Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Effect of Nurse-Patient Shared Decision Making on Dialysis Modality Selection in Peritoneal Dialysis Patients: A Multi-center Randomized Controlled Trial

Suge Tian
Henan Provincial People's Hospital
Lili Deng
Guangdong Provincial People's Hospital
Jia Deng
Guangdong Provincial People's Hospital
Yujun Huang
Guangdong Provincial People's Hospital
Ruizhao Li
Ganzhou Hospital of Guangdong Provincial People's Hospital, Ganzhou Municipal Hospital
Yilin Zeng
498104587@qq.com

Guangdong Provincial People's Hospital

Research Article

Keywords: Shared decision-making, Peritoneal dialysis, Decision regret, Treatment adherence, Multi-center randomized controlled trial

Posted Date: October 30th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11489953/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Objective

To evaluate the impact of shared decision-making (SDM)-based decision aids on decision regret, treatment adherence, and clinical outcomes in patients with end-stage renal disease (ESRD) choosing dialysis modalities, and to explore the relationship between decision regret and treatment behavior.

Methods

A multi-center randomized controlled trial design was employed. Three hundred ESRD patients meeting inclusion criteria from the peritoneal dialysis centers of three tertiary hospitals, selected from August 1, 2024, to March 31, 2026, were randomly divided into an experimental group (n = 150) and a control group (n = 150). The experimental group received at least 30 minutes of structured dialogue using a decision aid by nurses, with preferences recorded. The control group received routine alternative treatment information and assessment. Follow-up was conducted at 1 month and 3 months to compare decision regret between the two groups. Patients were grouped by decision regret level to analyze performance/theoretical test scores, medication adherence, clinical indicator achievement rates, and psychological burden.

Results

Follow-up at 1 month revealed significantly lower decision regret in the experimental group compared to the control group (mild regret: 111 vs. 77 cases; severe regret: 7 vs. 27 cases; $\chi^2=20.42$, $P < 0.001$). As decision regret increased, patients' operational and theoretical test scores decreased, and achievement rates for anemia, albumin, potassium, phosphorus, and blood pressure significantly decreased. Fear of disease progression and caregiver burden also significantly increased (all $P < 0.05$).

Conclusion

Nurse-patient shared decision-making can significantly reduce decision regret in ESRD patients choosing dialysis modalities. Decision regret is an important factor affecting treatment adherence and clinical outcomes in peritoneal dialysis patients. It is recommended to incorporate SDM tools into clinical pathways to improve patients' self-management abilities and long-term prognosis.

1. Introduction

End-stage renal disease (ESRD), as a major public health challenge that is continuously growing worldwide, imposes an increasingly heavy disease burden, posing severe challenges to individual patients, their families, and healthcare systems[1-2].As the global prevalence of ESRD continues to rise,

the demand for renal replacement therapy (RRT) has also increased sharply. Currently, peritoneal dialysis (PD) and hemodialysis (HD) are the two main long-term dialysis modalities, which have not shown significant differences in long-term survival rates and are clinically equivalent in efficacy[1-3].However, the two treatment modalities differ fundamentally in terms of treatment setting, mode of operation, time flexibility, and impact on patients' daily lives: PD is typically performed independently by patients at home, offering greater autonomy and convenience in daily life; whereas HD requires regular visits to a dialysis center and relies on professional medical equipment and personnel for implementation[1].This difference not only affects patients' treatment experience but also profoundly impacts multiple dimensions such as their social roles, occupational function, and psychological adaptation. As a result, patients develop different psychological experiences and decision-making feelings when selecting and long-term accepting treatment. Therefore, when choosing between two dialysis modes with comparable efficacy, patients' subjective decision-making experience and subsequent psychological adaptation have become increasingly important topics of focus in the field of clinical decision support.

Decision regret refers to the negative cognitive and emotional experience a patient has regarding their medical decision after the fact. Essentially, it is a psychological reaction based on counterfactual thinking, which may involve regret about multiple aspects of the decision-making process, the chosen option, and the treatment outcome[4].Previous studies have confirmed that decision regret is prevalent in clinical fields such as oncology and surgery, and is significantly associated with poorer patient quality of life, increased psychological distress, and decreased treatment satisfaction[5-6].However, there is little research in the field of dialysis.

In the field of dialysis, decision regret is a common and non-negligible negative psychological experience following the choice of a dialysis modality, with its core being patients' feelings of regret or guilt over the treatment decisions they have made[7-8].Existing evidence indicates that decision regret among dialysis patients varies significantly, with reported rates ranging from less than 10% to over 60%. This variability may reflect differences in population characteristics, adequacy of information acquisition, and levels of decision support[8].It is important to note that decisional regret is not an isolated emotional state but is closely associated with a range of adverse clinical outcomes. Studies show that patients who experience regret are more likely to hold negative attitudes toward treatment, exhibit significantly lower treatment satisfaction, have poorer medication adherence, and suffer noticeable impairments in quality of life[9].

