ISSN 2354-8428
e-ISSN 2598-8727

JURNAL KEPERAWATAN

KOMPREHENSIF

COMPREHENSIVE NURSING JOURNAL

Published by :

Sekolah Tinggi Ilmu Keperawatan
PPNI Jawa Barat

Vol. 10 No. 3, July 2024

JURNAL KEPERAWATAN KOMPREHENSIF	VOL. 10	NO. 3	Bandung July 2024	ISSN 2354-8428	e-ISSN 2598-8727

p-ISSN : 2354 8428 | e-ISSN: 2598 8727

Jurnal Keperawatan Komprehensif
Volume 10 Issue 3 July 2024

Research Article

Effectiveness of Digital Self-Management Toward Fluid Restriction on Interdialytic Weight Gain Among Patients Undergoing Hemodialysis in Jakarta Islamic Hospital

Wahdaniyah Wahdaniyah[1]* | Irna Nursanti[2] | Diana Irawati[3] | Dhea Natashia[4] | Yeti Resnayati[5]

[1,2,3,4]Fakultas Ilmu Keperawatan Universitas Muhammadiyah Jakarta, Jakarta 10510 - Indonesia
[5]Politeknik Kesehatan Jakarta

***contact**

wahdaniyah.ardan@gmail.com

Received : 24/11/2023
Revised : 23/07/2024
Accepted : 24/07/2024
Online : 29/07/2024
Published : 29/07/2024

Abstract

Aims: Controlling interdialytic weight gain (IDWG) in hemodialysis (HD) patients requires a key component of fluid restriction. If IDWG rises, complications related to chronic renal failure may arise. Digital self-management improves fluid restriction in IDWG by empowering patients, increasing data monitoring, and simplifying communication with healthcare providers, perhaps leading to better hemodialysis patient outcomes.
Objective: This study aims to determine the effectiveness of digital self-management toward fluid restriction on interdialytic weight gain among patients undergoing hemodialysis in Jakarta Islamic Hospital.
Method: The study was quasi-experimental, using a pretest-posttest and control group. Convenience sampling was employed to select 25 intervention and 25 control group members. IDWG digital self-management can track fluid intake, weight, and symptoms, and patients can communicate openly with the health team. The data analysis used in this research is the T-test.
Results: In this study, respondents were categorized by gender, mean age, and duration of HD (months) in the intervention group (men 60%, 49.1 and 27.2) and control group (women 52%, 48.1 and 42.1). IDWG decreased in the intervention group, from 4.06 to 2.45, while it increased in the control group before 3.84 and after 4.34. The paired and independent t-tests demonstrated that digital-based fluid restriction management self-care interventions reduced IDWG with a p-value of 0.001.
Conclusion: The digital self-management toward fluid restriction showed a promising impact on improving interdialytic weight gain among patients undergoing hemodialysis in Jakarta Islamic Hospital

Keywords:
IDWG, Self-care fluid restriction management

INTRODUCTION

Hemodialysis (HD) is a treatment for end-stage renal disease (ESRD) patients. The number of HD patients is indeed increasing worldwide. In Indonesia, hemodialysis treatments are growing year after year, and by 2020, the growth will be dramatic due to an increase in the number of people joining the program. In 2017, there were 1694.43 HD patients, and this figure is expected to rise to 3551.61 by 2020 (1). Although

https://doi.org/10.33755/jkk

p-ISSN : 2354 8428 | e-ISSN: 2598 8727

Jurnal Keperawatan Komprehensif
Volume 10 Issue 3 July 2024

public information on HD patient growth in Indonesia from 2020 to 2023 is not yet available, several variables suggest an increase, which is increasing unhealthy lifestyles (eating meals high in cholesterol, salt, and sugar, as well as a lack of physical activity, can raise the risk of CKD).

