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Original Article

Application value of individual nursing intervention in patients with high risk of a diabetic foot

Fangli Peng[1], Xinfeng Huang[1], Li Chen[2], Yanmei Zhou[1], Zhifang Han[3]

[1]Department of Hand and Foot Surgery, [2]Human Resources Department, [3]Anorectal Department, Affiliated Nanhua Hospital, University of South China, Hengyang, Hunan, China

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Abstract: Objective: To explore the effects of individual nursing intervention on emotion, life quality and complications of patients at high risk of having a diabetic foot. Methods: A total of 104 patients with high risk of a diabetic foot admitted to our hospital from September 2016 to January 2018 were selected as research subjects, among which 50 patients receiving routine nursing intervention were enrolled as Group A, and another 54 patients receiving individual nursing intervention were enrolled as Group B. The two groups were compared for anxiety, depression, life quality, complications, treatment compliance, self-management ability and nursing satisfaction. Results: Before nursing, there was no significant difference between the two groups in Hamilton Anxiety Scale (HAMA) and Hamilton Depression Scale (HMDS) scores (both $P>0.05$); while after nursing, both groups had lower HAMA and HMDS scores, but Group A had higher HAMA and HMDS scores than Group B (both $P<0.05$). After nursing, Group A showed a significantly higher overall incidence of complications than Group B ($P<0.05$); while after nursing, both groups had lower life quality scores, but Group A had higher life quality scores than Group B (both $P<0.05$). At the end of the follow-up, Group A showed a lower compliance rate than Group B in all items ($P<0.05$); while after nursing, both groups had significantly higher self-management ability scores, but Group A had significantly lower self-management ability scores than Group B (both $P<0.05$). Group B showed a significantly higher nursing satisfaction than Group A ($P<0.05$). Conclusion: Individual nursing intervention can help patients at high risk of having a diabetic foot effectively control their own negative emotions, and can improve their life quality and reduce complications, so it is of high clinical application value.

Keywords: Individual nursing, high risk of diabetic foot, emotion, life quality, complications

Introduction

A high-risk diabetic foot is a diabetic foot without damage, which mainly manifests with severe foot deformity, neuropathy, peripheral angiopathy and other foot issues [1, 2]. It can easily develop into a foot ulcer when not treated or improperly intervened, which will cause limb pain and even possible amputation, bringing psychological pain and economic burden to patients, so it is particularly important to reduce foot ulcers in patients with diabetes [3, 4]. Patients at high risk of having a diabetic foot are hyperglycemic for a long time, so vascular injury, blood circulatory disorders, and oxidative stress will lead to a series of metabolic disorders, damaging the normal physiological function of sensory nerves and causing symptoms such as numbness, pain, flaccidity or weakness, hypoesthesia or anesthesia of the affected limbs, which seriously affects the quality of life of patients [5-7]. In addition, the disability rate and recurrence rate of a diabetic foot are relatively high, which poses difficulty in treatment [8]. Therefore, a main point to prevent diabetic feet is to identify patients at high risk of having a diabetic foot and take treatment and intervention measures for them to prevent the disease or amputation [9]. At present, patients at high risk of having a diabetic foot are usually treated with mecobalamin, insulin, alprostadil, and other conventional drugs, but their efficacies are limited [10]. In addition to treatment, early and effective nursing intervention is also very important for treatment of high risk of diabetic feet. Therefore, it is necessary to understand the risks in patients as early as possible and give them appropriate

treatment and nursing to slow down the progression of disease [11].

Individual nursing is an effective nursing mode developed for patients on the basis of routine clinical nursing. Under individual nursing, nursing staff specifically nurse patients based on their clinical skills and personal experience after understanding the progression of the disease in each patient. It is widely used in nursing care due to its therapeutic nature specific for patients [12].

Therefore, this study explored the effects of individual nursing interventions on emotion, life quality and complications of patients at high risk of having a diabetic foot, so as to find a better nursing scheme for them.