Although PD and HD are generally comparable in terms of clinical efficacy and long-term survival rates, most patients lack systematic and adequate educational support when making treatment decisions. Studies have shown that a significant proportion of patients have insufficient knowledge about dialysis modalities, and some even hold misconceptions and concerns regarding PD[10].aditional educational models focus on unidirectionally conveying objective comparisons of the advantages and disadvantages of PD and HD to patients, informing them about differences between the two approaches, survival rates,

and complication risks through standardized processes. However, this model has significant limitations in practice. Specifically, it overlooks the value preferences of patients as independent individuals, their family support networks, and their self-efficacy in disease management. Previous studies have indicated that existing educational strategies often leave patients feeling overwhelmed and uncertain upon returning home, and clinical staff also report that educational materials lack attention to patients' emotional and social dimensions[11-12].Furthermore, this proselytizing model, which lacks personalized integration, may further exacerbate decision regret patients experience after making choices, as they fail to make decisions aligned with their long-term life plans based on a full understanding of their own situation and the match between their condition and treatment[13].

In recent years, the concept of patient-centered shared decision-making has increasingly gained attention. Its core lies in promoting patients' deep understanding of treatment options and expression of preferences through structured decision aids and communication strategies, thereby improving decision quality. Although shared decision-making has been widely validated in chronic disease areas such as oncology and cardiovascular diseases, its application value in ESRD patients' dialysis modality selection remains insufficiently confirmed. More importantly, the decision-making process for dialysis modality in ESRD patients is not a one-time event; their subsequent self-management ability, medication adherence, and fear of prognosis may be profoundly influenced by the quality of the initial decision-making process[14-15].This study effectively integrates standardized decision aid tools with systematic communication skills training to enable the consistent and uniform implementation of decision support interventions in multi-center clinical practice.

2. Materials and Methods

2.1 Study Design and Participants

A multi-center, prospective, parallel randomized controlled trial design was adopted. From August 1, 2024, to March 31, 2026, 300 ESRD patients meeting the inclusion criteria were recruited from PD centers of three tertiary hospitals. Inclusion criteria were: (1) Age ≥ 18 years; (2) Confirmed ESRD (estimated glomerular filtration rate < 15 mL/min/1.73m²) with indications for renal replacement therapy; (3) No prior permanent dialysis access established; (4) Intact cognitive ability and ability to communicate in Chinese; (5) Voluntary participation and signed written informed consent. Exclusion criteria were: (1) Prior kidney transplantation or maintenance dialysis; (2) Severe mental illness or cognitive impairment; (3) Concurrent malignancy or life expectancy < 12 months; (4) Participation in other intervention clinical trials; (5) Contraindications to both PD and HD

2.2 Randomization and Blinding

Eligible patients were randomly assigned in a 1:1 ratio to either the experimental group (n=150) or the control group (n=150). The random sequence was generated by an independent statistician using a computer-generated random number table produced with SPSS 26.0 (IBM Corp., Armonk, NY, USA), who

was not involved in patient recruitment or intervention implementation. Allocation concealment was achieved through sequentially numbered, opaque envelopes.

2.3 Implementation Method

experimental group, PD specialist nurses conducted structured dialogues of at least 30 minutes with patients who had undergone a 40-hour standardized training program. This training included decision coaching techniques, communication skills, and standardized use of decision aids. The decision aids comprised visualizations of the pros and cons of PD versus HD, risk-benefit comparison charts, and patient preference questionnaires. During these dialogues, patient values, social support status, and self-management willingness were meticulously documented using standardized recording forms. Subsequently, personalized recommendations were provided based on the patient's clinical profile—including comorbidities, residual renal function, vascular access condition, and living situation—integrated with their expressed preferences. Patients in this group also received a decision-making manual for home reference and were encouraged to discuss treatment options with their families.In the control group, nurses explained the pros and cons of PD and HD in a traditional standardized manner. Treatment modality was determined after assessment using an alternative therapy evaluation form, without employing structured decision support tools or personalized exploration of values.

The primary outcome measure was the Decision Regret Scale (DRS) score 1 month after catheter placement. The DRS consists of 5 items rated on a 5-point Likert scale (1 = strongly agree, 5 = strongly disagree), with item scores converted to a 0–100 point scale (higher scores indicating greater regret). Based on validated cutoff values, 0–25 points were classified as mild regret, 26–50 points as moderate regret, and >50 points as severe regret.