HD is a life-saving treatment, but it's not without its challenges. Patients need to work closely with their healthcare team to manage these challenges, optimize their quality of life, and address any psychological or emotional issues that may arise. Patients undergoing HD must make a time commitment: dietary limitations, the danger of vascular problems, and the psychological effects of weariness and weakness. HD is a strict treatment regimen that significantly affects the patient's schedule and everyday life. This may make it difficult to work, interact, or travel freely. HD sufferers must endure Dietary limitations: To regulate fluid balance and waste accumulation, HD patients frequently must observe tight dietary restrictions, limit fluid intake, and require continuous monitoring, demanding major lifestyle adjustments(2). HD patients are at risk for Vascular Access Problems since the condition necessitates vascular access, either by a fistula (arteriovenous connection) or a catheter (3). This might result in consequences such as infection, blood clots, or malfunction, necessitating further surgeries or treatments (4). Because of the chronic nature of ESRD and the demands of HD therapy, patients may experience anxiety, sadness, and diminished social contact. Frustration, dread, and a lack of control are frequent emotions. Implementing HD might lead to fatigue and weakness(5).

HD sufferers may take control of their health and enhance their quality of life by practicing self-management. Patients may improve their general health and feel more empowered by controlling their medications, monitoring their condition, eating a nutritious diet, and getting enough rest. Components of Self-Management are Diet, Fluid Restriction, Medication Management, Physical Activity, and Emotional Well-being (6). As your healthcare team recommends, follow a kidney-friendly diet that restricts sodium, potassium, phosphorus, and protein intake. This helps manage fluid balance and waste buildup in the blood.(7). Limiting fluid intake to prevent excess buildup between dialysis sessions. This can be challenging, but it is crucial to maintain a healthy weight and avoid complications like heart problems. (8). Taking medications as prescribed to manage blood pressure, anemia, and other associated conditions. Tracking weight, blood pressure, urine output, and recording observations about your feelings. This information helps your healthcare team adjust treatment as needed. Engaging in regular physical activity, as tolerated, to improve overall health and well-being. Managing stress and anxiety associated with chronic illness. Consider talking to a therapist or joining a support group for emotional support. In HD patients, inadequate self-management leads to a higher risk of problems (such as electrolyte imbalance, high blood pressure, and excess fluid), poor nutritional status, and a lower quality of life (depression, weariness, and weakness all significantly lower quality of life) (9).

Hemodialysis patients must limit their fluid intake, as excessive fluid volume and uremic symptoms can cause rapid weight gain (more than 5 %), edema, pulmonary crackles, swollen pupils, and shortness of breath. The Interdialytic Weight Gain (IDWG) value, or the increase in body weight between dialysis, indicates the presence of excess fluid. (10). To achieve a favorable IDWG score, you must improve self-care management by increasing self-awareness in monitoring body weight and daily IDWG assessment so that shortness of breath due to pulmonary edema and anasarca edema does not occur. (11).

In the current digital age, supervision must be done digitally to facilitate achieving your desired level of health. Digital self-

https://doi.org/10.33755/jkk

p-ISSN : 2354 8428 | e-ISSN: 2598 8727

Jurnal Keperawatan Komprehensif
Volume 10 Issue 3 July 2024

management tools have much going for them regarding fluid restriction and interdialytic weight gain (IDWG) (12). Patients can electronically record their weight and fluid intake using digital tools. The data is presented in charts and graphs, which makes it simpler to see trends in body weight and fluid consumption. These electronic gadgets also can deliver messages to patients, encouraging them to check their weight and consumption, which improves ongoing monitoring. Applications for monitoring fluid limitations are required to construct a self-care monitoring information system for fluid management in hemodialysis patients, which will assist patients in controlling fluids to enhance their health outcomes. Based on this, researchers want to study "The Effectiveness of Digital-Based Self-Care Management of Fluid Restrictions on IDWG Hemodialysis Patients."

