Research Square

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Evaluation of a Home Self-Management Programme for Patients with Lower Limb Deep Vein Thrombosis after Hospital Discharge: A quasi-experimental study

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Research Article

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Abstract

Objective

To develop and evaluate the effectiveness of a home self-management programme for patients with lower limb deep vein thrombosis (DVT) following discharge.

Methods

Using convenience sampling, 72 patients with lower limb DVT who were discharged from the Vascular Surgery Department of a Grade A Level III hospital in Jinan between January and May 2025 were selected. Patients were allocated to the intervention group or control group according to the sequence of admission,with 36 patients per group. The control group received routine follow-up care, whilst the observation group, in addition to the standard care provided to the control group, implemented an evidence-based home self-management programme (including health education via WeChat groups, regular follow-ups and online lectures). Self-management ability (Lower Limb DVT Patient Self-Management Scale), Villalta score, medication adherence (Morisky Scale) and quality of life (DVTQOL) were assessed in both groups at discharge and at 1, 3 and 6 months post-discharge.

Results

Repeated measures analysis of variance revealed a significant time × group interaction effect for the total self-management ability score in both groups ($F = 110.762$, $P < 0.001$). At 6 months post-discharge, the total self-management ability score in the observation group (87.94 ± 2.64) was significantly higher than that in the control group (69.08 ± 5.70), with a statistically significant difference ($P < 0.001$). The observation group demonstrated better medication adherence than the control group ($P < 0.001$), lower Villalta scores than the control group ($P < 0.001$), and greater improvement in overall quality of life scores than the control group ($P < 0.001$). The incidence of PTS was 0% in the observation group and 11.11% in the control group.

Conclusion

An evidence-based home self-management programme can effectively improve self-management ability, medication adherence and quality of life in patients discharged with lower limb DVT, whilst reducing the risk of PTS; it is therefore worthy of further clinical validation and implementation.

Introduction

Deep vein thrombosis (DVT) of the lower limbs is one of the most common acute and critical conditions encountered in vascular surgery, with its incidence showing an upward trend year on year(Di Nisio, van Es, & Büller, 2016; Heymann, 2024; Wolf et al., 2024). DVT not only causes acute symptoms such as swelling and pain in the affected limb, but poses an even greater challenge in the form of long-term complications

following discharge—post-thrombotic syndrome (PTS), which has an incidence rate of 20% to 50%, which severely affects patients' quality of life and ability to work, placing a heavy economic burden on families and society(Brown, Tokessy, Delluc, & Carrier, 2024; Caiano et al., 2023; de Kleijn et al., 2022; Kahn, 2016). Currently, relatively mature guidelines and consensus have been established for the acute-phase diagnosis and treatment of DVT; however, there is a lack of systematic, standardised and practical implementation plans for continuity of care and self-management at home following discharge. Following discharge, DVT patients require long-term anticoagulant therapy, the wearing of compression stockings, functional exercises and regular follow-up appointments; failure to adhere to any of these measures may lead to adverse outcomes such as recurrent thrombosis, haemorrhage or PTS(Enden, Kløw, & Sandset, 2013; Ganguli et al., 2011; Guarascio et al., 2025; Kawtharany H et al., 2025; Kerwin et al., 2025; Liu et al., 2025; Schlager et al., 2025). However, traditional follow-up models, which rely primarily on telephone follow-ups, suffer from issues such as fragmented content, a lack of interactivity and difficulties in maintaining patient adherence. In recent years, with the widespread adoption of mobile health technologies and social media platforms such as WeChat, information technology-based models of continuity of care have shown great promise in the management of chronic diseases; however, high-quality evidence remains lacking in the field of home-based self-management for DVT. Consequently, this study developed an evidence-based home self-management programme for patients with lower limb DVT following discharge. Through a quasi-experimental study, the study evaluated the programme's impact on patients' self-management capabilities, medication adherence, quality of life and the incidence of PTS, with the aim of providing an evidence-based foundation for the continuity of care for DVT patients.

1. Materials and methods

1.1. Study population

Using convenience sampling, the study included patients with lower limb DVT who were discharged following inpatient treatment in the Vascular Surgery Department of a Grade III Class A hospital in Jinan between January and May 2025 and who met the inclusion and exclusion criteria.

Inclusion criteria: (1) Patients with a first-time diagnosis of lower limb DVT, as defined by the third edition of the 'Guidelines for the Diagnosis and Treatment of Deep Vein Thrombosis'; (2) Age ≥ 18 years; (3) Alert and able to cooperate with post-discharge follow-up; (4) The patient or a family member is capable of using a smartphone; (5) Voluntary participation in the study and signing of an informed consent form. The informed consent form is provided in the supplementary materials.

Exclusion criteria: (1) Patients transferred to another hospital for continued treatment; (2) Patients who discharged themselves; (3) Patients with a history of mental illness or dementia; (4) Patients with severe comorbidities, such as organ failure, haematological disorders or malignant tumours; (5) Perinatal patients.

1.2. Sample size estimation

This study is an experimental study, and the sample size is calculated using the formula for two-sample means: $N_1 = N_2 = 2[(t\alpha/2 + t\beta/2)S/\delta]^2$. Here, N_1 and N_2 represent the number of patients required for each sample; $t\alpha/2$ and $t\beta/2$ are the t-values corresponding to the significance level α and the Type II error

probability β, respectively; S is the estimate of the standard deviation of the two populations, taken as the square root of the combined variance of the two samples; and δ is the difference between the two sample means. After consulting statistical standards and domestic and international literature, and referring to the self-management scores of patients with lower limb DVT reported in the study by Tan Yue et al.(Tan, 2020), α was set at 0.05 and β at 0.1. Consulting the tables, tα/2 = 1.96 and tβ/2 = 1.28. S was set at 0.51 and δ at 0.42. Taking into account a 15 per cent loss to follow-up rate, the final calculations yielded $N_1 = N_2 = 36$ cases, requiring a total of 72 cases. However, even so, the sample size remains relatively small, and the study results should be regarded as exploratory.

1.3. Grouping methods

- A single-center quasi-experimental study with non-randomized controlled groups was conducted. Participants were allocated to the intervention group or control group according to the sequence of admission. Outcome indicators were measured at baseline and scheduled follow-up time points.

2. Research content

This study selected patients discharged following lower limb DVT as the study population and implemented an intervention targeting their self-management practices at home. A quasi-experimental study design was employed, with participants meeting the inclusion criteria divided into a control group and an intervention group. The control group received a standard follow-up management programme, whilst the intervention group received an evidence-based post-discharge home self-management programme in addition to the control group's care, in order to validate the effectiveness of the programme. All patients in this study were prescribed rivaroxaban as their anticoagulant following discharge. As rivaroxaban has a rapid onset of action, a short half-life, few drug interactions and does not require routine monitoring, none of the patients included in the study required regular INR monitoring.

2.1. Establishment of a self-management group for patients with lower limb DVT following discharge

The team consists primarily of one Head Nurse of Vascular Surgery, two charge nurses from Vascular Surgery, one consultant in Vascular Surgery and three postgraduate nursing students. Prior to the implementation of the protocol, all team members must undergo specialist training to clarify the objectives, methods and precautions of this study; they may only participate in the study after passing an assessment. During the implementation of the protocol, team members must promptly identify patients' needs and take effective measures to enhance patients' self-management capabilities. The Head Nurse is responsible for supervising and coordinating the specific implementation of the programme; the Attending Physician is responsible for conducting follow-up examinations and addressing complex specialist queries; the Registered Nurses and postgraduate nursing students are responsible for providing health education and explaining disease-related knowledge to patients on the day of discharge, organising discussion sessions and health talks, teaching self-management skills, conducting timely follow-up assessments of discharged patients, recording all relevant data during the implementation of the programme, and collating and analysing the data.