Materials and methods

General data

A total of 104 patients at high risk of having a diabetic foot admitted to our hospital from September 2016 to January 2018 were selected as research subjects; among which 50 patients receiving routine nursing intervention were enrolled as Group A, and the other 54 patients receiving individual nursing intervention above the routine nursing intervention for Group A were enrolled as Group B. The patients consisted of 56 males and 48 females, with an average age of 57.51±8.65 years, body mass index (BMI) of 24.71±2.47 kg/m^2, and fasting blood glucose of 9.76±2.17 mmol/L.

Inclusion and exclusion criteria

Inclusion criteria of the patients were as follows: Patients meeting the diagnosis standard for diabetes released by the World Health Organization (WHO) and diagnosed with having a high-risk diabetic foot based on Gavin's weighted-in-points method for risk factors of diabetes [13, 14]; patients with clear consciousness and good communication skills, and patients who could understand the content of a questionnaire and cooperated to complete it. Exclusion criteria of the patients were as follows: Patients with diabetic foot ulcer, infection, tinea pedis, other comorbid organ diseases, complications, comorbid lipid abnormality, severe hepatic or renal function obstacle, or patients who received other nursing interventions. All patients and their families agreed to participate in the experiment and signed an informed consent form, and this experiment was in compliance with relevant standards from the ethics review committee of our hospital.

Nursing methods

Patients in Group A were given routine nursing interventions from the department of endocrinology and nursing about psychological health according to their doctors' advice, including instruction and education about basic diabetes health, medication guidance, symptom observation, psychological intervention, and so on. Patients in Group B were nursed, based on nursing measures for Group A, in other ways as follows: A personal medical file was established for each patient in Group B at admission, mainly covering personal details, treatment history, blood glucose monitoring records, foot care history, etc. This file was used to record and evaluate the actual situation of each patient to formulate an individual nursing scheme for them and conduct timely and effective evaluation and inspection on nursing efficacy. Individual nursing intervention measures for patients at high risk of having a diabetic foot were performed from the following aspects specifically: (1) Health education: Aided in knowledge about diabetes such as principle of food heat exchange, significance of weight loss through exercise, and related drug treatment was explained in the manner of group teaching with solid models. (2) Guidance of insulin injection: According to the records of previous blood glucose changes, professional nurses responsible for diabetes patients taught the patients insulin injection skills and strictly monitored their blood glucose based on individual education and guidance schemes after responsible doctors formulated the diabetes control treatment methods for them. (3) Foot care: Responsible nurses explained the treatment methods of a diabetic foot to the patients in a "one-on-one" education mode to help them understand the nursing methods and cooperate with treatment. (4) Diet guidance: A diet management scheme was formulated for the patients and the diet regulations of fixed time and quota diet, and raw, cold or greasy food avoidance were strictly implemented. Responsible nurses were established personal contact files for patients when they were discharged from our hospital to record their contact information,

give them individual discharge instructions, and regularly followed up by telephone to understand and record their conditions in detail.

Observation indexes

Anxiety and depression: Hamilton Anxiety Scale (HAMA) and Hamilton Depression Scale (HMDS) were used to evaluate the anxiety and depression of patients in the two groups, and specific evaluation criteria were shown in references [15, 16].

Treatment compliance: Patients in the two groups were evaluated using the *Questionnaire on Treatment Compliance of the Population at High Risk of Diabetes* designed by our own hospital during follow-up, which covered diet, weight control, exercise, and regular blood sugar monitoring. The score of each item was 20 points, and patients with scores larger than 15 points in one item were considered as in compliance with this item.

Self-management ability: Self-management ability scale (SMAS) was used to evaluate the self-management ability of patients in the two groups before and after nursing, which covered self-concept, health knowledge, self-care responsibility, self-care skills and so on. The score was positively correlated to self-management ability [17].

Complications: Complications of patients in the two groups within 3 months after nursing were analyzed and recorded.

Life quality: The quality of life (QOL) scale was used to evaluate the life quality of patients with a diabetic foot [18], which covered 5 dimensions (39 items), including disease dimension (12 items), physiological dimension (8 items), psychological dimension (7 items), social dimension (5 items) and satisfaction dimension (7 items). The 5-grade scoring system was adopted for each item, and higher score indicated poorer life quality.

