

The value of PBL combined with mind map in health education for patients with VTE

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ABSTRACT Purpose: This study aimed to investigate the effect of problem-based learning (PBL) combined with mind map in health education for patients with venous thromboembolism (VTE); Methods: 110 patients with VTE treated in our hospital were enrolled as study subjects, and they were divided into the study group (PBL + mind map, 60 cases) and the control group (routine health education, 50 cases). The health knowledge, self-care ability, self-efficacy, and quality of life scores were evaluated before and after the intervention. The incidence of complications and satisfaction with the nursing between two groups were compared; Results: The health knowledge, self-care ability, and self-efficacy scores of patients in the study group after the intervention were significantly higher than those in the control group ($P < 0.05$); Patients in the study group had higher scores on all items of quality of life scale after receiving the intervention than the control group ($P < 0.05$); The incidence of complications in the study group was 10.00%, which was lower than that of the control group (14.00%) ($P > 0.05$); The satisfaction rate of patients in the study group was 98.33%, and the mean satisfaction score was (95.49 ± 2.11) , which was significantly higher than 88.00% and (89.27 ± 3.29) of the control group ($P < 0.05$); Conclusion: PBL combined with mind map was a better health educational tool for VTE patients, which can significantly increase their awareness of the disease and improve their self-care abilities. It also improves the quality of life of patients and has positive significance for the doctor-patient relationship.

INDEX TERMS PBL; mind map; VTE; health education; applied research

1. INTRODUCTION

Venous Thrombo Embolism (VTE) is a common disease in vascular surgery department [1], which is [2], [3] abnormal clotting of blood in the veins, leading to complete or incomplete obstruction of the vessels. VTE is often manifested as two types: deep vein thrombosis (DVT) and pulmonary embolism (PE). The clinical symptoms of patients include pain and swelling of the affected limb, which could be relieved by elevation of the affected limb [4]. Epidemiological investigation showed that VTE has an extremely high incidence of about 1-3/1000 in the general population, and PE is now ranked as one of primary cardiovascular diseases, with high morbidity, mortality, and under-diagnosis rates [5], [6]. A study showed that the incidence of VTE in patients without any intervention can be as high as 10-40%, of which 5% may develop a lethal PE [7]. It was noted an increase was observed in the incidence of VTE in oncology patients receiving surgery, radiotherapy, hormone therapy or immunotherapy [8].

Studies have been conducted to explore the causes of VTE, among which poor patient compliance and lack of knowledge are risk factors for the development of VTE,

thus proper health education is of positive significance in reducing the incidence of VTE. In a study of 200 patients receiving hip arthroplasty, the incidence of VTE in the study group with health education was only 1%, which was significantly lower than 15% in the control group without health education [9].

The PBL is a common practice model in clinical teaching and is effective in developing students' ability to identify and solve problems. This model has been widely implemented in patient health education. One study noted that the PBL model could improve scores on patient autonomy from (78.19 ± 3.22) to (89.19 ± 4.21) [10].

Mind map is a simple diagram integrating text with images, which can visualize abstract issues. This model has also been widely used in health education, increasing the rate of awareness of disease from 59.9% to 87.1% [11].

The aim of this study was to investigate the feasibility of PBL combined with mind map for patients with VTE, and sought to investigate the effect of this model in terms of patients' self-care ability, quality of life, self-efficacy, health knowledge, satisfaction with the nursing intervention, and complication rate, aiming to providing clinical references

for improving the prognosis of patients with VTE.

II. MATERIALS AND METHODS

A. GENERAL DATA

One hundred and ten patients with VTE from October 2019 to December 2020 were enrolled for the study, and they were divided into a study group (PBL+ mind map, 60 cases) and a control group (routine health education, 50 cases).

Inclusion criteria:

- (1) the enrolled subjects were conscious and could cooperate with the study;
- (2) the enrolled subjects had complete data;
- (3) the enrolled subjects met the diagnostic criteria for VTE [12] and presented with the corresponding clinical symptoms;
- (4) the study was approved by hospital ethics committee;
- (5) the enrolled subjects clearly understood the process, methods, and rationale of the study and signed the informed consent form.