2.2. Management of the control group

The control group followed a standard follow-up management protocol. (1) On the day of discharge, patients were given the 'Health Education Handbook for Patients with Lower Limb DVT'. Nurses provided standard discharge health education, covering disease knowledge, exercise rehabilitation measures, medication regimens and dietary management, and advised patients to attend follow-up appointments on time, whilst providing the department's contact details. (2) A follow-up logbook for discharged patients was established. Telephone follow-ups were conducted at 2 weeks, 1 month, 2 months and 3 months post-discharge to enquire about the patients' recovery: whether the condition had recurred; whether complications such as bleeding or pulmonary embolism (PE) had occurred; whether medication was being taken regularly; whether they were maintaining a healthy lifestyle; whether any other illnesses had developed; and whether they had undergone any recent surgery. Appropriate treatment advice and nursing guidance were provided based on the patients' needs and any issues identified. (3) Promptly remind patients who require follow-up examinations or filter removal to return to the hospital on time for check-ups and treatment.

2.3. Management of the observation group

In addition to the measures taken in the control group, the observation group implemented a home-based self-management programme for patients with lower limb DVT following discharge. The specific measures are as follows.

(1) On the day of discharge, nursing postgraduate students assessed each patient, taking detailed enquiries regarding their medication use and lifestyle habits; they conducted a physical examination, accurately recording all vital signs at the time of discharge, and determined the presence or absence of swelling, pain and bruising in both lower limbs, as well as the severity of any swelling and pain; they also assessed medication adherence, self-management ability and quality of life, and administered the Villalta score. A personalised file is created for each patient, containing their basic information, medical history, assessment results and post-discharge follow-up details. Patients are provided with the 'Health Education Handbook for Patients with Lower Limb DVT'; contact details are obtained from the patient or their family, and they are invited to join the WeChat group for discharged patients. Particular emphasis is placed on providing guidance on healthy lifestyles for patients with underlying conditions such as diabetes, hypertension and obesity. Patients are encouraged to share their healthy lifestyle practices, exercise videos and tips for adhering to medication regimens within the WeChat group. They are invited to log their daily medication intake in the group, with appropriate rewards given to those demonstrating good compliance. This programme constitutes a resource-enhanced intervention and can be further strengthened to include regular dissemination of relevant nursing information, follow-ups at fixed intervals and on-demand online Q&A sessions.

(2) Nursing postgraduate students will post DVT-related health education articles or educational videos in the group each week. Content will primarily cover the pathophysiology of DVT, risk factors, signs and symptoms, types and usage of anticoagulant medications, the use of compression stockings, and exercise guidance. Patients with inferior vena cava filters will be informed of the filter type and reminded to return to the hospital for follow-up appointments on time so that the filter can be removed promptly.

(3) The designated nurse conducts a monthly follow-up with each patient, which may take the form of a telephone call, video call or in-person visit, depending on the specific circumstances. Standardised follow-ups are carried out using a pre-established follow-up form to ensure the professionalism and consistency of the follow-up content. Patient assessments are carried out one month, three months and six months after discharge to monitor any changes in medication adherence at home, healthy lifestyle practices, psychological well-being, self-efficacy, self-management skills and quality of life. Nursing care plans are adjusted promptly based on each patient's follow-up and assessment results, and patients are informed of these adjustments in a timely manner.

(4) Online educational lectures and discussion sessions are held every two months to ensure that every discharged patient participates in at least three such sessions within six months. Departmental specialists will explain the key points of self-management at home for patients with lower limb DVT following discharge, as well as the significant impact of a healthy lifestyle on recovery from thromboembolic diseases, thereby fostering patients' health literacy. Specific content includes: Knowledge of DVT-related conditions, such as the types, usage and precautions of commonly used anticoagulant medications; symptoms and signs of DVT and PE; causes and risk factors for thrombus formation; monitoring for bleeding tendencies; and management procedures in the event of complications such as bleeding or PE; the correct method of wearing and caring for elastic compression stockings; lower limb functional exercises, such as ankle pumping, the Berger exerappendixcise and straight-leg raises; guidance on healthy lifestyles, including developing scientifically sound dietary habits, giving up smoking and limiting alcohol consumption, controlling blood glucose, blood pressure, blood lipids and body weight, and ensuring daily water intake of ≥ 2000ml; whilst taking anticoagulants, patients should avoid high-risk activities that may lead to bleeding; Patients with pronounced symptoms who have not yet made a full recovery may tailor their daily activity levels according to their individual rehabilitation progress and inform the research team of their activity plan; the research team will then provide appropriate exercise management advice based on the patient's individual circumstances. Patients with mild symptoms who are recovering well should avoid prolonged sitting or standing and should engage in at least 150–300 minutes of moderate-intensity aerobic exercise or at least 75–150 minutes of vigorous-intensity aerobic physical activity per week. During the discussion session, members of the research team addressed self-management issues encountered by patients during the month and reminded those due for a follow-up appointment the following month. Patients were invited to share their successful experiences of self-management at home to boost their confidence in overcoming the disease.

2.4. Research tools

2.4.1. Patient general information questionnaire

This table includes the patient's name, gender, admission number, age, height, weight, home address, contact details, educational background, marital status, site of thrombosis and treatment method. Please refer to supplementary materials for further details.

2.4.2. Key indicators

(1) Self-management ability

Assessment was carried out using the Self-Management Scale for Patients with Lower Limb DVT developed by Li Jia et al.(Li, 2021). This scale comprises five dimensions—symptom management, adherence management, daily life management, emotional management and self-efficacy—and consists of 22 items in total. The split-half reliability coefficient was 0.870, Cronbach's α was 0.933, and the test-retest reliability was 0.898. The scale utilised a 5-point Likert scale; the total score was calculated by summing the scores for all items, with higher scores indicating better self-management ability. For further details, see supplementary materials.

(2) Incidence of DVT recurrence and complications

Ultrasound was used to confirm DVT recurrence, whilst the Villalta scoring system was used to diagnose post-thrombotic syndrome (PTS). The Villalta score comprises five symptoms (pain, cramps, itching, heaviness, and paraesthesia) and six physical signs (redness, skin induration, pigmentation, venous dilation, anterior tibial oedema, and tenderness on palpation of the calf), as well as the presence of ulcers on the affected limb. Each symptom or sign was categorised as absent, mild, moderate, or severe, corresponding to 0, 1, 2, and 3 points respectively. For patients suspected of having PTS, a remote video consultation is conducted between the doctor and the patient. Scoring is based on the severity of the patient's symptoms: a total score of ≤ 4 indicates no PTS; 5–9 indicates mild; 10–14 indicates moderate; and ≥ 15 or the presence of an ulcer indicates severe.

2.4.3. Secondary outcomes

(1) Medication adherence

Assessment is carried out using the Chinese version of the Morisky Medication Adherence Scale, translated and revised by Si Zaixia et al.(Si, 2012). The scale comprises eight questions. Questions 1 to 7 each have two options: 'Yes' and 'No', with 'Yes' scored as 0 points and 'No' as 1 point; question 5 is reverse-scored; Question 8 offers five response options—'All the time', 'Often', 'Sometimes', 'Occasionally' and 'Never'—scored at 0, 0.25, 0.5, 0.75 and 1 point respectively. The total score is calculated by summing these scores; a score of 8 indicates high adherence, 6 ≤ score < 8 indicates moderate adherence, and < 6 indicates low adherence. This scale has a Cronbach's α coefficient of 0.81 and a test-retest reliability coefficient of 0.95. Studies have applied this scale to research on medication adherence among DVT patients, with favourable evaluation results. See supplementary materials for details.