Nursing satisfaction: The nursing satisfaction of the patients was evaluated using the questionnaire developed by our own hospital, and it was divided into three levels: Very satisfied, satisfied and dissatisfied based on the collected scores.

Statistical analysis

In this study, SPSS 19.0 software (Beijing ND Times Technology Co., Ltd.) was adopted for statistical analysis of experiment data. Enumeration data were analyzed by chi-square test, and measurement data were expressed by mean ± standard deviation. Comparison between the two groups was analyzed using independent t test, and comparison within groups before and after nursing was analyzed using paired t test. The data were made into figures using Graphpad Prism8. $P<0.05$ indicated a significant difference.

Results

Comparison between the two groups in general data

There was no significant difference between the two groups in gender, age, nationality, educational level, religious belief, place of residence, BMI, course of disease and lesion site (all $P>0.05$). See **Table 1**.

Comparison between the two groups in anxiety and depression before and after nursing

The HAMA and HMDS scores of Group A after individual nursing were 33.84±4.54 and 35.91±4.73, respectively; which were significantly higher than those of Group B (21.78±4.12 and 21.73±4.39) (both $P<0.05$). See **Figure 1**.

Comparison between the two groups in life quality after nursing

Before nursing, there were no significant differences between the two groups in life quality scores including disease dimension, physiological dimension, psychological dimension, social dimension, satisfaction dimension, and total dimension score (all $P>0.05$); while after nursing, both of the groups had lower life quality scores, and Group A had higher life quality scores than Group B (both $P<0.05$). See **Figure 2**.

Comparison between the two groups in overall incidence of complications

After nursing, Group A showed a significantly higher overall complication rate than Group B (16.00% vs. 3.70%), ($P<0.05$). See **Table 2**.

Table 1. Comparison between the two groups in general data

Group	Group A (n=50)	Group B (n=54)	t/X^2	P
Gender (case)			<0.001	0.976
Male	27 (54.00)	29 (53.70)		
Female	23 (46.00)	25 (46.30)		
Age (Y)	57.43±8.55	57.63±8.63	0.119	0.906
Nationality (case)			<0.001	0.978
Han nationality	39 (78.00)	42 (77.78)		
Minority nationality	11 (22.00)	12 (22.22)		
Education level (case)			<0.001	0.996
With primary school diploma	9 (18.00)	10 (18.52)		
With junior diploma	17 (34.00)	18 (33.33)		
With senior high school diploma and above	24 (48.00)	26 (48.15)		
Religious belief (case)			0.042	0.838
Yes	13 (26.00)	15 (27.78)		
None	37 (74.00)	39 (72.22)		
Place of residence (case)			0.010	0.919
Urban area	31 (62.00)	34 (62.96)		
Rural area	19 (38.00)	20 (37.04)		
BMI (kg/m^2)	24.64±2.44	24.83±2.48	0.393	0.695
Course of disease (Month)	36.75±11.35	37.28±11.10	0.241	0.810
Lesion site (case)			0.010	0.995
Left lower extremity	18 (36.00)	19 (35.19)		
Right lower extremity	19 (38.00)	21 (38.89)		
Both lower extremities	13 (26.00)	14 (25.93)		
Pathological grade (case)			0.002	0.999
Grade I-II	15 (30.00)	16 (29.63)		
Grade III-IV	23 (46.00)	25 (46.30)		
Grade V	12 (24.00)	13 (24.07)		
Fasting blood glucose (mmol/L)	9.74±2.16	9.78±2.19	0.094	0.926