Exclusion criteria:

- (1) comorbid with psychiatric disorders;
- (2) comorbid with malignancies;
- (3) Pregnant or lactating women;
- (4) comorbid with severe hepatic or renal dysfunctions;
- (5) comorbid with congenital coagulation dysfunction;
- (6) comorbid with anemia;
- (7) comorbid with localized abnormalities of the lower extremities such as dermatitis, gangrene or recent skin grafts.

Elimination criteria:

- (1) patients died during the study;
- (2) those who voluntarily requested to withdraw from the study;
- (3) those who were lost to follow-up.

B. INTERVENTION METHODS

Patients in the control group received routine health education, including basic knowledge of VTE, prevention measures, common manifestations of VTE and complication prevention, etc. Specific measures included distribution of pamphlets and explanations by medical personnel.

The health education in the study group was adopted by PBL combined with mind map:

- (1) The problem-centered health education is carried out based on the PBL model. First, the nursing staff has a preliminary understanding of the patient's education level and basic knowledge. With their questions as clues, VTE's health knowledge was sorted out by keywords, lines, etc., which were used to carry out targeted health education for patients
- (2) The mind map. In terms of VTE, epidemiology, specific manifestations, key nursing points and risk factors, the main points of VTE health education were listed in a mind map. Health education was carried out for patients point by point listed in "nursing points", trying to cultivate patients' self-care ability (Figure 1).

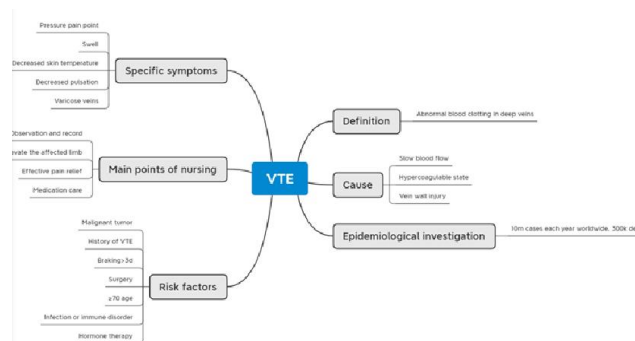


Fig. 1. Mind Map for VTE Health Education

C. OUTCOME MEASUREMENT

1) ASSESSMENT OF THE PATIENT'S CONDITION BY THE HEALTH CARE PROVIDER

The health care personnel were responsible, and the patients' mastery of health knowledge was assessed pre-intervention, 3 d, 7 d and 15 d after intervention. The scale used was the hospital-made VTE Health Knowledge Scale, which includes two dimensions: care/nursing and diet and daily living activities. Patients' mastery of causes of VTE, key points of care and out-of-hospital interventions was evaluated by the Scale, ranging 0-100 points. The higher the score, the higher the level of health education; At 15th day of intervention, the incidence of complications, such as pulmonary embolism, pulmonary hypertension, and post-thrombotic syndrome, was compared. At the same time, the patient's satisfaction with the nursing intervention is evaluated by self-made scale by the hospital, including 5 major items such as emergency management and health knowledge education, ranging 0-100 points. 90-100: very satisfied, 80-89: satisfied, 79 points and below: satisfied. Total satisfaction rate = (very satisfied + satisfied) / total number of cases $\times$ 100%.

2) ASSESSMENT OF THE PATIENT'S ABILITIES

The self-care ability, self-efficacy and quality of life before and after intervention are evaluated before intervention, 3d, 7d and 15d after intervention. The self-care ability is determined by ESCA scale [13], which includes 42 items including self-care skills, self-responsibility, self-concept, and health knowledge, covering 0-100 points. The higher the score, the higher self-care ability of the subjects. Self-efficacy was assessed using the GSES scale [14], which consists of 10 items on a 1-4 Likert scale, covering 0-40 points. The higher the score, the higher the subject's self-efficacy; The quality of life scores were evaluated by the SF-36 scale [15] before and 15 days after the intervention, and the scale was divided into three dimensions: physical function, physiological function and psychological function. The higher the scores, the higher the quality of life.

