

The Application Effect of Family Doctor Team Combined with Hierarchical Diagnosis and Treatment among People at Risk of Diabetic Foot in the Community

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Abstract: *Objective:* To explore the disease management effect and risk prevention and control effect of family doctor team joint hierarchical diagnosis and treatment model on high-risk groups of diabetic foot in the community. *Methods:* 120 high-risk patients with diabetic foot who were screened in the community from March 2020 to March 2023 were selected and divided into a control group of 60 cases (conventional chronic disease management) and an observation group of 60 cases (graded diagnosis and treatment intervention led by a family doctor team) using the random number table method. The differences in the foot risk assessment system (DFS score), self-management behavior scale (DSMQ score), graded referral implementation rate, blood glucose metabolism index and incidence rate of foot complications were compared between the two groups after 12 months of intervention. *Results:* After the intervention, the DFS score of the observation group was lower than that of the control group, and the self-management score was higher than that of the control group ($p < 0.05$); the stratified referral implementation rate of the observation group reached 96.67%, which was significantly higher than 73.33% of the control group ($p < 0.05$); the fasting blood glucose value of the observation group ($6.28 \pm 0.82\text{mmol/L}$) was better than that of the control group ($7.65 \pm 1.03\text{mmol/L}$), the glycated hemoglobin in the observation group (6.57 ± 0.75) was significantly lower than the control group (7.92 ± 0.98) (all $p < 0.05$); the total incidence of foot complications in the observation group was 5.00% (2 cases of superficial ulcers, 1 case of deep infection), which was significantly lower than 21.67% in the control group (8 cases of superficial ulcers, 3 cases of deep infection, and 2 cases of abscess formation) ($p < 0.05$). *Conclusion:* The family doctor team combined with the hierarchical diagnosis and treatment model can effectively improve the metabolic indicators of high-risk groups with diabetic foot, improve self-management ability and significantly reduce the risk of foot complications, providing an innovative management model for the prevention and control of diabetic foot in the community.

Keywords: Family doctor team; Hierarchical diagnosis and treatment; Community diabetic foot risk groups; Application effects

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1. Introduction

Diabetic foot is one of the most serious chronic complications caused by diabetes, with a high possibility of disability and high cost of treatment. According to global data, about 15–25% of diabetic patients will develop foot ulcers during

the course of their illness, and 20% of patients with severe conditions will eventually have to have their limbs amputated. Therefore, early intervention measures for high-risk groups of diabetic foot in the community are the key to prevention and control^[1,2]. However, there are some problems in the traditional community chronic disease management model, such as incoherent health management, patients not cooperating as required, and unsmooth transfer mechanisms to other hospitals for treatment, etc. This makes the prevention and control of foot risks for high-risk groups less effective. In recent years, the advancement of the hierarchical diagnosis and treatment system has brought new methods to chronic disease management. Family doctor teams are the core of primary medical services. Whether they can effectively intervene in high-risk groups of diabetic foot by integrating hierarchical diagnosis and treatment resources requires actual evidence to prove. Based on community practice, this study analyzes the management effect of a family doctor team combined with a hierarchical diagnosis and treatment model on high-risk groups of diabetic foot.

2. Materials and methods

2.1. General information

120 high-risk patients with diabetic foot who underwent community screening from March 2020 to March 2023 were selected and randomly divided into a control group and an observation group of 60 cases each. The age of the control group was (62.35 ± 7.24) years, the duration of diabetes (8.53 ± 2.17) years, and the BMI (25.83 ± 3.16) kg/m²; the age of the observation group was (63.12 ± 6.95) years old, the duration of diabetes was (8.72 ± 2.05) years, and the BMI was (26.04 ± 3.28) kg/m². The baseline data of the two groups were comparable ($p > 0.05$).

2.1.1. Inclusion criteria

- (1) Aged 40–75 years old and meeting the high-risk screening criteria for diabetic foot;
- (2) Fasting blood glucose ≥ 7.0 mmol/L or glycosylated hemoglobin $\geq 7.0\%$;
- (3) Voluntarily signed informed consent.

