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Original Article

Transtheoretical model based continuous nursing in patients with gout combined with myocardial infarction

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Abstract: Objective: To explore the effects of continuous nursing based on a transtheoretical model in patients with gout and myocardial infarction and its influence on visual analogue scale (VAS) score. Methods: A total of 92 patients with gout combined with myocardial infarction in our hospital were enrolled and randomized into a control group (n=46) and an observation group (n=46) by a random number table. The control group was provided with routine nursing, and the observation group was additionally given continuous nursing on basis of a transtheoretical model. After 4 weeks of nursing care, heart function, self-efficacy, VAS score, incidence of recurrent cardiovascular events, satisfaction score, compliance, and self-management skills were compared between the two groups. Results: In comparison with the control group after nursing care, the observation group exhibited higher left ventricular ejection fraction (LVEF), lower left ventricular end systolic volume (LVESV), lower left ventricular end diastolic volume (LVEDV), lower left ventricular end-diastolic diameter (LVEDD), and higher scores of daily life, health behaviors, compliance behaviors, and emotional management, as well as lower VAS scores at 1, 2, 3 and 4 weeks after nursing, lower incidence of complications, higher satisfaction scores towards nursing method and nursing effects, and higher compliance to prescribed treatment medications and follow-up ($P<0.05$). The scores of the observation group in diet control, regular exercise, medication compliance, complication awareness, and disease awareness were all higher than those of the control group ($P<0.05$). Conclusion: Continuous nursing based on a transtheoretical model can improve cardiac function and self-efficacy, reduce patient pain and recurrent cardiovascular events, and improve patient satisfaction, compliance and self-management skills in patients with gout and myocardial infarction.

Keywords: Continuous nursing based on transtheoretical models, gout, myocardial infarction, nursing effect, visual analogue scale, self-efficacy, self-management skills

Introduction

The risk of suffering from gout increase as people get older, but gout can affect men of any age whereas women are more likely to develop gout after the menopause. Gout patients often experience sudden joint pain at night, characterized by the sudden onset of severe pain, swelling, heat, and redness of a joint [1]. A study has shown [2] that the causes of gout are complex, including high blood uric acid levels and urate deposition. The clinical manifestations are joint pain, joint deformation, edema and inflammation, which affect the sexual function, sleep, social life, emotional health and personal hobbies. Myocardial infarction is myocardial necrosis caused by persistent ischemia/hypoxia in acute coronary arteries. Severe and long-lasting retrosternal pain cannot be relieved after rest and nitrate drugs. Some patients may have associated abnormal electrocardiogram (ECG) and biochemical indicators, leading to arrhythmia, shock/heart failure [3, 4]. Another study has shown [5] that myocardial infarction is generally caused by overwork, overeating, cold stimulation, *etc*., and has a high mortality rate. Clinically, gout is associated with an increased risk of myocardial

Table 1. Comparison of baseline data between the two groups

Baseline data		Observation group (n=46)	Control group (n=46)	χ^2/t	P
Gender	Male	29 (63.04)	27 (58.70)	1.291	0.683
	Female	17 (36.96)	19 (41.30)		
Age (year)		59.58±5.45	60.01±5.47	0.746	0.981
Body mass index (BMI)		23.23±3.23	23.26±3.27	0.434	0.574
Gout location	Big toe	15 (30.43)	13 (28.26)	1.121	0.415
	Finger joints	11 (23.91)	12 (26.09)		
	Elbow joint	9 (19.57)	13 (28.26)		
	Knee joint	11 (23.91)	8 (19.57)		
Course of gout (years)		4.39±0.51	4.41±0.53	0.835	0.558
Smoking history		8 (17.39)	9 (19.557)	1.214	0.757
Drinking history		18 (39.13)	20 (43.48)	0.312	0.631
Hypertension		17 (36.96)	19 (41.30)	0.668	0.946
Hyperlipidemia		15 (30.43)	14 (30.43)	0.534	0.683

infarction, leading to a poor prognosis and requiring a high quality of nursing [6].

Continuous nursing can prolong the nursing period of discharged patients. Due to a lack of self-management skills, patients do not receive the same level of care services after discharge as they do in the hospital [7]. The transtheoretical model (TTM) of behavior change is an integrative theory of therapy that assesses an individual's readiness to act on a new healthier behavior, and provides strategies, or processes of change to guide the individual. The model is composed of stages of change, processes of change, levels of change, self-efficacy, and decision makeing balance [8]. Studies have shown [9, 10] that TTM can improve the self-decision-making ability of individuals in terms of change in behaviors, which is widely used in clinical practice and thus it achieves a high satisfaction. However, there are only a few studies on the effect of continuous nursing based on the transtheoretical model on the visual analogue scale (VAS) scores of patients with gout and myocardial infarction [11]. Therefore, this study aimed to explore the nursing effect of TTM-based continuous nursing in patients with gout and myocardial infarction and its influence on VAS score.