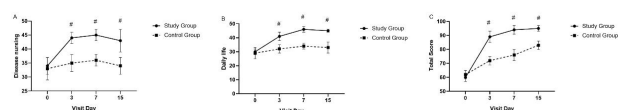


Fig. 2. Analysis of changes in health knowledge scores before and after intervention. Disease care (Figure A), living and eating (Figure B) and total score (Figure C). # $P < 0.05$

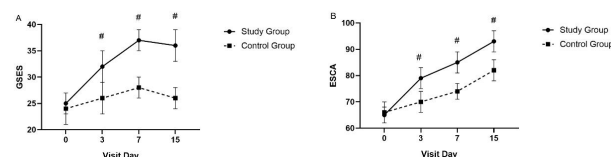


Fig. 3. Analysis of the changes in GESE and ESCA scale scores before and after intervention. # $P < 0.05$

D. STATISTICAL METHODS

SPSS22.0 statistical software was selected to analyze the data. The measurement data were expressed as (mean $\pm$ standard deviation), and t-test was used for differences between groups for data meeting normal distribution or even variance while approximate t-test was applied for data with uneven variance, F-test was used for comparison of differences between multiple groups, chi-square test was used for differences in count data between groups. $P < 0.05$ indicated significant difference. Graphpad prism 8.3 [16] was used to plot the figures.

III. RESULTS

A. COMPARISON OF BASELINE DATA

The two groups differ significantly in terms of age, weight, risk of preoperative DVT ($P > 0.05$), suggesting that two groups were comparable (Table 1).

B. COMPARISON OF EFFECTS OF NURSING INTERVENTIONS

The results showed that there was little difference between the groups in terms of mastery of health knowledge ($P > 0.05$). Their health knowledge after intervention were significantly higher than those before the intervention ($P < 0.05$). The scores of each item of the study group were higher than those of the control group at 3d, 7d and 15d after the intervention ($P < 0.05$) (Figure 2). The study group showed a total complication rate of 10.00%, which was significantly higher than 14.00% in control group ($P > 0.05$) (Table 2). The satisfaction rate was 98.33% with a mean score of (95.49 ± 2.11) in the study group, which is significantly higher than 88.00% and a mean score of (89.27 ± 3.29) ($P < 0.05$) (Table 3).

C. CHANGES IN SELF-EFFICACY, SELF-CARE AND QUALITY OF LIFE AFTER THE INTERVENTION

The two groups did not differ in terms of GESE, ESCA and SF-36 scales before the intervention ($P > 0.05$). The patients in study group at 3 d, 7 d and 15 d after the intervention had significantly higher scores on the GESE (Figure 3A) and ESCA (Figure 3B) scale than those of controls ($P < 0.05$), and the SF-36 scores in the study group were higher than those of controls at 15 d after the intervention ($P < 0.05$) (Figure 4).

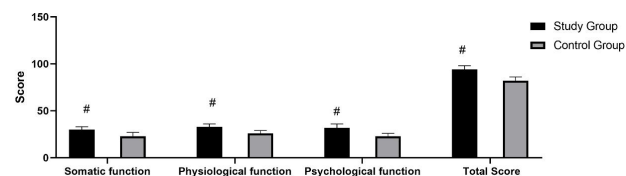


Fig. 4. Comparison of the quality of life scores between two groups. # $P < 0.05$.

TABLE 1. Comparison of Baseline Data ($x \pm s$)/[N (%)]

Clinical information	Category	Study group (n=60)	Control group (n=50)	t/X^2	P
Mean age (years)		50.23±1.11	50.18±1.21	0.226	0.822
Average weight (kg)		72.38±5.44	72.49±5.10	0.109	0.913
Preoperative risk score	Low	1	0	1.119	0.571
	Moderate	38	30		
	High	21	20		
Surgical departments	Orthopedics	15	14	0.891	0.776
	General Surgery Department	14	12		
	Obstetrics and Gynecology Department	21	14		
	Intervention Department	10	10		

TABLE 2. Comparison of Complication Rates [N (%)]