(2) Quality of Life

The Deep Venous Thrombosis Quality of Life (DVTQOL) scale, developed by Hedner et al.(Hedner et al., 2004), was used to assess the quality of life at home among patients with DVT. Chinese researcher Wang Sisi(Wang et al., 2018) translated, revised and validated this scale, yielding a Cronbach's α coefficient of 0.864 and a test-retest reliability of 0.817. The scale comprises six dimensions—emotional distress, symptoms, activity limitations, anticoagulation management issues, sleep disturbances and dietary problems—comprising a total of 29 items. A 7-point Likert scale was used; the total score was calculated by summing the scores of the 29 items, with higher scores indicating poorer quality of life for patients. The following rules apply to the handling of missing items within each dimension of the scale: if the number of

missing items in a given dimension does not exceed 20 per cent of the total number of items in that dimension, the missing values are replaced by the mean of the completed items in that dimension; if the number of missing items exceeds 20 per cent, the questionnaire is excluded and not included in the statistical analysis for that time point. Please refer to supplementary materials for further details.

2.5. Statistical analysis

Data in this study were processed using SPSS 26.0 software. Categorical data were described using frequencies and percentages, whilst continuous data were described using the mean (s). Where continuous data followed a normal distribution with equal variances, comparisons were made using a t-test; where variances were unequal, a t'-test or a rank-sum test was used. Where continuous data did not follow a normal distribution, comparisons were made using a rank-sum test. A p-value of < 0.05 was considered statistically significant.

2.6. Ethical review

This study has been approved by the Ethics Committee, approval number YXLL-KY-2022 (110). Patient privacy will be respected, patient information will not be disclosed, and all research data will be securely stored. Informed consent forms will be signed by patients in strict accordance with the principle of voluntary participation.

2.7. Quality control

The ‘blinded envelope’ method was employed: the results of subject allocation were placed in light-proof envelopes and securely stored to ensure that subjects remained unaware of their group assignment. Patients in both groups received routine treatment and care in accordance with medical instructions during their hospitalisation, and were provided with the same health education upon discharge. Throughout the implementation of the protocol, the research team leader conducted supervision and random spot checks to ensure the accuracy of implementation. Data collection was carried out by rigorously trained charge nurses and postgraduate nursing students; data was entered and verified by two separate individuals to ensure accuracy.

3. Results

3.1. Comparison of general patient characteristics

The two groups of patients were compared in terms of age, BMI, educational attainment, marital status, smoking history, site of thrombosis and treatment modality; no statistically significant differences were observed ($P > 0.05$), indicating that the groups were comparable. The specific details of the two groups are shown in Table 1.

Table 1
Comparison of general patient characteristics between the two groups (n, %)

Project Name	Project Category	Control group(n = 36)	Observation group(n = 36)	t/c^2	*P*
Gender	Female	12(33.33)	14(38.89)	0.2411	0.624
	Male	24(66.67)	22(61.11)		
Mean age (years)		66.28 ± 11.72	60.25 ± 14.77	1.9182	0.059
BMI		26.04 ± 2.39	26.59 ± 3.42	-0.7892	0.433
Education level	Primary school or below	19(52.78)	21(58.33)	1.3791	0.606
	Junior high school	12(33.33)	13(36.11)		
	Senior high school/technical secondary school or above	5(13.89)	2(5.56)		
Marital status	Married	32(88.89)	36(100.00)	2.3821	0.115
	Unmarried/divorced/widowed	4(11.11)	0(0.00)		
Smoking history	Current smoker	4(11.11)	4(11.11)	1.3731	0.549
	Ex-smoker (quit before admission)	6(16.67)	10(27.78)		
	Non-smoker	26(72.22)	22(61.11)		
Thrombosis location	Left lower extremity	18(50.00)	21(58.33)	1.2181	0.572
	Right lower extremity	12(33.33)	12(33.33)		
	Bilateral lower extremities	6(16.67)	3(8.33)		
Treatment method	Conservative treatment	23(63.89)	26(72.22)	0.5751	0.448
	Surgery (filter placement/thrombectomy/thrombolysis)	13(36.11)	10(27.78)		
Note: 1 corresponds to the 2-value, and 2 corresponds to the t-value					

3.2. Comparison of self-management abilities between the two groups of patients

3.2.1. Comparison of total self-management scores

The total self-management scores for patients in both groups followed a normal or near-normal distribution; a repeated measures analysis of variance was used to examine changes in total self-management scores over time. The results of the Mochi-Lai sphericity test showed $P < 0.001$, indicating that the data did not satisfy the assumption of sphericity; consequently, the Greenhouse-Geissler method was employed for the calculations. The results showed that the main effect of group was significant ($F = 116.577$, $P < 0.001$), the main effect of time was significant ($F = 142.022$, $P < 0.001$), and the interaction effect between time and group was significant ($F = 110.762$, $P < 0.001$); see Table 2 for details. A simple effects analysis was then conducted. Pairwise comparisons were conducted between the four time points within each group; with the exception of the comparison between 'at discharge' and '6 months post-discharge' in the observation group, which was not significant ($P = 0.923 > 0.05$), all other pairwise comparisons were significant ($P < 0.001$); see Table 3 for details. At 1 month, 3 months and 6 months post-discharge, the main effect of group was significant ($P < 0.001$); see Table 4 for details. The scores in the control group decreased over time, whereas the scores in the observation group were higher than those in the control group; see **Fig. 1** for details. Detailed analysis results of the each dimensions of self-management ability are provided in Table 5.

Table 2

Comparison of total self-management ability scores between the two groups ($\backslash \mathrm{varvec} x \pm s$)

Group	At discharge	1 month after discharge	3 months after discharge	6 months after discharge	Interaction effect
Control group	89.67 ± 10.07	81.69 ± 5.59	75.14 ± 6.42	69.08 ± 5.70	$F = 110.762$
Observation group	89.17 ± 8.06	98.06 ± 3.79	94.06 ± 3.79	87.94 ± 2.64	$P<0.001$

Table 3
Self-management – Results of pairwise comparisons between the two groups of patients at four time points

Group	Time	Time	*P*	95% CI
Control group	1	2	<0.001	(5.420,10.524)
		3	<0.001	(11.478,17.577)
		4	<0.001	(16.978,24.189)
	2	3	<0.001	(5.315,7.796)
		4	<0.001	(10.911,14.312)
	3	4	<0.001	(4.843,7.268)
Observation group	1	2	<0.001	(-11.441,-6.337)
		3	<0.001	(-7.938,-1.840)
		4	0.932	(-2.383,4.828)
	2	3	<0.001	(2.760,5.240)
		4	<0.001	(8.411,11.812)
	3	4	<0.001	(4.899,7.324)

Note: Time 1 refers to discharge; Time 2 refers to one month after discharge; Time 3 refers to three months after discharge; Time 4 refers to six months after discharge

Table 4
Self-management—results of pairwise comparisons between the control group and the observation group at each time point

Time	Control group	Observation group	*P*	95% CI
1	89.67 ± 10.07	89.17 ± 8.06	0.817	(-3.787,4.787)
2	81.69 ± 5.59	98.06 ± 3.79	<0.001	(-18.607,-14.115)
3	75.14 ± 6.42	94.06 ± 3.79	<0.001	(-21.402,-16.432)
4	69.08 ± 5.70	87.94 ± 2.64	<0.001	(-20.950,-16.772)

Note: Time 1 refers to discharge, Time 2 refers to one month after discharge, Time 3 refers to three months after discharge, and Time 4 refers to six months after discharge.