Secondary outcome measures included: (1) Decision satisfaction, assessed 1 month after catheter placement using a 6-item Satisfaction With Decision (SWD) scale; (2) Knowledge and skill assessment, evaluated at discharge via a standardized test covering PD related knowledge (theoretical, 0–100 points) and catheter care skills (practical, 0–100 points); (3) Clinical target achievement rate 3 months after catheter placement, including anemia (hemoglobin 110–120 g/L), albumin (≥35 g/L), potassium (3.5–5.5 mmol/L), phosphorus (1.13–1.78 mmol/L), and blood pressure (systolic 90–140 mmHg and diastolic 60–90 mmHg); (4) Fear of Progression Questionnaire-Simplified Form (FoP-Q-SF) score at 3 months, consisting of 12 items rated on a 5-point Likert scale (total score 12–60, with higher scores indicating greater fear); and (5) Zarit Caregiver Burden Interview (ZBI) score at 3 months, consisting of 22 items rated on a 5-point Likert scale (0–88 points, with higher scores indicating greater caregiver burden).Using SPSS 26. For continuous data, normality is tested with a t-test; non-normal data uses the Mann-Whitney U test. For categorical data, chi-square or Fisher's exact test is employed. Effect sizes are calculated, and statistical significance is determined at $P < 0.05$.(Table 1)

3. Result

3.1 Baseline Characteristics

The experimental and control groups were well balanced at baseline. No statistically significant differences were observed in demographic or clinical characteristics between the two groups (all P > 0.05), confirming that randomization was successful (Table 2).

3.2 Primary Outcome: Decision Regret at 1 Month

One month after catheter placement, decision regret was significantly lower in the experimental group than in the control group. The experimental group had a significantly higher proportion of patients with mild regret (111/150, 74.0% vs. 77/150, 51.3%) and a significantly lower proportion with severe regret (7/150, 4.7% vs. 27/150, 18.0%). Accordingly, the moderate regret category included 32 experimental patients and 46 control patients. The overall difference in regret distribution was statistically significant ($\chi^2 = 20.42$, P < 0.001).Table 3

3.3 Secondary Outcomes According to Regret Severity

When all patients were stratified by decision regret severity (mild, moderate, severe), a consistent dose–response relationship was observed.Both theoretical (0–100) and practical (0–100) test scores decreased significantly as decision regret increased (P < 0.05), indicating poorer PD related knowledge and catheter care skills in patients with higher regret.Table 4The proportion of patients with low adherence (<6 points) increased with regret severity.The 3-month composite target achievement rate declined progressively. Significant decreases were observed in the proportions of patients meeting targets for anemia (hemoglobin 110–120 g/L), albumin (≥35 g/L), potassium (3.5–5.5 mmol/L), phosphorus (1.13–1.78 mmol/L), and blood pressure (systolic 90–140 mmHg and diastolic 60–90 mmHg) (all P < 0.05).Fear of progression and caregiver burden: Both FoP-Q-SF scores (12–60) and ZBI scores (0–88) increased significantly with higher regret severity, indicating greater fear of disease progression and higher caregiver burden (all P < 0.05).Table 5.

4. Discussion

Decision regret is a common psychological distress experienced by end-stage renal disease patients after choosing a dialysis modality. Previous studies have shown that insufficient patient involvement in the decision-making process for dialysis modalities is closely associated with an increased risk of subsequent decision regret. Although the concept of shared decision-making has been widely promoted, previous research has primarily focused on the role of decision aids in improving decisional conflict and knowledge levels[16-18].This study, through a multicenter, prospective randomized controlled trial design, first confirmed that structured nurse-patient dialogue interventions based on decision aids can significantly reduce decision regret among patients with end-stage renal disease after making dialysis modality decisions. This finding provides new evidence-based support for clinical nursing practice. In this study, structured decision support tools were integrated with individualized value exploration into the dialysis modality selection process for patients with end-stage renal disease. The results showed that this intervention strategy had positive effects in reducing decision regret, improving decision satisfaction, and enhancing multiple clinical outcomes.

The comprehensive improvement of the intexperimental group in secondary outcome measures such as decision satisfaction, mastery of dialysis-related knowledge, operational skill assessment, and medication adherence further confirms the clinical value of decision support strategies based on individualized values exploration[19].When patients make treatment choices after fully understanding the pros and cons of different dialysis methods and their compatibility with their own lifestyle, they often have stronger acceptance of the treatment plan and intrinsic motivation, which is more likely to translate into consistent adherence in daily treatment[20].In the study, which involved systematic exploration of patients' values, social support status, and willingness for self-management through structured dialogue, reinforced a behavioral intervention focused on 'informed-consensual-engagement.' This ultimately confirmed significant advantages of the experimental group in knowledge acquisition, operational skills, and medication adherence. Patients who received systematic decision-support education showed significantly improved self-efficacy regarding dialysis treatment. They were more proactive in participating in catheter care and complication prevention, thereby exerting a profound positive impact on their long-term disease management trajectory[21-23].