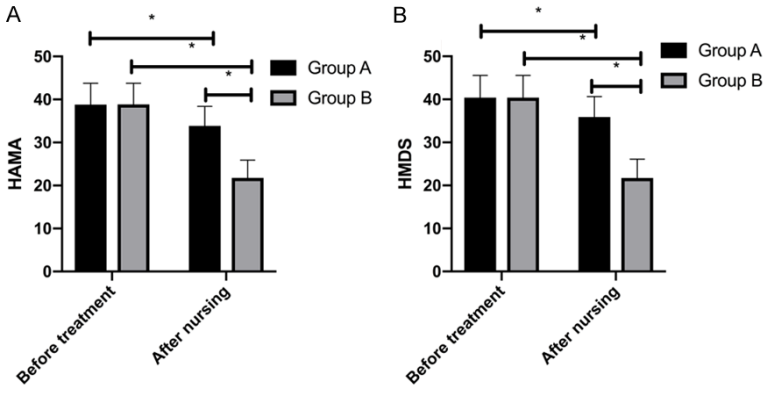

Figure 1. Comparison between the two groups in anxiety and depression before and after nursing. A. After nursing, both of the two groups had significantly lower HAMA scores, and Group A had a significantly higher HAMA score than Group B. B. After nursing, both of the two groups had significantly lower HMDS scores, and Group A had a significantly higher HMDS score than Group B. Note: *indicates P<0.05.

Comparison between the two groups in treatment compliance during follow-up

After follow-up, Group A had significantly lower compliance indexes than Group B in diet, weight control, exercise, and regular blood glucose (P<0.05). See **Table 3**.

Comparison between the two groups in self-management ability scores before and after nursing

Before individual nursing intervention, there were no significant differences between