Note

On the horizontal axis, Time 1 corresponds to discharge, Time 2 to one month after discharge, Time 3 to three months after discharge, and Time 4 to six months after discharge.

Figure 1. Line graph showing changes in total self-management ability scores between the two groups of patients

3.2.2. Comparison of scores across dimensions of self-management ability

Table 5
Results of the analysis of scores, interaction effects and simple effects for each dimension of self-management ability between the two groups of patients ($\overline{x} \pm s$)

Dimension	Assessment time	Control group	Observation group	Interaction effect
Disease symptoms	At discharge	15.39 ± 3.59[1,2,3]	15.53 ± 3.18[1,2]	
	1 month after discharge	13.83 ± 2.32[4,5,a]	18.25 ± 1.52[4,5,a]	*F* = 66.178
	3 months after discharge	12.36 ± 2.10[6,a]	18.25 ± 1.34[6,a]	*P*<0.001
	6 months after discharge	11.31 ± 1.56[6,a]	16.67 ± 1.47[6,a]	
Time main effect	*F* = 29.190	*P*<0.001		
Group main effect	*F* = 74.112	*P*<0.001		
Medication adherence management	At discharge	13.81 ± 1.39[1,2,3]	13.72 ± 1.28[1,3]	
	1 month after discharge	12.75 ± 0.94[4,5,a]	14.39 ± 0.67[5,a]	*F* = 30.144
	3 months after discharge	11.53 ± 1.30[6,a]	14.11 ± 0.71[6,a]	*P*<0.001
	6 months after discharge	10.36 ± 1.55[6,a]	12.61 ± 0.93[6,a]	
Time main effect	*F* = 91.324	*P*<0.001		
Group main effect	*F* = 68.768	*P*<0.001		
Daily life management	At discharge	12.39 ± 1.78[2,3]	12.06 ± 1.97[1,2]	
	1 month after discharge	11.81 ± 1.77[4,5,a]	13.39 ± 1.64[4,5,a]	*F* = 29.515

Note: '1' indicates a statistically significant difference between the time of discharge and one month after discharge ($P < 0.001$); '2' indicates a statistically significant difference between the time of discharge and three months after discharge ($P < 0.001$); '3' indicates a statistically significant difference between the time of discharge and six months after discharge ($P < 0.001$); '4' indicates a statistically significant difference between 1 month and 3 months post-discharge ($P < 0.001$); '5' indicates a statistically significant difference between 1 month and 6 months post-discharge ($P < 0.001$); '6' indicates a statistically significant difference between 3 months and 6 months post-discharge ($P < 0.001$); 'a' indicates a statistically significant difference between the control group and the observation group ($P < 0.001$)

Dimension	Assessment time	Control group	Observation group	Interaction effect
	3 months after discharge	10.92 ± 1.92[6,a]	12.83 ± 1.54[6,a]	*P*<0.001
	6 months after discharge	10.39 ± 1.59[6,a]	11.92 ± 1.57[6,a]	
Time main effect	*F* = 42.947	*P*<0.001		
Group main effect	*F* = 9.851	*P*<0.001		
Emotional management	At discharge	17.72 ± 1.78[1,2,3]	18.14 ± 1.74[1,3]	
	1 month after discharge	16.14 ± 1.62[4,5,a]	19.03 ± 1.16[4,5,a]	*F* = 36.823
	3 months after discharge	14.67 ± 1.55[6,a]	18.06 ± 1.35[6,a]	*P*<0.001
	6 months after discharge	13.17 ± 1.16[6,a]	16.53 ± 1.32[6,a]	
Time main effect	*F* = 142.850	*P*<0.001		
Group main effect	*F* = 78.335	*P*<0.001		
Self-management efficacy	At discharge	30.36 ± 4.33[1,2,3]	29.72 ± 3.47[1]	
	1 month after discharge	27.17 ± 2.05[4,5,a]	33.00 ± 2.41[4,5,a]	*F* = 59.841
	3 months after discharge	25.67 ± 1.97[6,a]	30.81 ± 2.05[6,a]	*P*<0.001
	6 months after discharge	23.86 ± 2.01[6,a]	30.22 ± 1.69[6,a]	
Time main effect	*F* = 49.853	*P*<0.001		
Group main effect	*F* = 68.124	*P*<0.001		

Note: '1' indicates a statistically significant difference between the time of discharge and one month after discharge ($P < 0.001$); '2' indicates a statistically significant difference between the time of discharge and three months after discharge ($P < 0.001$); '3' indicates a statistically significant difference between the time of discharge and six months after discharge ($P < 0.001$); '4' indicates a statistically significant difference between 1 month and 3 months post-discharge ($P < 0.001$); '5' indicates a statistically significant difference between 1 month and 6 months post-discharge ($P < 0.001$); '6' indicates a statistically significant difference between 3 months and 6 months post-discharge ($P < 0.001$); 'a' indicates a statistically significant difference between the control group and the observation group ($P < 0.001$)

3.3. Complications and DVT recurrence in the two groups

3.3.1. Comparison of complications and DVT recurrence rates between the two groups

At 6 months post-discharge, there were 4 cases of mild PTS in the control group, accounting for 11.11 per cent of the total number of patients in that group; no cases of PTS were observed in the observation group. No cases of DVT recurrence were reported in either group. See Table 6 for details.

Table 6
Incidence of PTS in the Two Groups (n, %)

Group	1 month after discharge	3 months after discharge	6 months after discharge
Control group	0(0)	3(8.33)	4(11.11)
Observation group	0(0)	0(0)	0(0)

3.3.2. Comparison of Villalta scores between the two patient groups

The Villalta scores for both patient groups followed a normal or near-normal distribution; a repeated measures analysis of variance (ANOVA) was used to examine changes in Villalta scores over time. The Mochi-Lai sphericity test yielded a *P*-value of < 0.001, indicating that the data did not satisfy the assumption of sphericity; therefore, the Greenhouse-Geissler correction was applied. The results showed that the main effect of group was significant ($F = 19.990$, $P < 0.001$), the main effect of time was significant ($F = 53.539$, $P < 0.001$), and the interaction effect between time and group was significant ($F = 14.094$, $P < 0.001$); see Table 7 for details. A simple effects analysis was then conducted. In the control group, the main effect was significant only when comparing '3 months post-discharge' and '6 months post-discharge' ($P < 0.001$); in the observation group, the main effect was not significant only when comparing '3 months post-discharge' and '6 months post-discharge' ($P = 0.011 > 0.001$), whilst the main effects were significant for all other comparisons ($P < 0.001$); see Table 8 for details. At 3 and 6 months post-discharge, the main effects for group were both significant ($P < 0.001$); see Table 9 for details. The scores in both groups decreased over time, but the rate of decline was greater in the observation group than in the control group; see **Fig. 2** for details.