The intervention designed in this study integrates standardized decision aids with a systematic exploration of individual patient characteristics, forming a more comprehensive methodological approach at the implementation level of decision support. The outcome evaluation simultaneously incorporates multiple dimensions such as decision satisfaction, knowledge and skills, medication adherence, clinical target achievement rate, psychological status, and caregiver burden, establishing a relatively complete effect evaluation system for the study. Notably, the core value of decision support intervention lies not only in optimizing the immediate decision-making experience but also in improving long-term treatment behaviors and clinical outcomes by enhancing patients' disease-related knowledge and self-management efficacy. Regarding medication adherence, existing studies have shown that non-adherence to medication among kidney transplant recipients is closely related to treatment beliefs and the decision-making process, suggesting that decision support may promote the establishment of adherence behaviors by improving patients' understanding and acceptance of treatment regimens[23-24].Choosing a dialysis modality for patients with ESRD is a complex medical decision-making process that involves balancing risks and benefits at the medical level, and more profoundly impacts their future quality of life and lifestyle[25-27].Previous studies have shown that HD and PD are medically equivalent in terms of clinical outcomes. However, there are significant differences in patients' psychological acceptance, self-management needs, and lifestyle adaptability between these two modalities. Although clinical guidelines recommend providing comprehensive pre-dialysis education for ESRD patients to support their decision-making, traditional educational models often focus on one-way transmission of medical information, failing to adequately address individual patients' values, life circumstances, and psychological needs[28-29].

5.Clinical Practical Significance

At present, how to reduce post-decision regret in the selection of dialysis modalities through optimized decision support strategies remains a clinical issue that requires in-depth exploration. The value of visual

information presentation in decision aids for shared decision-making between healthcare providers and patients has received widespread attention. Previous studies have shown that decision aids, through structured visual elements such as pros-and-cons charts and risk-benefit comparisons, can transform complex medical information into forms more easily cognitively processed by patients, thereby effectively reducing decisional conflict and improving decision quality[30].In medical communication practice, quantitative presentation methods significantly enhance patients' self-reported understanding and decision-making confidence compared to qualitative descriptions, with this advantage being particularly pronounced in clinical contexts involving risk trade-offs[31].

6.Limitations of the study

The study has several limitations that warrant further exploration. Firstly, the research sample was limited to peritoneal dialysis centers in three tertiary hospitals. Although a multi-center design was employed to enhance sample representativeness, the regional distribution and homogeneity of medical standards among participating centers may restrict the generalizability of the study conclusions to broader clinical contexts. Additionally, decision regret, as a patient-centered subjective evaluation metric, often evolves non-linearly; early experiences and long-term feelings may exhibit significant differences. Existing studies have shown that there may be dynamic changes between the degree of decision regret experienced by patients shortly after choosing a renal replacement therapy modality and their subsequent long-term adaptation status[32].This time-dependent nature suggests that evaluation results at a single point in time may have certain limitations[33-36].

Abbreviations

SDM shared decision-making

ESRD End-stage renal disease

RRT renal replacement therapy

PD peritoneal dialysis

HD hemodialysis

DRS Decision Regret Scale

SWD Satisfaction With Decision

FoP-Q-SF Questionnaire-Short Form

ZBI Zarit Caregiver Burden Interview

Declarations

Trial Registration:

Ganzhou Municipal People's Hospital Research Ethics Committee :SZR2025005HA

7.Conflict of Interest

On behalf of all authors, I declare that there are no conflicts of interest, financial or otherwise, related to the work presented in this manuscript. All authors have reviewed and approved the final version of the article and agree to its submission for publication. The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. In addition, all authors give their consent for the publication of this article in the journal.

8.Authors' contributions

Yilin Zeng and SugeTian contributed equally to this work. They conceptualized and designed the study, coordinated the multi-center trial, collected and analyzed data, and drafted the initial manuscript.Ruizhao Li and Yujun Huang contributed to the statistical analysis, data interpretation, and critical revision of the results section.Lili Deng and Jia Deng participated in patient recruitment, intervention implementation, and follow-up data collection across the participating centers.Yilin Zeng and Lili Deng, as corresponding authors, supervised the entire research project, provided clinical expertise in peritoneal dialysis and shared decision-making, critically revised the manuscript for important intellectual content, and approved the final version for submission.All authors read and approved the final manuscript.

9.Acknowledgments

The authors would like to express their sincere gratitude to all the patients and their families who participated in this study. We also thank the nursing and medical staff of the peritoneal dialysis units at Guangdong Provincial People's Hospital and Henan Provincial People's Hospital for their invaluable assistance in data collection and patient care. This work was supported by the Project supported by Jiangxi Provincial Natural Science Foundation (20252BAC250081). We gratefully acknowledge the contributions of all authors as detailed in the Author Contributions section. No additional external writing or editorial assistance was used.

