Writing

The author used ChatGPT/Gemini in the writing process to improve readability and remove grammatical errors. However, he took full responsibility for the content.

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