2.1.2. Exclusion criteria

- (1) Combined with severe cardiorenal complications or history of lower limb amputation;
- (2) Presence of mental illness or cognitive impairment;
- (3) Participation in other diabetes intervention studies in the past 3 months.

2.2. Method

The control group implements routine chronic disease management. Specific measures include regular follow-up calls to understand the patient's recent physical condition and blood sugar control. Patients are organized to go to the community health service center for a routine physical examination every three months (physical examination items include height, weight, blood pressure measurement, and blood sugar, blood lipids and other blood index tests). At the same time, patients are given popular science propaganda materials about diabetes and diabetic foot and informed of daily diet, exercise and other precautions.

The observation group adopts hierarchical diagnosis and treatment intervention led by the family doctor team. The specific measures are as follows.

- (1) Personalized assessment and plan formulation, that is, the family doctor team will visit the patient within one week of enrollment to collect the patient's medical history in detail (including the course of diabetes, previous treatment plans, and whether they have experienced foot discomfort). or injury experience, etc.), while using professional tools to measure the patient's foot skin temperature, dorsalis pedis artery pulsation, and evaluate neurosensory function. Based on the evaluation results, a personalized disease management plan including blood sugar control goals, foot care points, exercise and diet plans is formulated for each patient.

- (2) Regular health guidance and training, organize a monthly health lecture for high-risk groups of diabetic foot taught by endocrinologists, nutritionists, rehabilitation therapists and other professionals (the lecture covers the pathogenesis of diabetic foot, daily foot care skills, such as the correct water temperature for foot washing should be controlled at around 37 °C, gently dry the feet with a soft towel, especially between the toes, choose loose and breathable shoes and socks, etc., and Reasonable diet, emphasizing low-sugar, high-fiber diet and controlling total daily caloric intake, as well as suitable exercise methods, such as slow walking, Tai Chi, etc., while guiding exercise intensity and time and reminding to avoid fasting exercise and excessive foot pressure), one-on-one health guidance is carried out every quarter, and the family doctor provides targeted adjustment suggestions and detailed guidance based on the patient's recent changes in condition and implementation of the plan.
- (3) Blood sugar and foot condition monitoring. Patients are equipped with a portable blood glucose meter and instructed to correctly use and record fasting and 2-hour postprandial blood sugar. The family doctor follows up via phone or WeChat every week to understand the blood sugar monitoring results and adjust the blood sugar reduction plan if necessary. The patient is required to check the foot by himself every day and observe whether there are any abnormalities such as skin damage, blisters, redness, corns, etc. If problems are found, contact the family doctor in time. The family doctor will come to check within 24 hours after receiving the feedback and conduct preliminary treatment and evaluate whether referral is needed based on the foot condition.
- (4) Hierarchical referral management. When a patient has poor blood sugar control (fasting blood sugar > 10 mmol/L for three consecutive days or blood sugar 2 hours after a meal > 15 mmol/L), ulcers on the foot that are difficult to heal, signs of infection (such as increased local redness, swelling, heat and pain, purulent secretions, etc.) or other serious complications, the family doctor will promptly refer the patient to the patient in accordance with the principles of hierarchical diagnosis and treatment. The patient is referred to the corresponding specialty of the higher-level hospital. Before the transfer, the family doctor fills out the referral form in detail (indicating the patient's basic information, condition introduction, preliminary treatment, etc.) and communicates well with the higher-level hospital. After the patient is transferred, the family doctor continues to track the diagnosis and treatment process. When the patient's condition is stable and transferred back to the community, he will formulate a follow-up rehabilitation and management plan for the patient based on the diagnosis and treatment recommendations of the higher-level hospital.

2.3. Observation indicators

Compare the differences in the foot risk assessment system (DFS score), self-management behavior scale (DSMQ score), graded referral implementation rate, blood glucose metabolism indicators, and incidence of foot complications between the two groups after 12 months of intervention.