Table 7
Comparison of Villalta scores between the two groups (s)

Group	At discharge	1 month after discharge	3 months after discharge	6 months after discharge	Interaction effect
Control group	3.19 ± 1.28	3.06 ± 0.63	2.94 ± 1.09	2.36 ± 1.10	$F = 14.094$
Observation group	3.22 ± 0.68	2.47 ± 0.88	1.56 ± 1.08	1.11 ± 1.09	$P<0.001$

Table 8
Villalta score—results of pairwise comparisons between the two groups of patients at four time points

Group	Time	Time	*P*	95% CI
Control group	1	2	0.949	(-0.296,0.574)
		3	0.774	(-0.297,0.797)
		4	0.001	(0.277,1.390)
	2	3	0.984	(-0.328,0.550)
		4	0.001	(0.243,1.146)
	3	4	<0.001	(0.211,0.956)
Observation group	1	2	<0.001	(0.315,1.185)
		3	<0.001	(1.120,2.213)
		4	<0.001	(1.554,2.668)
	2	3	<0.001	(0.477,1.356)
		4	<0.001	(0.910,1.812)
	3	4	0.011	(0.072,0.817)

Note: Time 1 refers to discharge; Time 2 refers to one month after discharge; Time 3 refers to three months after discharge; Time 4 refers to six months after discharge

Table 9
Villalta score—results of pairwise comparisons between the control group and the observation group at each time point

Time	Control group	Observation group	*P*	95% CI
1	3.19 ± 1.28	3.22 ± 0.68	0.909	(-0.511,0.455)
2	3.06 ± 0.63	2.47 ± 0.88	0.002	(0.224,0.942)
3	2.94 ± 1.09	1.56 ± 1.08	<0.001	(0.878,1.900)
4	2.36 ± 1.10	1.11 ± 1.09	<0.001	(0.754,1.746)

Note: Time 1 refers to discharge, Time 2 refers to one month after discharge, Time 3 refers to three months after discharge, and Time 4 refers to six months after discharge.

Note

On the horizontal axis, Time 1 corresponds to discharge, Time 2 to one month after discharge, Time 3 to three months after discharge, and Time 4 to six months after discharge.

Figure 2. Line graph showing changes in Villalta scores for the two groups of patients

3.4. Comparison of medication adherence between the two groups

The assessment results were described in terms of frequencies and percentages, and statistical analysis was performed using non-parametric tests. Intergroup comparisons showed that, at 6 months post-discharge, medication adherence in the observation group was superior to that in the control group, with the difference being statistically significant ($P < 0.001$). Intra-group comparisons revealed that medication adherence in the control group varied across the four time points, with statistically significant differences ($P < 0.001$), whilst medication adherence in the observation group remained consistent across the four time points, with no statistically significant differences ($P = 0.258 > 0.05$). See Table 10 for details.

Table 10
Comparison of medication adherence between the two groups (n, %)

Assessment time	Level	Total	Control group	Observation group	*H*	*P*
At discharge	High	58	30(83.3)	28(77.8)	0.35	0.554
	Medium	14	6(16.7)	8(22.2)		
	Low	0	0(0)	0(0)		
1 month after discharge	High	59	28(77.8)	31(86.1)	0.833	0.361
	Medium	13	8(22.2)	5(13.9)		
	Low	0	0(0)	0(0)		
3 months after discharge	High	47	18(50.0)	29(80.6)	7.013	0.008
	Medium	18	13(36.1)	5(13.9)		
	Low	7	5(13.9)	2(5.5)		
6 months after discharge	High	38	11(30.6)	27(75.0)	16.195	<0.001
	Medium	27	18(50.0)	9(25.0)		
	Low	7	7(19.4)	0(0)		
H			30.2	1.441		
P			<0.001	0.696		

3.5. Comparison of quality of life between the two groups of patients

3.5.1. Comparison of total quality of life scores between the two groups of patients

The total quality of life scores for both groups of patients followed a normal or approximately normal distribution; repeated measures analysis of variance (ANOVA) was used to examine changes in total quality

of life scores over time. The Mochi-Lai sphericity test yielded a *P*-value of < 0.001, indicating that the data did not satisfy the assumption of sphericity; consequently, the Greenhouse-Geissler correction was applied. The results showed that the main effect of group was significant ($F = 2.818$, $P < 0.001$), the main effect of time was significant ($F = 280.253$, $P < 0.001$), and the interaction effect between time and group was significant ($F = 17.983$, $P < 0.001$); see Table 11 for details. A simple effects analysis was then conducted. Pairwise comparisons were made between the four time points within each group, and the main effect of time was significant in all cases ($P < 0.001$); see Table 12 for details. At discharge and one month post-discharge, the main effect of group was not significant ($P > 0.05$); at three and six months, the main effect of group was significant ($P < 0.001$); see Table 13 for details. The scores in both groups decreased over time, but the rate of decline was greater in the observation group than in the control group; see **Fig. 3** for details.

Table 11
Comparison of total quality of life scores between the two groups (s)

Group	At discharge	1 month after discharge	3 months after discharge	6 months after discharge	Interaction effect
Control group	90.69 ± 17.12	81.64 ± 12.82	73.97 ± 11.61	68.67 ± 12.38	$F = 17.983$
Observation group	94.75 ± 13.23	80.08 ± 7.81	66.53 ± 4.94	58.03 ± 4.86	$P<0.001$

Table 12
Quality of life—results of pairwise comparisons between the two groups of patients at four time points

Group	Time	Time	*P*	95% CI
Control group	1	2	<0.001	(5.920,11.191)
		3	<0.001	(11.682,21.763)
		4	<0.001	(15.881,28.175)
	2	3	<0.001	(4.655,10.679)
		4	<0.001	(8.775,17.170)
	3	4	<0.001	(3.400,7.211)
Observation group	1	2	<0.001	(11.531,17.802)
		3	<0.001	(23.182,33.263)
		4	<0.001	(30.575,42.869)
	2	3	<0.001	(10.543,16.568)
		4	<0.001	(17.858,26.253)
	3	4	<0.001	(6.594,10.406)

Note: Time 1 refers to discharge; Time 2 refers to one month after discharge; Time 3 refers to three months after discharge; Time 4 refers to six months after discharge

Table 13
Quality of life—results of pairwise comparisons between the control group and the observation group at each time point

Time	Control group	Observation group	*P*	95% CI
1	90.69 ± 17.12	94.75 ± 13.23	0.265	(-11.248,3.137)
2	81.64 ± 12.82	80.08 ± 7.81	0.536	(-3.432,6.544)
3	73.97 ± 11.61	66.53 ± 4.94	<0.001	(3.251,11.638)
4	68.67 ± 12.38	58.03 ± 4.86	<0.001	(6.218,15.060)

Note: Time 1 refers to discharge, Time 2 refers to one month after discharge, Time 3 refers to three months after discharge, and Time 4 refers to six months after discharge.

Note

On the horizontal axis, Time 1 corresponds to discharge, Time 2 to one month after discharge, Time 3 to three months after discharge, and Time 4 to six months after discharge.

Figure 3. Line graph showing changes in the total quality of life scores for the two groups of patients

3.5.2. Comparison of scores across quality of life dimensions between the two patient groups

Detailed analysis results of the each dimensions of quality of life are provided in Table 14. It should be noted that, amongst the various quality of life dimensions, the ‘emotional distress’ dimension showed a downward trend over time (significant main effect of time, F = 181.082, $P < 0.001$), the main effect of group was not significant ($F = 0.363$, $P = 0.549$). This does not fully align with the trend of significant between-group differences observed for the total quality of life score and other dimensions (such as symptoms and physical activity). Possible reasons for this include: Both the control and observation groups received telephone follow-ups at least once a month after discharge; patients in both groups received basic psychological support and medical advice, which may have alleviated disease-related emotional distress to some extent, thereby reducing the differences between the groups; The emotional distress dimension of the DVTQOL scale (which has a relatively small number of items) may be less sensitive to responses to behavioural interventions (such as exercise guidance and medication supervision) than to psychological interventions; in other words, this dimension has limited discriminatory power for the intervention programme centred on ‘behavioural management’ in this study. It is recommended that future studies incorporate more targeted psychological assessment tools (such as the Hospital Anxiety and Depression Scale (HADS) or the Generalised Anxiety Disorder Scale (GAD-7)) to capture the impact of intervention measures on patients’ emotional states with greater sensitivity.