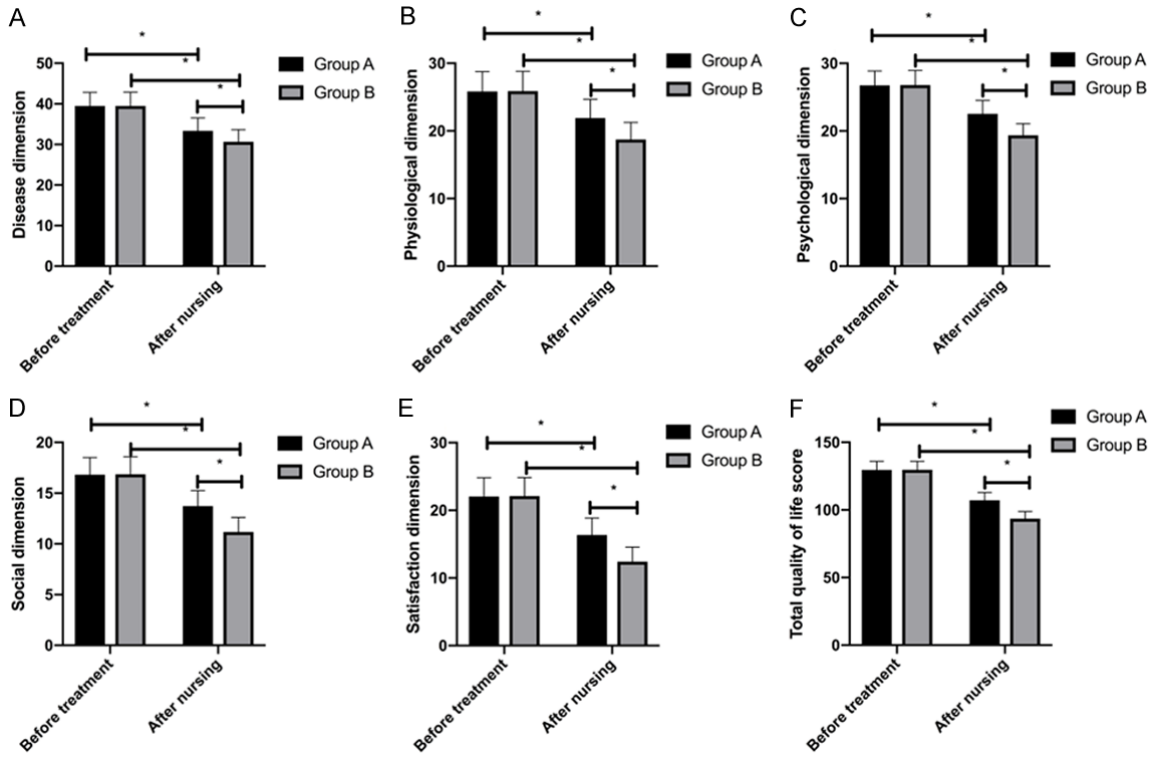

Figure 2. Comparison between the two groups in life quality after nursing. A. After nursing, both of the groups had significantly lower disease dimension scores, and Group A had a significantly higher disease dimension score than Group B. B. After nursing, both of the two groups had significantly lower physiological dimension scores, and Group A had a significantly higher physiological dimension score than Group B. C. After nursing, both of the two groups had significantly lower psychological dimension scores, and Group A had a significantly higher psychological dimension score than Group B. D. After nursing, both of the two groups had significantly lower social dimension scores, and Group A had a significantly higher social dimension score than Group B. E. After nursing, both of the two groups showed significantly higher nursing satisfaction scores and Group A showed a significantly lower social nursing satisfaction score than Group B. F. After nursing, both of the two groups had significantly lower life quality scores and Group A had a significantly higher life quality score than Group B. Note: *indicates P<0.05.

Table 2. Comparison between the two groups in the overall incidence of complications [n (%)]

Group	Group A (n=50)	Group B (n=54)	X^2	P
Ulcer	3 (6.00)	1 (1.85)	-	-
Infection	2 (4.00)	1 (1.85)	-	-
Osteomyelitis	1 (2.00)	0	-	-
Muscular atrophy	2 (4.00)	0	-	-
Overall incidence of complications	8 (16.00)	2 (3.70)	4.517	0.034

the two groups in scores of self-concept, health knowledge, self-care responsibility, self-care skills and self-care management (all P>0.05); while after nursing, both of the two groups had higher self-management ability scores, and Group A had significantly lower self-management ability scores than Group B (both P<0.05). See **Figure 3**.

Comparison between the two groups in nursing satisfaction

Group A showed a nursing satisfaction of 84.00%, with 30 patients very satisfied with nursing, 12 patients satisfied with it, and 8 patients dissatisfied with it; and Group B showed a satisfaction of 96.30%, with 37 patients very satisfied with nursing, 15 patients satisfied with it, and 2 patients dissatisfied with it. Group A showed a significantly higher nursing satisfaction than Group B (P<0.05). See **Table 4**.

Discussion

Diabetic foot is one of the chronic complications of diabetes that causes a series of foot

Table 3. Comparison between the two groups in treatment compliance during follow-up [n (%)]

Group	Group A (n=50)	Group B (n=54)	X^2	P
Diet compliance	39 (78.00)	51 (94.44)	6.026	0.014
Weight control compliance	41 (82.00)	52 (96.30)	5.610	0.018
Exercise compliance	37 (74.00)	48 (88.89)	3.854	<0.050
Compliance with regular blood glucose testing	38 (76.00)	50 (92.59)	5.491	0.019