Materials and methods

Baseline data

A total of 92 patients with gout and myocardial infarction admitted to our hospital from May 2018 to April 2020 were enrolled and randomly divided into a control group (n=46) and an observation group (n=46). This study was approved by the ethics committee of the Second Affiliated Hospital of Hainan Medical University. Written informed consent was obtained from the patient/family. The baseline data of the two groups were not statistically significant (P>0.05) (**Table 1**).

Inclusion and exclusion criteria

Inclusion criteria: patients who (1) met the American Rheumatism Association's diagnostic criteria for gout [12]; (2) met the diagnostic criteria of myocardial infarction in the "Guidelines for the diagnosis and treatment of acute ST-segment elevation myocardial infarction" [13]; (3) with first episode; (4) with clear consciousness, and who were able to communicate effectively were included.

Exclusion criteria: patients (1) with mental disorders, pulmonary insufficiency; (2) taking uric acid-lowering drugs, severe liver and kidney dysfunction, or cognitive dysfunction or other diseases; (3) with coagulation dysfunction, blood diseases or autoimmune disorders were excluded.

Methods

The control group received routine nursing. All patients were discharged from the hospital. Nurses often communicated with patients/family members, and explained to them the relevant knowledge of gout and myocardial

infarction, including pathogenesis, clinical manifestations, treatment methods, and harmful consequences, so as to help patients have a comprehensive knowledge and understanding of the nursing. At the time of discharge, the patients were issued a disease handbook. A telephone call was performed once a week, followed by a home visit every 4 weeks. Questions were patiently answered to make a comprehensive, up-to-date record of their recovery progress [14].

The observation group was given the continuous nursing on basis of TTM. (1) The formulation of a nursing care plan. Behavioral intervention strategies were formulated with TTM for gout complicated with myocardial infarction. The bad habits, unhealthy behaviors and negative emotions were summarized. Negative behaviors were set as target behaviors, including significant mood changes, lack of rehabilitation exercises, non-compliance with medication, high labor intensity, *etc*. Combined with the TTM theory, the nursing of patients was divided into 5 different stages, and the care plan was determined before discharge. (2) TTM-based continuous nursing. The patients were evaluated in terms of precontemplation, contemplation, preparation, action and maintenance. ① Precontemplation before discharge, gout and myocardial infarction conditions were evaluated, so as to help the patient have a comprehensive understanding of medication compliance, regular follow up, rehabilitation exercises, *etc*., and guide them to make positive decisions. ② Contemplation. Patients with the same conditions joined the same WeChat and QQ groups, *etc*. Such communication platforms were established to promote a more detailed behavior change plans, which established their confidence in overcoming the disease, and developed an optimistic attitude. ③ Preparation. TTM-based nursing interventions were formulated accordingly to fully evaluate the behavior change of patients. Through health promotion and education, group discussion and on-site Q&A were conducted to solve the common problems after discharge. ④ Action. The patients completed 4 weeks of nursing intervention. After discharge, the patients were followed up once a week to assess the physical condition, motion and recovery status, and guidance for the patient's diet, exercise and medication was strengthened. One follow-up was performed every 4 weeks to understand the physical condition of patients and the occurrence of adverse cardiovascular events. Patients were encouraged to go to the hospital for review regularly to find out the existing problems and correct them in time. ⑤ Maintenance. For those with critical illness or loss of self-life ability, social support and intervention were strengthened to improve care and nursing as well as patient cooperation. Both groups completed 4 weeks of nursing.