Table 14
Results of the analysis of scores for each dimension of quality of life, interaction effects and simple effects (s) for the two groups of patients

Dimension	Assessment time	Control group	Observation group	Interaction effect
Emotional distress	At discharge	25.92 ± 6.25[1,2,3]	28.39 ± 5.62[1,2,3]	
	1 month after discharge	24.22 ± 5.39[4,5]	25.25 ± 4.04[4,5]	*F* = 22.392
	3 months after discharge	21.81 ± 3.99[6,a]	19.56 ± 2.35[6,a]	*P*<0.001
	6 months after discharge	19.97 ± 3.33[6,a]	16.44 ± 2.49[6,a]	
Time main effect	*F* = 181.082	*P*<0.001		
Group main effect	*F* = 0.363	*P* = 0.549		
Symptoms	At discharge	16.28 ± 4.21[3]	17.28 ± 3.55[1,2,3]	
	1 month after discharge	15.78 ± 3.87[5,a]	13.86 ± 1.61[4,5,a]	*F* = 25.329
	3 months after discharge	15.36 ± 3.33[6,a]	12.08 ± 1.50[a]	*P*<0.001
	6 months after discharge	14.06 ± 2.99[6,a]	10.86 ± 1.25[a]	
Time main effect	*F* = 81.712	*P*<0.001		
Group main effect	*F* = 5.857	*P*<0.001		
Physical activity	At discharge	16.75 ± 4.59[1,2,3]	16.17 ± 3.40[1,2,3]	
	1 month after discharge	14.78 ± 3.19[4,5]	14.14 ± 2.32[4,5]	*F* = 4.627
	3 months after discharge	13.00 ± 2.91[6,a]	11.39 ± 1.55[6,a]	*P*<0.001
	6 months after discharge	12.36 ± 2.80[6,a]	10.03 ± 1.23[6,a]	

Note: '1' indicates a statistically significant difference between the time of discharge and one month after discharge ($P < 0.001$); '2' indicates a statistically significant difference between the time of discharge and three months after discharge ($P < 0.001$); '3' indicates a statistically significant difference between the time of discharge and six months after discharge ($P < 0.001$); '4' indicates a statistically significant difference between 1 month and 3 months post-discharge ($P < 0.001$); '5' indicates a statistically significant difference between 1 month and 6 months post-discharge ($P < 0.001$); '6' indicates a statistically significant difference between 3 months and 6 months post-discharge ($P < 0.001$); 'a' indicates a statistically significant difference between the control group and the observation group ($P < 0.001$)

Dimension	Assessment time	Control group	Observation group	Interaction effect
Time main effect	$F = 145.856$	$P<0.001$		
Group main effect	$F = 4.620$	$P<0.001$		
Disease monitoring	At discharge	$12.00 \pm 3.22^{1,2,3}$	$13.19 \pm 2.66^{1,2,3}$	
	1 month after discharge	$9.94 \pm 2.15^{4,5}$	$9.72 \pm 1.39^{4,5}$	$F = 8.659$
	3 months after discharge	$9.28 \pm 1.80^{6,a}$	$8.50 \pm 1.03^{6,a}$	$P<0.001$
	6 months after discharge	$8.25 \pm 2.14^{6,a}$	$7.25 \pm 0.91^{6,a}$	
Time main effect	$F = 152.530$	$P<0.001$		
Group main effect	$F = 0.271$	$P = 0.604$		
Sleep problems	At discharge	$9.22 \pm 2.83^{2,3}$	$9.92 \pm 2.40^{1,2,3}$	
	1 month after discharge	$8.67 \pm 2.43^{4,5}$	$8.39 \pm 1.40^{4,5}$	$F = 10.987$
	3 months after discharge	$8.08 \pm 2.09^{6,a}$	$7.17 \pm 1.00^{6,a}$	$P<0.001$
	6 months after discharge	$7.64 \pm 2.05^{6,a}$	$6.28 \pm 1.21^{6,a}$	
Time main effect	$F = 71.015$	$P<0.001$		
Group main effect	$F = 1.599$	$P = 0.210$		
Dietary problems	At discharge	10.06 ± 2.82	9.81 ± 2.69	
	1 month after discharge	9.36 ± 2.19	8.94 ± 2.19	$F = 1.565$
	3 months after discharge	8.81 ± 1.51	7.83 ± 1.58	$P = 0.199$
	6 months after discharge	8.08 ± 1.56	7.17 ± 1.38	
Time main effect	$F = 48.413$	$P<0.001$		

Note: '1' indicates a statistically significant difference between the time of discharge and one month after discharge ($P < 0.001$); '2' indicates a statistically significant difference between the time of discharge and three months after discharge ($P < 0.001$); '3' indicates a statistically significant difference between the time of discharge and six months after discharge ($P < 0.001$); '4' indicates a statistically significant difference between 1 month and 3 months post-discharge ($P < 0.001$); '5' indicates a statistically significant difference between 1 month and 6 months post-discharge ($P < 0.001$); '6' indicates a statistically significant difference between 3 months and 6 months post-discharge ($P < 0.001$); 'a' indicates a statistically significant difference between the control group and the observation group ($P < 0.001$)

Dimension	Assessment time	Control group	Observation group	Interaction effect
Group main effect	$F = 2.356$	$P = 0.129$		

Note: '1' indicates a statistically significant difference between the time of discharge and one month after discharge ($P < 0.001$); '2' indicates a statistically significant difference between the time of discharge and three months after discharge ($P < 0.001$); '3' indicates a statistically significant difference between the time of discharge and six months after discharge ($P < 0.001$); '4' indicates a statistically significant difference between 1 month and 3 months post-discharge ($P < 0.001$); '5' indicates a statistically significant difference between 1 month and 6 months post-discharge ($P < 0.001$); '6' indicates a statistically significant difference between 3 months and 6 months post-discharge ($P < 0.001$); 'a' indicates a statistically significant difference between the control group and the observation group ($P < 0.001$)

4. Discussion

4.1. A home-based self-management programme can effectively improve self-management skills in patients with DVT

This study found that the total scores for self-management ability in the observation group were significantly higher than those in the control group at 1 month, 3 months and 6 months post-discharge ($P < 0.001$), and that the interaction effect between time and group was significant ($F = 110.762$, $P < 0.001$), indicating that an evidence-based home-based self-management programme has a sustained and stable positive effect on enhancing patients' self-management ability. Consistent with the findings of Tan Yue et al.(Tan, 2020), systematic, multidimensional intervention strategies (covering symptom management, adherence management, daily life management, emotional management and self-management efficacy) help patients develop long-term healthy behavioural habits. It is worth noting that the difference in the total self-management ability score between 'at discharge' and '6 months post-discharge' in the observation group was not statistically significant ($P = 0.923$). This suggests that the observation group received intensive health education and assessment at discharge, resulting in a 'artificially elevated' baseline level; although this declined somewhat during the subsequent 6-month follow-up, it remained significantly superior to that of the control group. This phenomenon is relatively common in studies on self-management of chronic diseases and suggests that future research could include an additional assessment point 1–2 weeks after discharge to more accurately capture the true baseline level of the intervention.

4.2. Home-based self-management programmes can reduce the risk of PTS and improve long-term prognosis

The results of this study show that at 6 months post-discharge, the Villalta score in the observation group (1.11 ± 1.09) was significantly lower than that in the control group (2.36 ± 1.10), with a statistically significant difference ($P < 0.001$); the incidence of PTS was 0% in the observation group and 11.11% (4 cases of mild PTS). PTS is the most common long-term complication of DVT, with an incidence of 20%–50%; once it occurs, it is difficult to reverse and severely affects patients' quality of life. In this protocol, guidance on regular lower-limb functional exercises—such as ankle pumping and the Berg exercise—along with education

on the correct use of compression stockings, may have promoted the recovery of deep vein valve function and the establishment of collateral circulation, thereby reducing the risk of PTS. Furthermore, standardised anticoagulation management (including medication adherence tracking via a group chat and regular reminders) ensured that the International Normalised Ratio (INR) or direct oral anticoagulants remained within the therapeutic window, which also indirectly reduced the incidence of residual thrombi and sequelae.