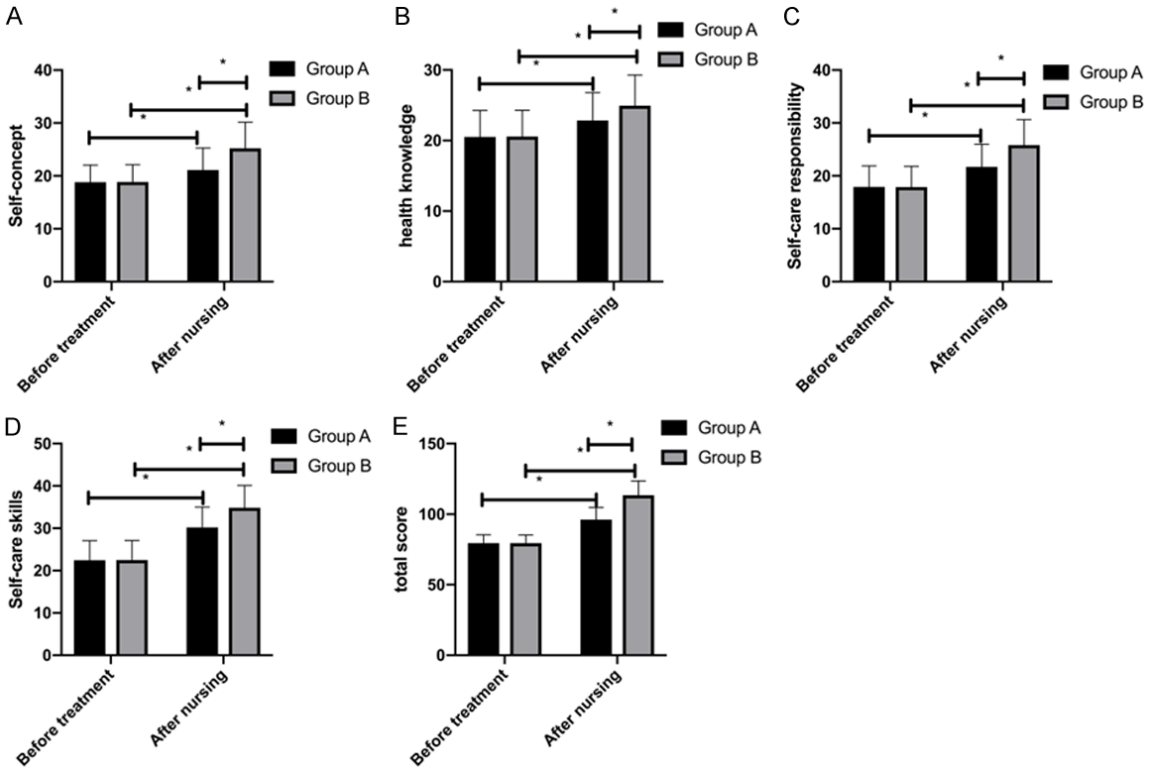

Figure 3. Comparison between the two groups in self-management ability scores before and after intervention. A. After nursing, both of the two groups had significantly higher self-concept scores and Group A had a significantly lower self-concept score than Group B. B. After nursing, both of the two groups had significantly higher health knowledge scores, and Group A had a significantly lower health knowledge score than Group B. C. After nursing, both of the two groups had significantly higher self-care responsibility scores, and Group A had a significantly lower self-care responsibility score than Group B. D. After nursing, both of the two groups had significantly higher self-care skill scores, and Group A had a significantly lower self-care skill score than Group B. E. After nursing, both of the two groups had significantly higher self-management ability scores, and Group A had a significantly lower self-management ability score than Group B. Note: *indicates P<0.05.

Table 4. Comparison between the two groups in nursing satisfaction [n (%)]

Group	Group A (n=50)	Group B (n=54)	X^2	P
Very satisfied	30 (60.00)	37 (68.52)	-	-
Satisfied	12 (24.00)	15 (27.78)	-	-
Dissatisfied	8 (16.00)	2 (3.70)	-	-
Nursing satisfaction	42 (84.00)	52 (96.30)	4.517	0.034

diseases with poor prognosis, and patients at high risk of having a diabetic foot are the target population in preventing diabetic foot [19]. Patients at high risk of having a diabetic foot who go to the hospital after 24 h of having an initial episode of a diabetic foot ulcer are considered to be patients who delayed seeking medical advice. The delay may lead to prolonged hospitalization, increased medical expenses, increased risks of disability and death, and other things [20, 21]. The pathological nature of disease in patients at high risk of having a diabetic foot also determines their urgent need for

early screening, clinical treatment and nursing for high-risk diabetic feet. Early screening and intervention for patients at high risk of having a diabetic foot can improve their neurological functions and blood circulation, alleviate clinical symptoms, reduce negative emotions, and improve social functions; thus improving their life quality and preventing adverse disease factors [22]. Individual nursing can help relieve patients' negative emotion towards nurses and correct their negative attitude towards rehabilitation treatment through early and effective individual nursing schemes [23], thus improving the outcomes. At present, it is required to develop an appropriate nursing scheme for patients at high risk of having a diabetic foot, so this study analyzed the effects of individual nursing intervention on emotion, life quality and complications of patients at high risk of having a diabetic foot during rehabilitation treatment, from the perspective of nursing mode and patient outcome.