Outcome measurements

(1) The level of cardiac function. The left ventricular ejection fraction (LVEF), left ventricular end systolic volume (LVESV), left ventricular end diastolic volume (LVEDV), and left ventricular end-diastolic diameter (LVEDD) levels were measured by color Doppler ultrasound before and 4 weeks after nursing in the two groups [15]. (2) Self-efficacy. Before and 4 weeks after nursing, the two groups were evaluated by the diabetes self-efficacy scale (DSES) scale from daily life, health behavior, compliance behavior, and emotional management on a 0-4 Likert scale, covering 112 points. High scores denote the high self-efficacy [16, 17]. (3) VAS score. The two groups of patients were assessed for pain with the VAS scale (0-10 points) before and at 1, 2, 3, and 4 weeks after nursing. A lower scores indicates lighter pain [18]. (4) The incidence of recurrent vascular events. The incidence rate of angina pectoris, heart failure, severe arrhythmia, non-fatal myocardial infarction, vascular reconstruction and cardiogenic death at 4 weeks after nursing was recorded in the two groups [19, 20]. (5) Satisfaction and compliance scores. The satisfaction and compliance questionnaire (100 points) was used to investigate the satisfaction scores (nursing method, nursing effect and nursing content) [21] and compliance (compliance with medical drugs, rehabilitation exercise and regular follow up) of the two groups after nursing. A score of ≥ 90 points indicated high compliance and satisfaction [22]. (6) Self-management skills. The self-management behavior questionnaire (2-DSCS) was used before and 4 weeks after nursing from five dimensions including diet control, regular exercise, medication compliance, complication and disease awareness, with a total of 26 items, ranging form 26-130 points. High scores indicate a high level of self-management skills [23]. In order to reduce the human error in the process of data collec-

Table 2. Comparison of cardiac function between the two groups ($\bar{x} \pm s$)

Group		LVEF (%)	LVESV (mL)	LVEDV (mL)	LVEDD (mm)
Observation group (n=46)	Before nursing	45.98±5.12	63.49±5.34	95.29±8.43	58.98±5.31
	4 weeks after nursing	67.49±5.77[a,b]	33.19±3.29[a,b]	63.58±5.14[a,b]	40.23±4.05[a,b]
Control group (n=46)	Before nursing	45.67±5.11	63.41±5.29	95.31±8.45	58.99±5.32
	4 weeks after nursing	51.36±5.69[b]	48.67±4.51[b]	78.96±6.78[b]	47.49±4.69[b]

Compared with the control group, [a]$P<0.05$; compared with before treatment, [b]$P<0.05$.

Table 3. Comparison of self-efficacy between the two groups (points, $\bar{x} \pm s$)

Group		Daily life	Healthy behavior	Compliance behavior	Emotion management
Observation group (n=46)	Before nursing	75.39±6.88	78.61±7.04	69.77±6.74	72.36±7.46
	3 months after nursing	98.46±8.61[a,b]	99.14±8.96[a,b]	94.52±7.56[a,b]	90.93±7.81[a,b]
Control group (n=46)	Before nursing	75.61±6.93	78.48±6.94	70.22±6.78	72.15±7.43
	3 months after nursing	81.34±7.85[b]	84.51±7.57[b]	89.45±7.43[b]	82.31±7.69[b]

Compared with the control group, [a]$P<0.05$; compared with before treatment, [b]$P<0.05$.

tion and processing, a double entry method was adopted in this study, and spot check was conducted on the data to improve the data accuracy and reduce the error.

Statistical analysis

SPSS 18.0 software was used for statistical analysis. Counting data were analyzed by χ^2 test and expressed as [n (%)]. All data were normally distributed. Measurement data were expressed as (x +/- sd) and were examined by *t* test. Analysis of variance (ANOVA) was used for repeated data detection. $P<0.05$ indicated a significant difference.

Results

Comparison of cardiac function

The difference in cardiac function was not statistically significant between the two groups ($P>0.05$). The level of LVEF of the observation group was higher than that of the control group ($P<0.05$) after 4 weeks of TTM-based continuous nursing, while the levels of LVESV, LVEDV and LVEDD of the observation group were lower than those of the control group ($P<0.05$, **Table 2**).

Comparison of self-efficacy between the two groups

The self-efficacy scores of the two groups were not statistically significant before nursing ($P>0.05$). The self-efficacy scores were higher in the two groups than those before nursing ($P<0.05$). The observation group exhibited higher self-efficacy scores than those of the control group ($P<0.05$, **Table 3**).

Comparison of VAS scores between the two groups

VAS scores of the two groups were not statistically significant before nursing ($P>0.05$). VAS scores of the two groups at 1, 2, 3, and 4 weeks after nursing were lower than those before nursing ($P<0.05$). The VAS scores at 2, 3 and 4 weeks of the observation group were lower than those of the control group ($P<0.05$, **Figure 1**).

Comparison of the incidence rate of recurrent cardiovascular events

The incidence rate of severe arrhythmia and death from cardiogenic shock in the two groups at 4 weeks after nursing was not statistically significant ($P>0.05$), and they were lower in the observation group at 4 weeks after nursing than those in the control group ($P<0.05$, **Figure 2**).