However, the follow-up period in this study was only six months, whilst some cases of PTS may only gradually manifest 1–2 years after DVT surgery; therefore, the long-term difference in PTS incidence between the two groups requires verification through extended follow-up. It is recommended that future studies extend the follow-up period to 12–24 months and incorporate Doppler ultrasound assessments of venous valve reflux to evaluate the preventive effect of the intervention on PTS more objectively.

4.3. The home-based self-management programme exhibits a ‘lag effect’ in improving quality of life

There was a significant time × group interaction effect on the total quality of life scores for both groups (F = 17.983, P < 0.001); however, there was no statistically significant difference between the two groups at discharge or one month post-discharge (P > 0.05), with significant differences only emerging at three and six months post-discharge. Possible reasons for this “lag effect” include: Improvements in quality of life depend on the long-term cumulative effects of self-management behaviours; patients require a certain amount of time to internalise the acquired healthy behaviours (such as regular exercise, a balanced diet and adherence to medication regimens) as lifestyle habits before these are reflected in an improvement in quality of life; The DVTQOL scale covers six dimensions: emotional distress, symptoms, activity limitations, anticoagulation management, sleep and diet; improvements in some of these dimensions (such as sleep and diet) require a longer period of behavioural adjustment.

It is worth noting that the main effect between groups for the ‘emotional distress’ dimension was not significant in this study (F = 0.363, P = 0.549), which does not fully align with the trend in changes to the total quality of life score. Possible reasons for this include: both the control and observation groups received telephone follow-ups at least once a month after discharge, and patients in both groups received basic psychological support and disease counselling, which to some extent alleviated disease-related emotional distress and reduced differences between the groups; Furthermore, the Emotional Distress dimension of the DVTQOL scale comprises a relatively small number of items, which may limit its sensitivity to interventions centred on ‘behavioural management’; this dimension may be more discriminatory in relation to specialised psychological interventions. It is recommended that future studies incorporate more targeted psychological assessment tools (such as the Hospital Anxiety and Depression Scale [HADS] or the Generalised Anxiety Disorder Scale [GAD-7]) to capture the impact of interventions on patients’ emotional states with greater sensitivity.

4.4. Limitations of this study and future prospects

Limitations: The sample size was small (36 participants per group); effect size estimates were relatively optimistic, which may have affected the statistical power of the tests and the generalisability of the conclusions; the study results should therefore be regarded as exploratory; The follow-up period was only

six months, making it impossible to evaluate the long-term effects of the intervention programme or the long-term incidence of PTS; This was a single-centre study, and the intervention relied on specialised personnel (postgraduate nursing students) for implementation; this may present challenges in terms of insufficient human resources when scaling up the programme in primary care hospitals; No correction was made for multiple comparisons in the statistical analysis (e.g. the Bonferroni method), and some significant results may carry a risk of Type I error inflation; As all study participants were patients taking rivaroxaban, it remains unclear whether the study conclusions are applicable to DVT patients taking other anticoagulants such as warfarin.

Future prospects: It is recommended that future studies adopt a multicentre, large-sample randomised controlled design, extend the follow-up period to 1–2 years, and include a cost-effectiveness analysis to evaluate the programme's economic benefits. In terms of intervention models, a simplified approach combining 'nurse-led care with smart technology support' (e.g. mobile applications and wearable device monitoring) could be explored to enhance the programme's scalability. Furthermore, it is recommended that stratified analyses be conducted for different DVT subtypes (e.g. central, peripheral and mixed) and different anticoagulation regimens, with a view to developing more personalised home-based self-management strategies.

5. Conclusions

The evidence-based home self-management programme for patients with lower limb DVT developed in this study, following six months of clinical validation, was found to significantly improve patients' self-management abilities, medication adherence and quality of life, whilst reducing Villalta scores and the incidence of post-thrombotic syndrome (PTS). The intervention demonstrated stable and clinically significant effects. This programme integrates multi-dimensional strategies, including health education via WeChat groups, regular follow-ups, online lectures and peer support, providing a practical model for the continuity of care for DVT patients. Although the study has limitations, such as a small sample size and a relatively short follow-up period, the results provide high-quality, evidence-based guidance for the post-discharge management of DVT patients. Future research should further validate the programme's effectiveness and generalisability through large-scale, multi-centre studies, whilst exploring simplified implementation models based on information technology.

Declarations

Conflict of interest

The authors declare no conflict of interest.

Ethics Approval:

This study was approved by the Medical Ethics Committee of The First Affiliated Hospital of Shandong First Medical University (Approval No. YXLL-KY-2022(110)).

Funding:

Author Contribution

Conceptualization: Ma X. Methodology: Ma X. Formal analysis: Ma X. Investigation: Ma X, Ye L. Data curation: Ma X, Ye L. Writing – original draft: Ma X. Writing – review & editing: Zhang S. Visualization: Ma X, Ye L. Supervision: Zhang S. Project administration: Zhang S. All authors read and approved the final manuscript.

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Data Availability

The raw dataset generated and analysed during the present study is not publicly available due to patient privacy and ethical restrictions. However, the de-identified dataset is available from the corresponding author upon reasonable request.

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Figures

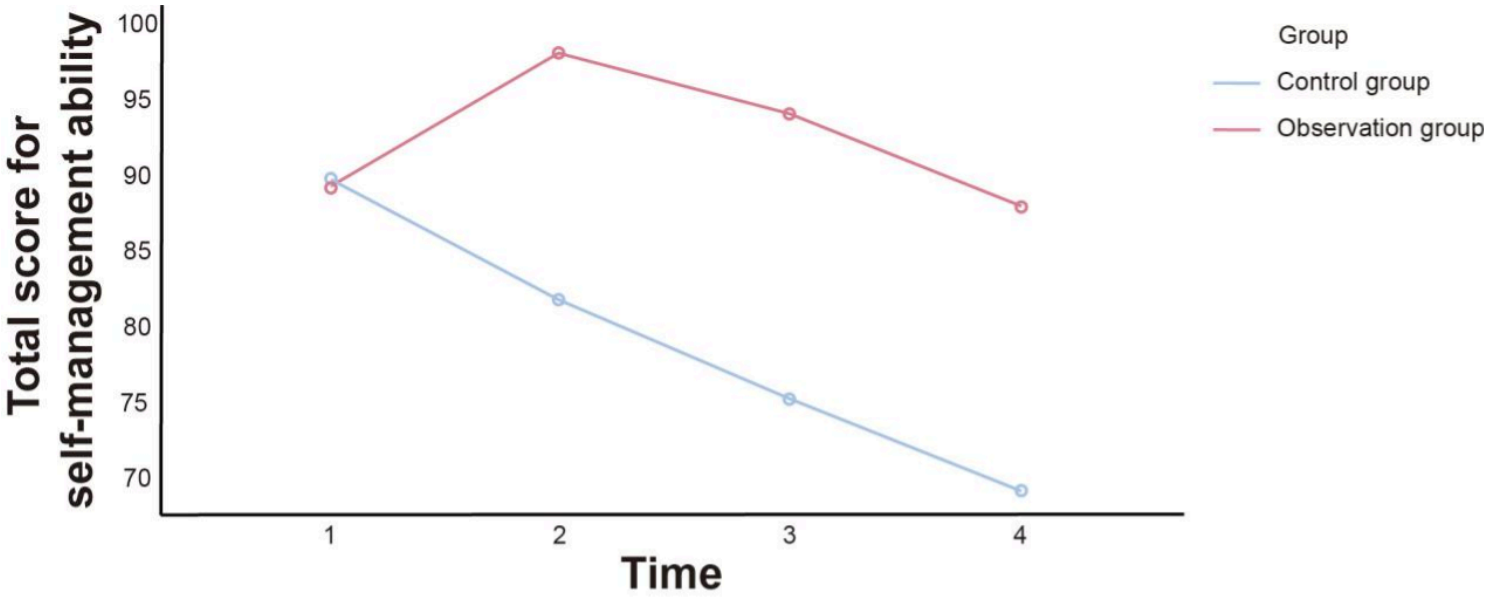


Figure 1

Line graph showing changes in total self-management ability scores between the two groups of patients

Note: On the horizontal axis, Time 1 corresponds to discharge, Time 2 to one month after discharge, Time 3 to three months after discharge, and Time 4 to six months after discharge.