2.4. Statistical methods

The data were processed with SPSS22.0 software, and χ^2 statistics and *t* test were performed. $p < 0.05$ indicated that the difference was significant.

3. Results

3.1. Comparison of foot risk assessment system (DFS score) and self-management behavior scale (DSMQ score) between the two groups

The observation group is better than the control group, $p < 0.05$, see **Table 1**.

Table 1. Comparison of foot risk assessment system (DFS score) and self-management behavior scale (DSMQ score) between two groups ($\bar{x} \pm s$, points)

Group	DFS score (pre-intervention)	DFS score (post-intervention)	DSMQ score (pre-intervention)	DSMQ score (post-intervention)
Observation group (n = 60)	6.15 \pm 1.32	2.13 \pm 0.12	41.25 \pm 5.16	67.83 \pm 6.14
Control group (n = 60)	6.14 \pm 1.51	3.23 \pm 0.34	40.89 \pm 5.33	53.27 \pm 5.89
<i>t</i>	0.039	23.632	0.376	13.255
<i>p</i>	0.969	0.000	0.708	0.000

3.2. Comparison of hierarchical referral implementation rate and blood sugar

The observation group was better, $p < 0.05$. As shown in Table 2.

Table 2. Comparison of hierarchical referral implementation and blood sugar between the two groups

Group	Graded referral implementation rate	Fasting blood glucose (mmol/L)	Glycated hemoglobin (%)
Observation group (n = 60)	58 (96.67)	6.28 \pm 0.82	6.57 \pm 0.75
Control group (n = 60)	46 (73.33)	7.65 \pm 1.03	7.92 \pm 0.98
t/χ^2	10.385	8.060	8.474
<i>p</i>	0.001	0.000	0.000

3.3. Comparison of foot complications between the two groups

The total incidence rate of foot complications in the observation group was lower than that in the control group ($p < 0.05$) (see Table 3).

Table 3. Comparison of foot complications between the two groups [n (%)]

Group	Superficial ulcer (number of cases)	Deep infection (number of cases)	Abscess formation (number of cases)	Overall incidence (number of cases)
Observation group (n = 60)	2 (3.33)	1 (1.67)	0 (0.00)	3 (5.00)
Control group (n = 60)	8 (13.33)	3 (5.00)	2 (3.33)	13 (21.67)
χ^2				7.212
<i>p</i>				0.007

4. Discussion

Diabetic foot is one of the most serious chronic complications caused by diabetes. It has a high possibility of disability and recurrence, which has become a major problem facing the global public health field. Therefore, finding an efficient and accurate management model has become the key to prevent and control diabetic foot in the community. The emergence of the joint hierarchical diagnosis and treatment model of family doctor teams provides new ideas to solve these problems. This model has shown obvious benefits in the disease management of high-risk groups of diabetic foot by integrating community medical resources, optimizing the diagnosis and treatment process, and strengthening cooperation between doctors and patients.

Judging from the changes in DFS scores, after intervention measures were taken, the DFS scores of the observation group were much lower than those of the control group. This has a lot to do with the accuracy of the family doctor team's joint hierarchical diagnosis and treatment model in foot risk assessment and intervention. The occurrence and development of diabetic foot is a gradual process. Factors such as foot neuropathy, vascular disease, and foot deformity will increase the risk of the foot. However, conventional chronic disease management only involves simple assessment through regular physical examinations, and it is difficult to comprehensively and dynamically grasp the condition of the patient's foot ^[3]. In the model adopted by the observation group, the family doctor team will conduct a detailed assessment of the patient's foot when he or she joins the study, including skin temperature, dorsalis pedis artery pulsation, neurosensory function and other indicators. It can accurately identify potential risk points in the foot and adjust intervention strategies to ensure the timeliness and effectiveness of risk assessment and intervention, thus significantly reducing the DFS score.