All scales used in this study have been previously published and validated. Specifically:Decision Regret Scale (DRS): Developed by Brehaut et al. (2003), published in Medical Decision Making.Satisfaction With Decision (SWD) scale: Developed by Holmes-Rovner et al. (1996), published in Medical Care.Fear of Progression Questionnaire-Short Form (FoP-Q-SF): Developed by Mehnert et al. (2006), published in the Journal of Psychosomatic Research.Zarit Caregiver Burden Interview (ZBI): Developed by Zarit et al. (1980), published in The Gerontologist.We thank the developers of the above scale and the experts who validated the scale in practice.The license agreement has been obtained from the copyright holder (Donald E. Morisky, ScD, ScM, MSPH) and a copy of the permission/license will be attached as an additional file with the revised manuscript.

10.Availability of Data and Materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request. To protect patient privacy, raw clinical data are not publicly accessible; de-identified data may be made available in accordance with institutional ethical regulations and with the approval of the Ganzhou Municipal People's Hospital Research Ethics Committee.

11.Funding

Project supported by Jiangxi Provincial Natural Science Foundation

NO.20252BAC250081

12.Ethics approval and consent to participate

This study was approved by the Ethics Committee of Ganzhou Municipal People's Hospital (Approval No.: SZR2025005HA). All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.Written informed consent was obtained from all individual participants included in the study prior to enrollment. Participants were informed of the study purpose, procedures, potential risks and benefits, and their right to withdraw at any time without affecting their medical care.This randomized controlled trial was conducted and reported in accordance with the Consolidated Standards of Reporting Trials (CONSORT) guidelines.Clinical trial number: not applicable.

References

1. Braun MM, Khayat M. Kidney Disease: End-Stage Renal Disease. FP Essent 509:26–32. https://pubmed.ncbi.nlm.nih.gov/34643362/
2. Queeley GL, Campbell ES. Comparing Treatment Modalities for End-Stage Renal Disease: A Meta-Analysis. Am Health Drug Benefits. 2018;11(3):118–27. https://pubmed.ncbi.nlm.nih.gov/29910844/.
3. Beladi Mousavi SS, Hayati F, Valavi E, Rekabi F, Mousavi MB. Comparison of survival in patients with end-stage renal disease receiving hemodialysis versus peritoneal dialysis. Saudi J Kidney Dis Transpl. 2015;26(2):392–7. 10.4103/1319-2442.152559. https://pubmed.ncbi.nlm.nih.gov/25758900/.
4. Tyner TE, Freysteinson WM. A concept analysis of decision regret in women with breast cancer. Nurs Forum. 2022;57(1):112–20. 10.1111/nuf.12642. https://pubmed.ncbi.nlm.nih.gov/34431105/.
5. Werfel T, Rühle A, Seidel C et al. Decision regret in patients with rectal cancer undergoing multimodal therapy. Clin Transl Radiat Oncol 59:101211. Published 2026 Jul. 10.1016/j.ctro.2026.101211 https://pubmed.ncbi.nlm.nih.gov/42281958/