Group	n	Pulmonary embolism	Pulmonary arterial hypertension	Post-thrombotic syndrome	Total incidence rate
Study group	60	0 (0.00)	1 (1.67)	5 (8.33)	6 (10.00)
Control group	50	1 (2.00)	1 (2.00)	5 (10.00)	7 (14.00)
X^2	-	-	-	-	-
P	-	-	-	-	-

TABLE 3. Assessment of Patient Satisfaction with Nursing Interventions ($x \pm s$)/[N (%)]

Group	n	Very satisfied	Satisfied	Unsatisfied	Total satisfaction rate	Mean satisfaction score
Study group	60	50 (83.33)	9 (15.00)	1 (1.67)	59 (98.33)	95.49±2.11
Control group	50	40 (80.00)	4 (8.00)	6 (12.00)	44 (88.00)	89.27±3.29
t/X^2	-	-	-	-	4.887	11.987
P	-	-	-	-	0.027	< 0.001

IV. DISCUSSION

Venous thromboembolism (VTE) is a serious in-hospital complication including deep vein thrombosis (DVT) and pulmonary thrombosis (PE) with high morbidity and mortality [17]. It was found that VTE can have a significant impact on the quality of life of patients, and if not receive timely and effective intervention, they may also develop severe chronic complications (e.g., pulmonary hypertension, venous valve insufficiency, etc.), leading to respiratory failure, and therefore early intervention is recommended [18], [19].

In this study, the effectiveness of PBL combined with mind map for health education of VTE patients was investigated by setting up different subgroups, and the results showed that compared to the control group, the post-intervention scores on the health knowledge scale, including disease care, diet and living and total scores, were significantly higher in the study group. A study pointed out that most patients lack health knowledge about VTE due to low level of education, resulting in a high incidence of VTE, and the study suggested active health education for surgical patients to reduce the incidence of VTE [20]. Another survey on the health education for 60 patients undergoing major orthopedic surgery showed that only 28.3% of patients would wear VTE prevention devices such as compression stockings and plantar venous pumps after surgery.

This study also found that the main factors affecting patients' VTE health knowledge included age and patients' caregivers, and the scholar suggested improving patient prognosis by increasing the frequency of patient education [21]. In this study, we concluded that hospitalized or surgical patients generally showed high incidence and high risk

of VTE. If active preventive measures can be carried out for patients, the incidence of VTE could be significantly reduced. PBL is a problem-based learning model designed to guide the educated to conduct self-learning and develop their independent problem-solving skills. While the mind map can visualize the abstract nursing points, and the combination of the two can improve the patients' awareness to VTE care on the one hand, and help them grasp the key points of nursing care on the other hand, thus the study group exhibited higher health knowledge scores [22]. This study also found that patients in the study group showed significantly higher self-efficacy, self-care and quality of life scores after the intervention, significantly better than those in control group. A controlled study on 65 patients with rheumatoid arthritis showed that patients in the observation group who received mind map-based health education exhibited a significant advantage in SF-36 scores compared to the control group received routine health education, and patients showed significant improvements in terms of somatic pain and social functioning [23]. Another study on 232 older adults found that PBL-based health education could improve the mental status, social adjustment, and self-perception of health in older patients [24]. We speculated the reason may be that the PBL model advocates more patient initiative and provides progressive health education to patients in the order of increasing patient awareness, main points introduction, nursing points listing and specialized guidance, which is more in line with patients' needs than cramming [25]. Furthermore, it has been found that mind map can simplify and systematize complex information and can help the educated to grasp the key points and summarize them. The mind map used images to make the key points

of VTE care explicit, which helped the senior patients to understand and grasp [26], thus the patients showed a significant reduction in the complication rate after the intervention, improving the quality of life.

In conclusion, PBL combined with mind map has a good health education effects on VTE patients, which can significantly increase patients' understanding of the condition, improve their self-care ability and self-efficacy as well as their quality of life, which is of positive significance to the establishment of a harmonious doctor-patient relationship.

The shortcoming of this study is that the effect of patients' education level as well as age on the outcome of the intervention was not excluded, leading to the possibility of some bias in the findings, which is proposed to be addressed in the next step.

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