METHODS

Study design

The present study used a quasi-experimental design known as the Pretest-Posttest with Control Group Design. For four weeks, the intervention group received treatment for digital self-management.IDWG's digital self-management tool is available on the web and mobile devices. The weight of the respondents at the time of hemodialysis is entered, and the difference in body weight is then calculated from their present weight. Next, input all of the fluid quantities in milliliters or ounces. The application will determine how much fluid was consumed overall. IDWG will then measure it, and those who reply will be informed about fluid restrictions.

The sampling technique employed is purposive sampling. According to the Solvin formula, the sample size of hemodialysis patients at Jakarta Islamic Hospital is determined to be 50 individuals. The study will involve a sample size of 50 individuals, with 25 participants assigned to the intervention group and 25 to the control group. The sample size is allocated to both the intervention group and control group through systematic random sampling.

The study's inclusion criteria are as follows: Hemodialysis patients, compos mentis consciousness, hemodynamic stability, devices, and family support for senior patients. Patients undergoing HD CITO were excluded from this study.

In May-June 2023, this study was carried out in the Hemodialysis Room of the Jakarta Islamic Hospital. Questionnaires, observation sheets, and web-based fluid restriction management self-care monitoring programs were utilized as research instruments.

RESULTS

The results of this research are presented based on univariate, bivariate, and multivariate analysis. According to Table 1, there is no significant difference between the characteristics of respondents in the control and intervention groups, and the mean age is 49.1 years (intervention) and 48.8 years (control). More than half are male (54%), nearly all are Muslim (80%), Javanese (66%), possess a high school diploma (36%) and are employed (56%). The control and intervention groups included participants of all ages, from young to older people. The HD duration ranges from one month to 180 months.

https://doi.org/10.33755/jkk

p-ISSN : 2354 8428 | e-ISSN: 2598 8727

Jurnal Keperawatan Komprehensif
Volume 10 Issue 3 July 2024

Table 1. Respondent Characteristics

Respondent Characteristics	*n*	Intervention group (*n* = 25)		Control group (*n* = 25)		P value
		f	%	*f*	%	
Gender						
Man	27	15	60	12	48	0. 570
Woman	23	10	40	13	52	
Religion						
Muslim	40	21	84	19	76	0.724
Non-Muslim	10	4	16	6	24	
Ethnic						
Non Javanese	17	6	24	11	44	0.232
Java	33	19	76	14	56	
Education						
Elementary School	5	3	12	2	8	
Junior High School	10	5	20	5	20	0.813
Senior High School	18	10	40	8	32	
College	17	7	28	10	40	
Occupation						
Doesn't work	22	13	52	9	36	0.393
Work	28	12	48	16	64	
	Mean	**Min – Max**		***Mean***	**Min – Max**	
Age (year)	49.1	18 - 71		48.9	20-69	0.882
Duration of HD (month)	20.1	2-132		42.2	1-180	0.515

Table 2. Differences in mean IDWG scores before and after treatment in the intervention and control groups

Group	IDWG	*n*	*Mean*	SD	t	*P value*
Intervention	Pre	25	4.06	1.23	6.98	0.0001
	Post	25	2,45	1,17		
Control	Pre	25	3.84	1.62	-2.41	0.024
	Post	25	4.34	1.40		

Table 2 results show that the two groups differ significantly from one another. However, this discrepancy means something else; although the mean IDWG increased by 0.5 in the control group, it decreased by 1.61 in the group under review.

https://doi.org/10.33755/jkk

p-ISSN : 2354 8428 | e-ISSN: 2598 8727

Jurnal Keperawatan Komprehensif
Volume 10 Issue 3 July 2024

Table 3. The Influence of Confounding Factors on IDWG Percentage Changes

Variable	*P value*	Criteria*
Age	0,793 [a]	no
Gender	0,856 [b]	no
education	0,542 [b]	no
occupation	0,302 [b]	no
duration HD	0,055 [c]	Yes
Self-care management	0,749 [b]	no
Fluid Intake	0,044 [b]	Yes

Based on the results of the bivariate test between confounding variables and changes in IDWG, final results were obtained where duration of HD (r=-0.274, p=0.055) and fluid intake (t=-2.069, p=0.044) met the requirements for use in multivariate analysis (Table 4).