Comparison of satisfaction and compliance

The nursing method, nursing effect and nursing satisfaction, compliance towards medical medication, rehabilitation exercise and regular follow-up in the observation group were all

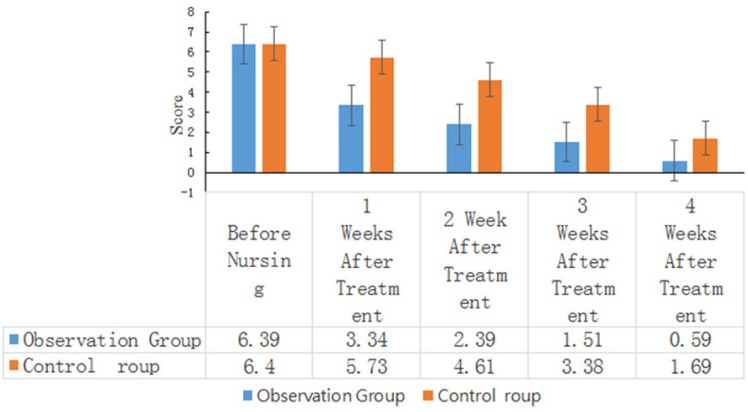

Figure 1. Comparison of VAS scores between the two groups.

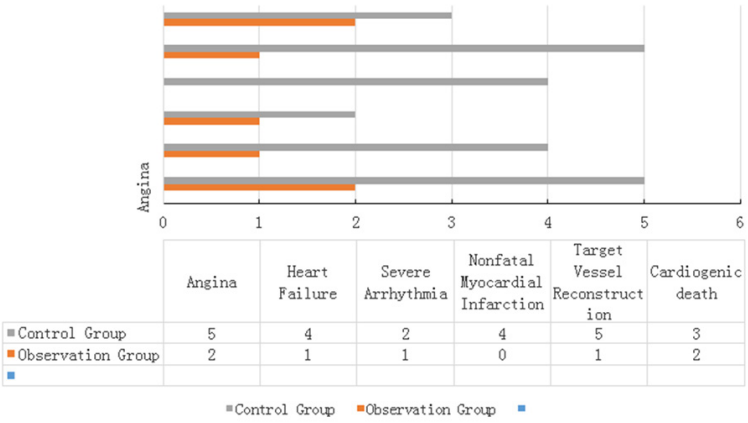

Figure 2. Comparison of the incidence of cardiovascular events.

higher than those in the control group (P<0.05, **Table 4**).

Comparison of self-management skills between the two groups

The level of self-management skills in the two groups was not statistically significant before nursing (P>0.05). After 4 weeks of nursing, the level of self-management skills was improved in both groups (P<0.05). The observation group had higher scores in terms of diet control, regular exercise, and compliance of medication, scores of complication and disease awareness than those of the control group (P<0.05, **Figure 3**).

Discussion

With the continuous development and growth of the economy and wealth, people's lifestyle and dietary habits have changed significantly, leading to an upward trend in the incidence rate of gout. Studies have shown that gout is a chronic disease with a long course and is difficult to cure. Its symptoms include redness, swelling and pain in the joints, and with the continuous development of the disease, it will increase the incidence rate of renal dysfunction and affect patient's quality of life [24]. Myocardial infarction is myocardial necrosis caused by acute and persistent hypoxia in the coronary arteries. It is clinically dominated by severe and long-lasting retrosternal pain, which may threatens the life of patients. Myocardial infarction can also be accompanied by gout, increasing the difficulty of clinical diagnosis and treatment. Some seriously-ill patients need to stay in bed for a long time, coupled with the lack of care after hospital discharged, resulting in a high incidence of cardiovascular events; therefore, the patients need high quality nursing [25].

TTM-based continuous nursing has been applied to patients with gout and myocardial infarction with satisfactory results. In this study, the heart function (LVEF) in the observation group was higher than that in the control group (P<0.05) after 4 weeks of TTM-based continuous nursing, while the LVESV, LVEDV and LVEDD in the observation group were lower than those in the control group (P<0.05), indicating that TTM-based continuous nursing is beneficial to the recovery of patients. Continuous nursing is a new type of nursing method that extends hospital nursing. It emphasizes the integrity, operability and effectiveness of nursing, aiming at personalized nursing care in a timely manner, which can improve self-efficacy combined with clinical treatment [26]. In this study, the observation group had higher scores in daily life, health behavior, compliance behavior, and emotional management four weeks after nursing than the control group (P<0.05),