In order to implement individual nursing to patients at high risk of having a diabetic foot, we developed an individual and special nursing scheme for each patient according to their condition, understanding their recovery after discharge, and patiently helped solve various problems encountered by each patient. The results revealed that before treatment in terms of emotion, the two groups had no differences in anxiety and depression and did not show clear emotional fluctuation, while after nursing, the two groups showed significantly improved emotion, and Group B showed a significantly higher improvement than Group A. Some studies showed that accurate and targeted individual nursing intervention could alleviate symptoms and control diseases; accompanied by psychological symptoms and emotional disorders, patients may show a sense of uneasiness, and their superficial understanding of their disease and severity of the disease were related to lower emotional states [24, 25]. In terms of life quality, there were no significant differences between the two groups in life quality score in each dimension before individual nursing intervention, while the life quality score in each dimension decreased gradually with the treatment, and Group B showed a more significant decline. In terms of complications, after nursing, Group A showed a significantly higher overall incidence of complications than Group B, which indicated the helpfulness of individual nursing schemes that focused on the life situations of patients in the hospital and after discharge, and reduced complications after clinical treatment, and improved the overall living standard of patients during and after illness. Some studies pointed out that improved life quality and lower complications rate could effectively alleviate negative mood factors of patients who are at high-risk of diabetic feet brought on by clinical symptoms such aspruritus, skin damage and ulceration; thus reducing the psychological burden of the patients and enabling them to have optimistic and positive mentalities to cooperate with treatment [26, 27]. We studied the patients in terms of treatment compliance, finding that at the end of the follow-up, the overall compliance of Group A was lower than that of Group B, which was consistent with results of our study with regard to emotion. Another study has pointed out that high treatment compliance can effectively improve treatment speed and efficiency of the whole treatment process and is beneficial to the condition of patients under controlled treatment [28]. The analysis showed that individual nursing had a high acceptance among the patients and relieved their anxiety and depression, and their enthusiasm for cooperating with nursing staff and doctors. The analysis of self-management ability after individual nursing intervention revealed that before individual nursing intervention, there were no significant differences between the two groups in self-management ability scores, while after treatment, the two group showed significantly improved self-management ability, and Group B showed a more significant improvement. Another study pointed out that under individual nursing, special nursing measures are developed based on patients' mood and diseases, and this ensures that patients can receive social support during nursing, and feel the care from their relatives, friends and other patients to regain confidence in overcoming diseases, so that they actively cooperate with rehabilitation training, and they are also encouraged to monitor their own symptoms every day [29]. Our results showed that patients who had received individual nursing showed stronger self-management ability. In terms of nursing satisfaction, Group B showed a significantly higher nursing satisfaction than Group A. A previous study has shown that individual nursing

intervention can significantly improve life quality, relieve negative emotions after surgery, and improve nursing satisfaction [30], which is consistent with our research results to a certain extent. According to our study and references, individual nursing can improve patients' treatment cooperation, self-management of diseases, and nursing satisfaction based on effective psychological and education given to them.

To sum up, individual nursing intervention is of great help to patients who are at high risk of having a diabetic foot, in improving their mood and life quality and reducing complications and it is also helpful in improving their treatment cooperation and nursing satisfaction. However, there are still some deficiencies in this study. For example, compliance and body function of patients at high risk of having a diabetic foot are closely related to diet, but diet management is not specifically analyzed and recorded. Individual diet regulation and monitoring may improve efficacy, so we will take it as the direction of our follow-up research, so as to better nurse patients at high risk of having a diabetic foot and improve their prognosis.

Disclosure of conflict of interest

None.

Address correspondence to: Zhifang Han, Anorectal Department Pain, Affiliated Nanhua Hospital, University of South China, Hengyang, Hunan, China, No. 336 Dongfeng South Road, Zhuhui District, Hengyang, Hunan Province, China. E-mail: hanzhifang87@yeah.net

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