Table 4. Multivariable Linear Regression Effect of Variables on Changes in IDWG

Variable	Model 1			Model 2		
	B	SE	β	B	SE	β
(Constant)	0,199	0,404		0,005	0,338	
duration HD (month)	-0,005	0,006	-0,123	-	-	-
Fluid Intake	0,880	0,430	0,284*	0,888	0,429	0,286*
R^2	0,097			0,082		
ΔR^2	0,059			0,063		
F	2,523			4,282		

DISCUSSION

Based on the results of the study, the age of respondents was 49 years. The risk of CKD increases with age. Age affects the distribution of one's body fluids. However, if accompanied by disease, he may be unable to adapt to these changes (13). The aging process is associated with a reduced quantity of nephrons, leading to a decline in glomerular function (14). Increasing age will cause changes in functional structure and easily experience decreased function of essential organs, including reduced kidney function influenced by lifestyle and fluid management, which is related to compliance in regulating fluid intake. Gender: The respondents in this study are primarily men. It is observed that males exhibit a higher prevalence of three out of the five risk factors associated with the development of chronic kidney disease (CKD), including obesity, hypertension, and smoking. This phenomenon can be attributed to the fact men generally exhibit suboptimal lifestyle behaviors in comparison to women. Females possess the hormone estrogen, which serves the purpose of regulating calcium levels inside the body. This regulatory function prevents kidney stone development, a condition that can potentially lead to chronic kidney disease (CKD) in subsequent years (15)—the majority of high-education respondents. Extensive knowledge allows patients to do good self-care management, act wisely towards themselves in controlling the problems encountered, have the correct estimate to overcome the events and understand what health workers recommend to make wise decisions (16). Education is essential in patients with chronic kidney disease, as it helps them understand and regulate themselves in limiting food and drinking. The results of several studies in the literature show that

https://doi.org/10.33755/jkk

p-ISSN : 2354 8428 | e-ISSN: 2598 8727

Jurnal Keperawatan Komprehensif
Volume 10 Issue 3 July 2024

higher education or broad knowledge will affect the actions and attitudes of respondents in fluid management.

Differences before and after the self-care intervention for digital-based fluid restriction management in the intervention group and the control group regarding IDWG

The results showed a decrease in IDWG in the intervention group with a p-value of 0.0001, while in the control group, there was a significant increase in IDWG with a p-value of 0.024. This shows that digital self-management is effective in reducing IDWG. This study found that digital self-management toward fluid restriction positively impacts IDWG. Previous research shows self-management contributes as much as 4% to handling IDWG. (17) However, digital management was not used in this study. Further studies have been carried out in Korea to create a mobile app-based self-management program that may improve hemodialysis patients' self-efficacy and help them maintain physiological parameters within the normal range. Fluid intake in patients with chronic kidney failure is challenging to remove in the body because kidney regulation in eliminating fluid is minimal. Fluid intake is associated with the patient's body because it directly increases body mass. (11). End Stage Renal Disease patients undergoing hemodialysis usually consume a large amount of drugs for various conditions; further Vascular access is the survival for hemodialysis patients, so treatment is needed. (18). An HD program's effectiveness depends on four compliance factors: diet, medication usage, fluid restriction, and the existence of HD. This compliance will also influence decreasing hospitalization rates, weakness, and side effects such as nutritional issues, muscular spasms, and blood infection.(19).