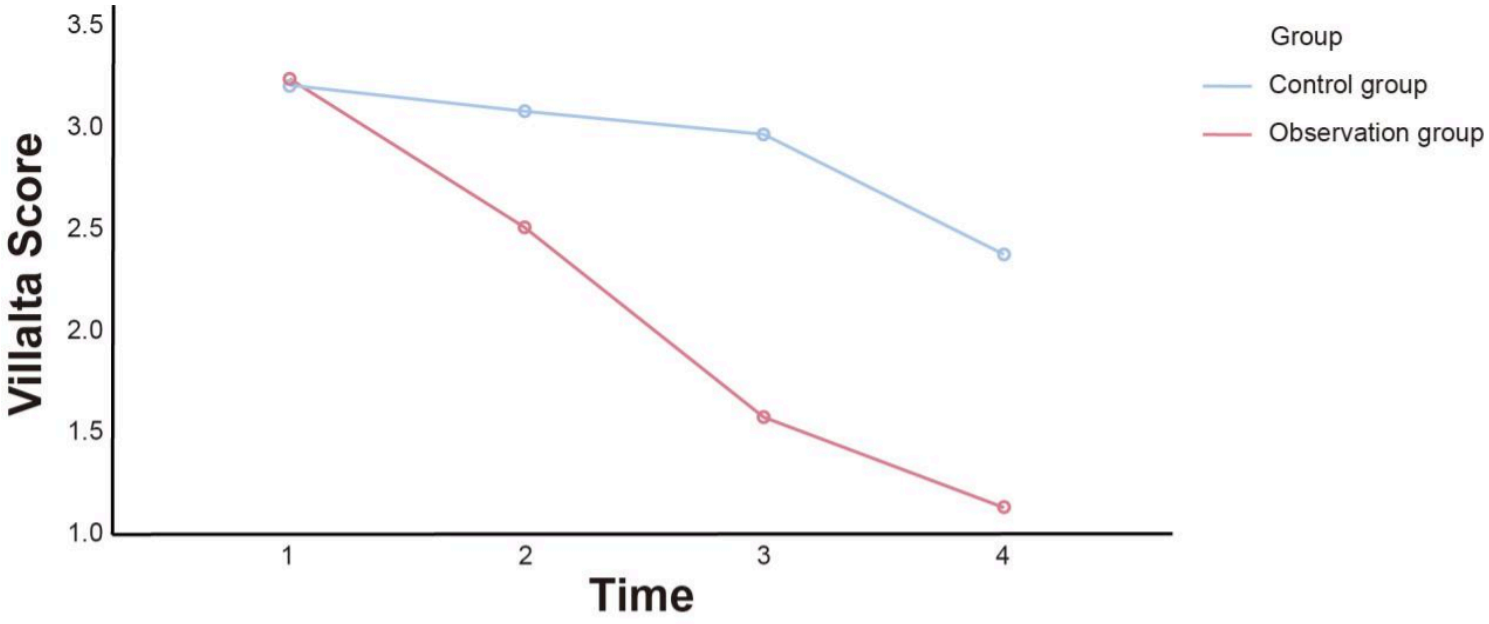


Figure 2

Line graph showing changes in Villalta scores for the two groups of patients

Note: On the horizontal axis, Time 1 corresponds to discharge, Time 2 to one month after discharge, Time 3 to three months after discharge, and Time 4 to six months after discharge.

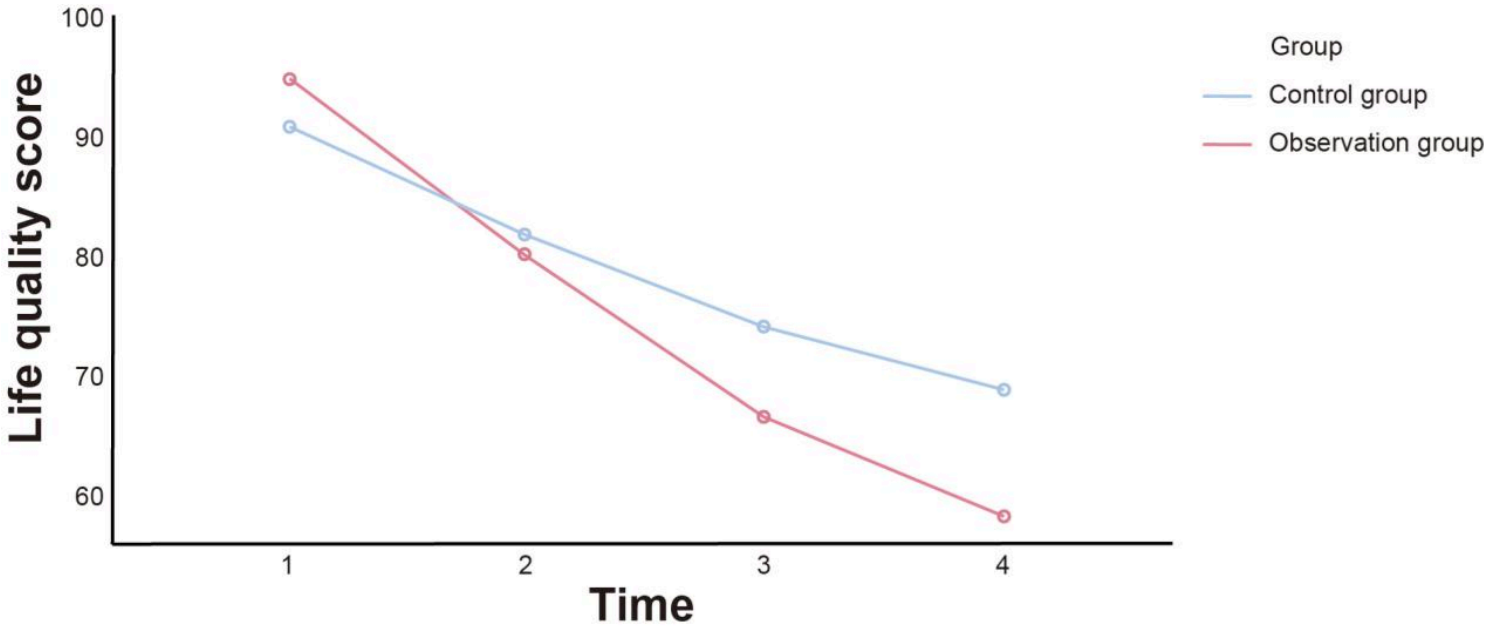


Figure 3

Line graph showing changes in the total quality of life scores for the two groups of patients

Note: On the horizontal axis, Time 1 corresponds to discharge, Time 2 to one month after discharge, Time 3 to three months after discharge, and Time 4 to six months after discharge.

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