Table 4. Comparison of satisfaction and compliance between the two groups [n (%)]

Group	Cases	Satisfaction			Compliance		
		Nursing method	Nursing effect	Nursing content	Medication	Rehabilitation exercise	Regular follow up
Observation group	46	44 (95.65)	45 (97.83)	43 (93.48)	46 (100.00)	43 (93.48)	45 (97.38)
Control group	46	35 (76.09)	37 (80.43)	36 (78.26)	38 (82.61)	36 (78.26)	37 (80.43)
χ^2	/	6.392	5.681	9.481	5.334	5.111	7.109
P	/	0.032	0.039	0.019	0.042	0.041	0.021

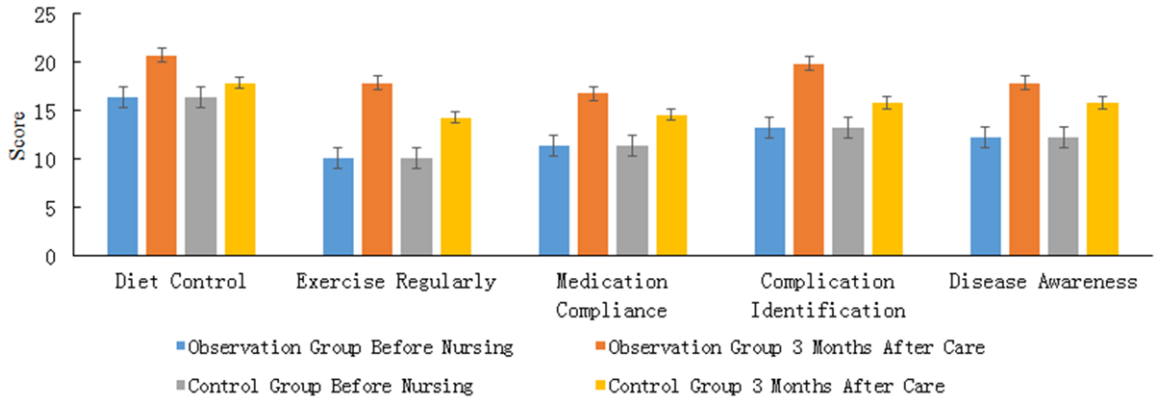

Figure 3. Comparison of self-management skills between the two groups.

indicating that TTM-based continuous nursing can improve the self-efficacy of patients with gout and myocardial infarction efficacy. A study has shown [27] that continuous nursing can extend the care services for daily life after discharge. Their conditions can be followed dynamically, improving patient compliance with medication after discharge. In addition, continuous nursing allows patients to receive professional care after discharge, which can promote recovery, avoid continuous deterioration of their condition, promote the recovery of patients, and obtains good social benefits. TTM is widely used in clinical practice to improve patients' unhealthy behaviors. In this study, the existing "negative behaviors" of patients with gout and myocardial infarction were set as "target behaviors", such as mood swings, lack of rehabilitation exercises, non-compliance with medical drugs, high labor intensity, *etc*. The implementation of TTM-based continuous nursing can intervene via different stages. Among them, stage 1-3 has not yet produced a behavior change; stage 4-5 is the stage of behavior change or maintaining good behaviors. Cyclical evaluation and intervention are carried out to lay the foundation for behavior changes in stage 4-5, ensure patients develop good behaviors, reduce pain and help their physical recovery [28, 29]. In this study, the VAS scores of the observation group at 1, 2, 3 and 4 weeks after nursing as well as the incidence of angina, heart failure, non-fatal myocardial infarction, target vascular remodeling were lower than those of the control group ($P<0.05$), indicating that TTM-based continuous nursing reduces the pain as well as incidence rate of cardiovascular events after discharge. Another study has shown that TTM-based continuous nursing can be implemented by conducting health knowledge lectures, setting role models, which improves patient compliance and strengthen the patient's self-management skills [30]. In this study, the satisfaction and compliance scores in the observation group were higher than those in the control group ($P<0.05$), and thee knowledge about complication and disease awareness scores in the observation group were all higher than those in the control group ($P<0.05$), indicating that TTM-based continuous nursing can improve the self-management skills of patients with gout and myocardial infarction, and can improve patient satisfaction, which benefits the prognosis.

In summary, TTM-based continuous nursing improve the heart function and self-efficacy, reduce the pain, the incidence of cardiovascular events, and improve the satisfaction of patients with gout and myocardial infarction, which is worthy of promotion and application.

Disclosure of conflict of interest

None.

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