Hemodialysis is a continuous therapy; patients must monitor their fluid intake because excessive fluid consumption, in the long run, increases interdialytic weight gain (IDWG), cardiovascular morbidity, and mortality. (20). Chronic extracellular fluid overload in dialysis patients is caused by sodium and fluid buildup from positive fluid imbalance over time. The unfavorable effects and cardiovascular implications lead to poor results. Cardiovascular problems in hemodialysis patients are caused mainly by excess extracellular fluid and inadequate fluid control. (21). Renal experts have worked tirelessly to restore salt and water equilibrium in hemodialysis patients, a goal encapsulated in the 'dry weight' probing technique. While this treatment strategy has been linked to improved cardiovascular outcomes, more recent research has shown that the aggressiveness or intensity of fluid removal during intermittent dialysis is linked to cardiovascular stress and possible organ damage. Several factors can impact HD patients' adherence to medication regimens, including knowledge, socioeconomic position, health views, treatment attitudes, and culture. (19). IDWG is in line with the amount of body fluid intake that cannot be eliminated by the kidneys, resulting in a gradient weight gain between dialysis periods (22). IDWG will be in line with the amount of body fluid intake that cannot be eliminated by the kidneys, resulting in a gradient weight gain between dialysis periods (10). Patients with increased IDWG who undergo hemodialysis do not comply with fluid intake restrictions and continue to consume more fluids than the nurse recommends(23). This is consistent with study findings in the control group, which showed an increase in IDWG.

The confounding factor significantly influences IDWG changes is the intervention of self-care management of fluid restrictions. Self-management is essential for HD patients to avoid complications such as high blood pressure, heart failure, and shortness of breath. Digital self-management in this research and technology can help patients track fluid intake and body weight more accurately, thereby providing valuable data for themselves and health care providers. The benefits obtained from the digital

https://doi.org/10.33755/jkk

p-ISSN : 2354 8428 | e-ISSN: 2598 8727

Jurnal Keperawatan Komprehensif
Volume 10 Issue 3 July 2024

application used in this research can provide education and reminders about fluid restriction guidelines and healthy eating habits. Additionally, the app connects patients with online communities or organizes fluid management, fostering motivation and a sense of control. This digital self-management also empowers patients to take responsibility for their health, increasing self-efficacy and overall well-being. Self-care can be improved through a nursing agency that includes a supportive educational system, such as self-care management of fluid restrictions (17). Self-care management of fluid restrictions includes diet, stress, activity and exercise, safe food, habits, vascular access care, and observation of care instructions (12). The media for self-care education in this research is through web-based self-care fluid monitoring. The self-care intervention aimed at managing fluid restriction involves enhancing the respondents' comprehension regarding the significance of restricting fluid consumption in individuals undergoing hemodialysis(24). A comprehensive grasp of counseling information can shape responders' attitudes toward self-care, resulting in increased adherence to fluid limits (25). The Importance of Self-Management with Technology for HD Patients provides benefits towards improved health outcomes, increased knowledge and self-efficacy, increased adherence to treatment, and greater autonomy and control (26,27). Technology can provide patients with educational resources and tools to understand better their condition and treatment (28–30). This can increase their confidence in managing dialysis (self-efficacy). Technology can remind patients of medication schedules, monitor fluid intake, and make appointment reminders, thereby encouraging better adherence to their dialysis regimen. Self-management tools allow patients to participate more actively in their care decisions, resulting in a greater sense of control over their health.

Study limitation

This study can only be conducted on HD patients with access to a reliable internet connection and the requisite equipment (smartphones, tablets) to use this technology.

Nursing Implication

Nurses are essential in digital-based fluid restriction self-care practices lead to a reduction in interdialytic weight gain (IDWG). Nurse participation in digital self-management toward fluid restriction on interdialytic weight gain among patients undergoing hemodialysis Assessment and Education. Evaluate patient preparedness and provide particular education on available technology, addressing concerns and ensuring patients understand how the technology fits into their dialysis routine.

CONCLUSION

The present study has discovered that the use of digital-based fluid restriction self-care practices leads to a reduction in interdialytic weight gain (IDWG). This study potentially provides an alternative technique for supporting interdialytic weight gain (IDWG) in hemodialysis patients. Add suggestions for future studies or healthcare policy.