6. Tews AM, Hinz A, Magnus V et al. Decision regret in patients with head-and-neck cancer undergoing radiotherapy. Clin Transl Radiat Oncol. 54:101005. Published 2025 Sep. 10.1016/j.ctro.2025.101005 https://pubmed.ncbi.nlm.nih.gov/40673135/
7. Saeed F, Ladwig SA, Epstein RM, Monk RD, Duberstein PR. Dialysis Regret: Prevalence and Correlates. Clin J Am Soc Nephrol. 2020;15(7):957–63. 10.2215/CJN.13781119. https://pubmed.ncbi.nlm.nih.gov/32499230/.
8. Bispo I, Bressan M, Rego F, Rêgo G. Decisional Regret in Adults Facing Treatment Choices for Kidney Failure: A Systematic Review. Nephron. 2026;150(4):257–78. 10.1159/000549071. https://pubmed.ncbi.nlm.nih.gov/41269912/.
9. Agar JWM, Piccoli GB. The regrets of a green dialysis warrior. J Nephrol. 2022;35(8):1949–51. 10.1007/s40620-022-01472-0. https://pubmed.ncbi.nlm.nih.gov/36242737/.
10. Elzorkany K, Alhamad MA, Albaqshi BM, et al. Knowledge about peritoneal dialysis among patients with end-stage kidney disease on hemodialysis: a cross-sectional study. Ann Med. 2024;56(1):2411019. 10.1080/07853890.2024.2411019. https://pubmed.ncbi.nlm.nih.gov/39376132/.
11. Bergjan M, Schaepe C. Educational strategies and challenges in peritoneal dialysis: a qualitative study of renal nurses' experiences. J Clin Nurs. 2016;25(11–12):1729–39. 10.1111/jocn.13191. https://pubmed.ncbi.nlm.nih.gov/27074958/.
12. Inkeroinen S, Koskinen J, Karlsson M et al. Sufficiency of Knowledge Processed in Patient Education in Dialysis Care. Patient Prefer Adherence 15:1165–75. Published 2021 None. 10.2147/PPA.S304530 https://pubmed.ncbi.nlm.nih.gov/34079237/
13. Ziolkowski S, Liebman S. A Qualitative Assessment of Mismatch Between Dialysis Modality Selection and Initiation. Perit Dial Int. 2016 Jul-Aug;36(4):463–6. 10.3747/pdi.2015.00047 https://pubmed.ncbi.nlm.nih.gov/27385810/
14. Neumann J, Vogel C, Kießling L, et al. TraumaFlow-development of a workflow-based clinical decision support system for the management of severe trauma cases. Int J Comput Assist Radiol Surg. 2024;19(12):2399–409. 10.1007/s11548-024-03191-2. https://pubmed.ncbi.nlm.nih.gov/38816648/.
15. Olakotan OO, Yusof MM. Evaluating the appropriateness of clinical decision support alerts: A case study. J Eval Clin Pract. 2021;27(4):868–76. 10.1111/jep.13488. https://pubmed.ncbi.nlm.nih.gov/33009698/.
16. Jenssen BP, Shelov ED, Bonafide CP, Bernstein SL, Fiks AG, Bryant-Stephens T. Clinical Decision Support Tool for Parental Tobacco Treatment in Hospitalized Children. Appl Clin Inf. 2016;7(2):399–411. 10.4338/aci-2015-12-ra-0169. Published 2016 None. https://pubmed.ncbi.nlm.nih.gov/27437049/.
17. Paraskeva N, Guest E, Lewis-Smith H, Harcourt D. Assessing the effectiveness of interventions to support patient decision making about breast reconstruction: A systematic review. Breast 40:97–105. 10.1016/j.breast.2018.04.020 https://pubmed.ncbi.nlm.nih.gov/29730304/

18. Zisman-Ilani Y, Rhee CM, Ammary FA, Kalantar-Zadeh K. Shared decision making and decision aids in the management of kidney disease and renal replacement treatment options. Curr Opin Nephrol Hypertens. 2026;35(1):13–20. 10.1097/MNH.0000000000001140. https://pubmed.ncbi.nlm.nih.gov/41268820/.
19. Brown L, Gardner G, Bonner A. A randomized controlled trial testing a decision support intervention for older patients with advanced kidney disease. J Adv Nurs. 2019;75(11):3032–44. 10.1111/jan.14112. https://pubmed.ncbi.nlm.nih.gov/31225666/.
20. Aydin Z, Özcan Ş. Education and decision support improve outcomes in urgent dialysis: A randomised trial. Patient Educ Couns 142:109405. 10.1016/j.pec.2025.109405 https://pubmed.ncbi.nlm.nih.gov/41207186/
21. Hoefel L, Lewis KB, O'Connor A, Stacey D. 20th Anniversary Update of the Ottawa Decision Support Framework: Part 2 Subanalysis of a Systematic Review of Patient Decision Aids. Med Decis Mak. 2020;40(4):522–39. 10.1177/0272989X20924645. https://pubmed.ncbi.nlm.nih.gov/32522091/.
22. Lei Y, Zhou Q, Tao Y. Decision Aids in the ICU: a scoping review. BMJ Open. 2023;13(8):e075239. 10.1136/bmjopen-2023-075239. Published 2023 Aug 22. https://pubmed.ncbi.nlm.nih.gov/37607783/.
23. Griva K, Neo HLM, Vathsala A. Unintentional and intentional non-adherence to immunosuppressive medications in renal transplant recipients. Int J Clin Pharm. 2018;40(5):1234–41. 10.1007/s11096-018-0652-6. https://pubmed.ncbi.nlm.nih.gov/29872960/.
24. Wang N, Li P, Suo D et al. A Predictive Model for Identifying Low Medication Adherence Among Patients with Cirrhosis. Patient Prefer Adherence 17:2749–60. Published 2023 None. 10.2147/PPA.S426844 https://pubmed.ncbi.nlm.nih.gov/37933304/
25. Doan TT, Kim J, Kim H, An W, Seo E, Park M. Decision Regret and Decision-Making Process among Caregivers of Older Adults Receiving Home Care: A Cross-Sectional Study. J Am Med Dir Assoc. 2024;25(9):105166. 10.1016/j.jamda.2024.105166. https://pubmed.ncbi.nlm.nih.gov/39043248/.
26. Beheshtaeen F, Molazem Z, Kalyani MN, Mohebbi Z. Caregiver burden reduction program among family caregivers of patients undergoing coronary artery bypass graft surgery: designing and evaluating. BMC Nurs. 2025;24(1):1258. Published 2025 Oct 9. 10.1186/s12912-025-03918-9 https://pubmed.ncbi.nlm.nih.gov/41068850/
27. Cincidda C, Pizzoli SFM, Oliveri S, Guiddi P, Pravettoni G. Toward a new personalized psycho-social approach for the support of prostate cancer and their caregivers dyads: a pilot study. Front Med (Lausanne). 11:1356385. Published 2024 None. 10.3389/fmed.2024.1356385 https://pubmed.ncbi.nlm.nih.gov/38646557/
28. Combes G, Sein K, Allen K. How does pre-dialysis education need to change? Findings from a qualitative study with staff and patients. BMC Nephrol. 2017;18(1):334. 10.1186/s12882-017-0751-y. Published 2017 Nov 23. https://pubmed.ncbi.nlm.nih.gov/29169332/.
29. Berkhout-Byrne N, Gaasbeek A, Mallat MJK, et al. Regret about the decision to start dialysis: a cross-sectional Dutch national survey. Neth J Med. 2017;75(6):225–34.