The Self-Management Behavior Scale (DSMQ score) improved more significantly in the observation group because this model is both systematic and targeted in cultivating patients' self-management abilities. The family doctor team gives health lectures every month and provides one-on-one health guidance to patients every quarter. This provides patients with systematic self-management knowledge training. The lectures combine the characteristics of diabetic foot specialists and explain in detail the steps of foot care, correct blood sugar monitoring methods, how diet and exercise affect blood sugar and foot health, etc., so that patients can understand the importance of self-management and know how to do it. One-on-one guidance will provide targeted guidance according to the patient's differences and help patients deal with practical problems encountered in the self-management process ^[4]. Moreover, the family doctor team continues to strengthen the patient's self-management concept through continuous follow-up and communication, prompting the patient to form good self-management habits. The patient's self-management ability has been significantly improved, and the DSMQ score has also been significantly improved.

In terms of the implementation rate of hierarchical referrals, the observation group is much higher than the control group. This also shows that the family doctor team's joint hierarchical diagnosis and treatment model is fast and efficient in the referral mechanism, and the cooperation between doctors and other medical resources is smoother. The family doctor team can promptly detect patients to be transferred based on the referral criteria, such as poor blood sugar control, severe foot ulcers or infections. During the referral, the family doctor team fills out a detailed referral form and communicates with the superior hospital to ensure the smooth transfer of the patient. At the same time, after the patient is transferred, the family doctor team will follow up the patient's diagnosis and treatment process until the patient's condition stabilizes and returns to the community, and then formulate the next management plan based on the recommendations given by the superior hospital, thus forming a complete management closed loop of "community-superior hospital-community". Such a standardized and highly cooperative referral process has greatly improved the recognition and cooperation of patients and their families for referrals, thus greatly improving the implementation rate of hierarchical referrals ^[5].

The observation group also had good results in blood sugar metabolism indicators, which is related to the comprehensive and personalized strategy adopted by this model in blood sugar control. The family doctor team equipped patients with portable blood glucose meters, taught them how to correctly monitor blood sugar and keep records, and monitored the patients' blood sugar changes during weekly follow-up visits. Based on the blood sugar monitoring results, the family doctor team can promptly adjust the blood sugar-lowering plan, drug dosage or type, etc., so as to control blood sugar within the target range ^[6]. Personalized diet and exercise plans also provide strong support for blood sugar control. Nutritionists formulate appropriate diet plans based on the patient's weight, activity level, blood sugar levels, etc., control total daily caloric intake, and maintain nutritional balance; rehabilitation therapists guide patients to do appropriate exercises to improve the body's sensitivity to insulin and speed up blood sugar metabolism ^[7]. Such a comprehensive and personalized blood sugar management strategy allows patients to effectively control fasting blood sugar and glycated hemoglobin, and the effect is much better than that of the control group.

The probability of foot complications has been significantly reduced, which reflects the benefits of the family doctor team's hierarchical diagnosis and treatment model in the prevention and control of diabetic foot. The occurrence of diabetic foot complications is related to many factors such as increased foot risk, poor blood sugar control, poor self-management

ability, and untimely referral. Due to the above shortcomings of the conventional management model, the probability of foot complications is relatively high. The observation group used accurate foot risk assessment and Intervention effectively reduces foot risks and reduces the possibility of foot injuries; by improving the patient's self-management ability, patients can detect abnormalities in the foot in time and take appropriate treatment measures to prevent further progression of the disease; through an efficient hierarchical referral mechanism, patients with serious foot problems can go to higher-level hospitals for professional treatment in a timely manner to avoid further worsening of complications^[8]. At the same time, the improvement of blood sugar metabolism indicators reduces the damage to foot nerves and blood vessels caused by high blood sugar, and fundamentally reduces the risk of foot complications. The combination of these factors resulted in the incidence of foot complications in the observation group being significantly lower than that in the control group.

In general, the application of the hierarchical diagnosis and treatment model jointly conducted by family doctor teams among high-risk groups of diabetic foot in the community is effective and can be promoted and applied.

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Disclosure statement

The author declares no conflict of interest.

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