REFERENCES

1. PERNEFRI. 13th Annual Report of Indonesian Renal Registry 2020. Indones Ren Regist [Internet]. 2020;13:11. Available from: https://www.indonesianrenalregistry.org/data/IRR 2018.pdf
2. Lim HS, Kim HS, Kim JK, Park M, Choi SJ. Nutritional Status and Dietary Management According to Hemodialysis Duration. Clin Nutr Res. 2019;8(1):28.
3. Adib-Hajbagheri M, Molavizadeh N, Alavi NM, Abadi MHM. Factors associated with complications of vascular access site in hemodialysis patients in Isfahan Aliasghar hospital. Iran J Nurs Midwifery Res [Internet]. 2019;19(2):208–14.

https://doi.org/10.33755/jkk

p-ISSN : 2354 8428 | e-ISSN: 2598 8727

Jurnal Keperawatan Komprehensif
Volume 10 Issue 3 July 2024

Available from: http://www.ncbi.nlm.nih.gov/pubmed/24834093%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC4020033

4. Jeong EY. Impact on health outcomes of hemodialysis patients based on the experience level of registered nurses in the hemodialysis department: a cross-sectional analysis. Front Heal Serv. 2023;3(August):1–7.
5. Pretto CR, Winkelmann ER, Hildebrandt LM, Barbosa DA, Colet C de F, Stumm EMF. Quality of life of chronic kidney patients on hemodialysis and related factors. Rev Lat Am Enfermagem. 2020;28:1–11.
6. Lee MC, Wu SFV, Lu KC, Liu CY, Liang SY, Chuang YH. Effectiveness of a self-management program in enhancing quality of life, self-care, and self-efficacy in patients with hemodialysis: A quasi-experimental design. Semin Dial. 2021;34(4):292–9.
7. Hafezieh A, Dehghan M, Taebi M, Iranmanesh S. Self-management, self-efficacy and knowledge among patients under haemodialysis: a case in Iran. J Res Nurs. 2020;25(2):128–38.
8. Schrauben SJ, Rivera E, Bocage C, Eriksen W, Amaral S, Dember LM, et al. A Qualitative Study of Facilitators and Barriers to Self-Management of CKD. Kidney Int Reports [Internet]. 2022;7(1):46–55. Available from: https://doi.org/10.1016/j.ekir.2021.10.021
9. A REP, Syam Y, Syahrul S. Correlation of self-efficacy and self-care of patients undergoing hemodialysis with their quality of life. Enfermería Clínica. 31(Supplement 5):S797–801.
10. Wahyuni ED, Haloho FNW, Asmoro CP, Laili NR. Factors Affecting Interdialytic Weight Gain (IDWG) in Hemodialysis Patients with Precede-Proceed Theory Approach. IOP Conf Ser Earth Environ Sci. 2019;246(1).
11. Mailani F, Huriani E, Muthia R, Rahmiwati. Self-Management and Relating Factors among Chronic Kidney Disease Patients on Hemodialysis: An Indonesian Study. Nurse Media J Nurs. 2023;13(1):109–20.
12. Riswanda V, Wijayanti GASPW. Efektifitas Penggunaan Kalender Pengelolaan Cairan dan Mobile Phone terhadap Interdialytic Weight Gain pada Pasien Gagal Ginjal Kronik di Ruang Hemodialisa. J Keperawatan Terpadu (Integrated Nurs Journal). 2021;2(2):165.
13. Potter PA, Perry AG. Fundamentals of Nursing: Concepts, Process, and Practice. 9th ed. Singapore: Elsevier; 2020.
14. LeMone, P., Burke KM, Bauldoff G. Textbook of Medical Surgical Nursing. Yogyakarta: EGC; 2016.
15. Sari F, Raveinal, Apriyanti E. Pengaruh Edukasi Berdasarkan Teori Efikasi Diri Terhadap Kepatuhan Pembatasan Cairan dan Interdialytic Weight Gain (IDWG) Pada Pasien Hemodialisis. J Penelit Kesehat Suara Forikes [Internet]. 2020;11(9):67–70. Available from: http://forikes-ejournal.com/index.php/SF/article/view/sf11nk411
16. Barus SB, Zainaro MA. BOOKLET KONSELING TERHADAP PENINGKATAN PENGETAHUAN SELF CARE MANAGEMENT PADA PASIEN GAGAL GINJAL KRONIK (GGK) DENGAN HEMODIALISA. Holistik J Kesehat. 2019;13(2):84–91.
17. Natashia D, Yen M, Chen HM, Fetzer SJ. Self-Management Behaviors in Relation to Psychological Factors and Interdialytic Weight Gain Among Patients Undergoing Hemodialysis in Indonesia. J Nurs Scholarsh. 2019;51(4):417–26.
18. Rahmanti A, Sunarto. Penerapan Intervensi Self Care Management