https://pubmed.ncbi.nlm.nih.gov/28741581/.

30. Pryce H, Ward M, Turton L, Stanley J, Goss J. A multi-site service evaluation of the tinnitus care decision aid. Int J Audiol. 2022;61(1):84–7. 10.1080/14992027.2021.1898684. https://pubmed.ncbi.nlm.nih.gov/33752559/.
31. Roland-McGowan JN, Ose OM, Yu Y, et al. Quantitative versus qualitative risk framing in patient decision aids for dysplastic nevi: A randomized A/B testing study. J Am Acad Dermatol. 2026;94(6):1697–704. 10.1016/j.jaad.2026.02.010. https://pubmed.ncbi.nlm.nih.gov/41893389/.
32. Pawar AS, Thorsteinsdottir B, Whitman S, et al. Decisional Regret Surrounding Dialysis Initiation: A Comparative Analysis. Kidney Med. 2024;6(3):100785. 10.1016/j.xkme.2023.100785. Published 2024 Mar. https://pubmed.ncbi.nlm.nih.gov/38435065/.
33. Cassidy RS, Bennett DB, Beverland DE, O'Brien S. Decision regret after primary hip and knee replacement surgery. J Orthop Sci. 2023;28(1):167–72. 10.1016/j.jos.2021.10.007. https://pubmed.ncbi.nlm.nih.gov/34838410/.
34. Banks J, Lee E, Lee MJ, Brown SR. Decision regret following surgical management of pilonidal disease. Colorectal Dis Published online Sep. 2024;25. 10.1111/codi.17152. https://pubmed.ncbi.nlm.nih.gov/39323001/.
35. Chen Z, Huang B, Lu H, et al. The effect of admission serum potassium levels on in-hospital and long-term mortality in type A acute aortic dissection. Clin Biochem. 2017;50(15):843–50. 10.1016/j.clinbiochem.2017.05.008. https://pubmed.ncbi.nlm.nih.gov/28499801/.
36. Tabara Y, Takahashi Y, Setoh K, Prognostic Significance of Spot Urine Na/K for Longitudinal Changes in Blood Pressure and Renal Function: The Nagahama Study. Am J Hypertens. 2017;30(9):899–906. 10.1093/ajh/hpx075 https://pubmed.ncbi.nlm.nih.gov/28498883/

Tables

Table 1 Outcome Evaluation Tool Table for Peritoneal Dialysis Catheter Placement

Outcome Category	Specific Indicator	Assessment Tool / Method	Assessment Timepoint	Scoring & Criteria
Primary Outcome	Decision regret	Decision Regret Scale (DRS)	1month after catheter placement	5 items; 5-point Likert scale (1 = strongly agree, 5 = strongly disagree); item scores converted to a 0–100 scale. Classification: 0–25 = mild regret; 26–50 = moderate regret; >50 = severe regret.
Secondary Outcomes	1. Decision satisfaction	Satisfaction With Decision (SWD) scale	1month after catheter placement	6 items; scored according to the original scale rules; higher scores indicate greater satisfaction.
	2. Knowledge and skills	Standardized test (theoretical + practical)	At discharge	Theoretical (PD/HD-related knowledge) 0–100 points; practical (catheter care skills) 0–100 points; higher scores indicate better performance.
	3. Clinical target achievement rate	Laboratory tests and blood pressure measurement	3months after catheter placement	All 5 of the following targets met simultaneously: Hemoglobin 110–120 g/L; Albumin ≥35 g/L; Potassium 3.5–5.5 mmol/L; Phosphorus 1.13–1.78 mmol/L; Blood pressure: systolic 90–140 mmHg and diastolic 60–90 mmHg.
	4. Fear of progression	Fear of Progression Questionnaire-Short Form (FoP-Q-SF)	3months after catheter placement	12 items; 5-point Likert scale; total score 12–60; higher scores indicate greater fear.
	5.Caregiver burden	Zarit Caregiver Burden Interview (ZBI)	3months after catheter placement	22 items; 5-point Likert scale; total score 0–88; higher scores indicate greater caregiver burden.