p-ISSN : 2354 8428 | e-ISSN: 2598 8727

Jurnal Keperawatan Komprehensif
Volume 10 Issue 3 July 2024

Untuk Mencegah Peningkatan. J Jufdikes. 2022;4(1).

19. Arad M, Goli R, Parizad N, Vahabzadeh D, Baghaei R. Do the patient education program and nurse-led telephone follow-up improve treatment adherence in hemodialysis patients? A randomized controlled trial. BMC Nephrol. 2021;22(1):1–13.
20. Putri NS, Sukartini T, Efendy F. Fluid Adherence Level Among Patients Undergoing With Hemodialysis. Int J Nurs Heal Serv [Internet]. 2019;2(4):320–5. Available from: https://ijnhs.net/index.php/ijnhs/article/view/133
21. Canaud B, Chazot C, Koomans J, Collins A. Fluid and hemodynamic management in hemodialysis patients: Challenges and opportunities. Brazilian J Nephrol. 2019;41(4):550–9.
22. Pratiwi D tunjung, Tamtomo DG, Sueyono A. Determinants of the Quality of Life for Hemodialysis Patients. Indones J Med. 2019;4(2):145–54.
23. Mailani F, Mahathir M, Yuni AR. Self-Efficacy and Compliance Fluid Intake Restrictions in Chronic Kidney Disease Patients Undergoing Hemodialysis: A Cross-Sectional Study. J Keperawatan Komprehensif [Internet]. 2023;9(July):269–76. Available from: https://doi.org/10.33755/jkk
24. Melastuti E, Nursalam N, Sukartini T, Putra MM, Adiutama NM. Self-care Adherence in Hemodialysis Patients: A Structural Equation Modeling. Sci Found SPIROSKI, Skopje, Repub Maced [Internet]. 2022;10(B):1107–12. Available from: https://oamjms.eu/index.php/mjms/article/view/9365
25. Hidayati R. Aplikasi Teori Adapatasi Roy Pada Pasien dengan End Stage Renal Disease (ESRD). J Sci Soluterm. 2019;2(1):30–40.
26. Yasin F, Khraim F, Santos M, Forgrave D, Hamad A. Factors influencing self-care management in adult hemodialysis patients: An integrative review. Qatar Med J. 2024;2024(1):1–17.
27. Shen H, Kleij RMJJ van der, Boog PJM van der, Chang X, Chavannes NH. Electronic Health Self-Management Interventions for Patients With Chronic Kidney Disease: Systematic Review of Quantitative and Qualitative Evidence. J Med Internet Res [Internet]. 2019;21(11). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6864489/
28. Johnson AM, Brimhall AS, Johnson ET, Hodgson J, Didericksen K, Pye J, et al. A systematic review of the effectiveness of patient education through patient portals. JAMIA Open. 2023;6(1):1–10.
29. Kuwabara A, Su S, Krauss J. Utilizing Digital Health Technologies for Patient Education in Lifestyle Medicine. Am J Lifestyle Med. 2020;14(2):137–42.
30. Haleema A, Javaida M, B MAQ, Rajiv Sumanc. Understanding the role of digital technologies in education: A review. Sustain Oper Comput [Internet]. 2022;3:275–85. Available from: https://www.sciencedirect.com/science/article/pii/S2666412722000137