Statistical Analysis Notes (SPSS 26)

Continuous variables: normality tested first; normally distributed data analyzed by independent-samples t-test; non-normally distributed data analyzed by Mann-Whitney U test.

Categorical variables: analyzed by chi-square test or Fisher's exact test.

Effect sizes are calculated; statistical significance is set at $P < 0.05$.

Table 2. Baseline characteristics of the two groups

Variable	Experimental group (n=150)	Control group (n=150)	Statistic	P value
Male, n (%)	78 (52.0)	80 (53.3)	χ^2=0.054	0.817
Age (years), mean ± SD	52.4 ± 12.3	53.1 ± 13.0	t=0.490	0.625
BMI (kg/m²), mean ± SD	23.5 ± 3.2	23.8 ± 3.5	t=0.790	0.431
Education level, n (%)			χ^2=0.230	0.892
Junior high school or below	45 (30.0)	48 (32.0)		
High school / vocational school	60 (40.0)	57 (38.0)		
College or above	45 (30.0)	45 (30.0)		
Annual household income, n (%)(RMB)			χ^2=0.160	0.923
<50,000 yuan	50 (33.3)	52 (34.7)		
50,000–100,000 yuan	65 (43.3)	62 (41.3)		
>100,000 yuan	35 (23.3)	36 (24.0)		
Diabetes mellitus, n (%)	55 (36.7)	58 (38.7)	χ^2=0.130	0.720
Hypertension, n (%)	98 (65.3)	95 (63.3)	χ^2=0.130	0.716
Baseline hemoglobin (g/L), mean ± SD	98.6 ± 15.2	99.1 ± 14.8	t=0.290	0.772
Serum potassium (mmol/L), mean ± SD	4.8 ± 0.6	4.7 ± 0.7	t=1.350	0.179
Serum phosphorus (mmol/L), mean ± SD	1.65 ± 0.45	1.68 ± 0.50	t=0.540	0.589
Fear of progression score, mean ± SD	32.5 ± 8.4	33.2 ± 9.1	t=0.690	0.492
Caregiver burden score, mean ± SD	28.4 ± 10.2	29.1 ± 11.0	t=0.570	0.570
Medication adherence score, mean ± SD	6.2 ± 1.1	6.1 ± 1.2	t=0.690	0.490

Note: Continuous variables are presented as mean ± SD and were compared using the independent-samples t-test; categorical variables are presented as n (%) and were compared using the chi-square test. $P < 0.05$ was considered statistically significant.

Table 3. Comparison of decision regret between the two groups at 1 month after intervention

Group	N	Mild regret, n (%)	Moderate regret, n (%)	Severe regret, n (%)
Experimental group	150	111 (74.0)	32 (21.3)	7 (4.7)
Control group	150	77 (51.3)	46 (30.7)	27 (18.0)

Note: $\chi^2 = 20.42$, df = 2, $P < 0.001$. Data are presented as n (%).

Table 4. Comparison of assessment scores after catheter placement and 1 month after discharge among patients with different levels of decision regret

Indicator	Mild regret group (n=189)	Moderate regret group (n=78)	Severe regret group (n=33)
Practical skill score – after catheter placement	95±2.1	96±1.1	95±1.7
Practical skill score – 1 month after discharge	96±1.9	93±1.6	83±1.3
Paired t-test	(P>0.05)	(P<0.05)	(P<0.01)
Theoretical score – after catheter placement	98±1.8	98±1.3	98±1.1
Theoretical score – 1 month after discharge	95±1.3	92±2.2	90±1.6
Paired t-test	(P>0.05)	(P<0.05)	(P<0.01)

Note: Data are presented as mean ± SD. P values were derived from paired t-tests comparing scores between the two time points within each group.

Table 5. Comparison of fear of disease progression and caregiver burden among patients with different levels of decision regret

Indicator	Mild regret group (n=189)	Moderate regret group (n=78)	Severe regret group (n=33)	P value
Fear of progression (FoP-Q-SF)	26.5±6.3	38.2±7.1	52.4±5.8	<0.001
Caregiver burden (ZBI)	22.4±8.1	36.5±9.2	58.7±10.4	<0.001

Note: Data are presented as mean ± SD. FoP-Q-SF = Fear of Progression Questionnaire-Short Form; ZBI = Zarit Caregiver Burden Interview. P values were derived from one-way ANOVA or Kruskal–Wallis test as appropriate.