

Effect of Health Education by Specialized Nurses on the Prevention and Treatment of Diabetic Foot Ulcer

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Abstract: *Objective:* To analyze the preventive effect of specialized nurse health education on diabetic foot ulcers. *Methods:* From January 2022 to December 2022, 90 diabetic high-risk foot patients that were admitted to the Endocrinology Department of a general hospital in Macau that met the inclusion criteria were selected as the research subjects. The research subjects were randomly divided into an intervention group and a control group, with 45 cases in each group by mechanical sampling method. The foot care knowledge of the patients one month and three months after the intervention were evaluated and analyzed. *Results:* The scores of foot care knowledge in the intervention group were higher than those in the control group at one month and three months after the intervention, and the difference was statistically significant ($P < 0.05$). *Conclusion:* Health education by specialized nurses are essential in preventing and treating diabetic foot ulcers. Effective prevention and management of diabetic foot ulcers can be achieved through guidance on diet control, exercise, foot care, blood sugar monitoring, infection prevention, stress reduction, appropriate medication, and regular follow-up.

Keywords: Health education; Diabetes; Diabetic foot

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1. Introduction

Diabetes mellitus (DM) is a common metabolic disease characterized by elevated blood sugar. The primary pathogenesis is caused by factors such as insufficient insulin secretion in the body or abnormal glucose metabolism induced by functional defects with apparent characteristics ^[1]. Diabetes is affected by one's lifestyle. The incidence of diabetes has been increasing yearly as the population ages ^[2]. It is estimated that the global incidence of diabetes will increase to 642 million by 2040 ^[3]. In China, adult account for about 11.6% of cases ^[4]. In the extended course of diabetes, treatment can only provide relief but not a complete cure. Additionally, the longer the illness persists, the greater the likelihood of complications and associated risks to various organs. Uncontrolled diabetes can lead to an expanding array of complications, significantly impacting

a patient's quality of life, overall health, and mental well-being [5].

Diabetic foot is a common complication of diabetic patients. This type of complication is the most difficult to treat and is detrimental to the patient's feet. The clinical manifestations of diabetic foot are ulcers and infections, mainly reflected in foot lesions [6]. The treatment of diabetic foot depends on the characteristics of the disease, making it a relatively complex process. Diabetic foot is a prevalent complication with high disability rate and high medical costs [7]. Once diabetic foot occurs, it is tough to treat and often result in disability. Even when successfully treated, the recurrence rate within a year can be as high as 30% to 40% [8]. Therefore, diabetic foot management presents a global nursing challenge.

The ultimate goal of treatment for diabetic patients is to control the patient's blood sugar level and improve the patient's quality of life, as stated in the International Diabetes Federation (IDF) [9]. Early prevention of is essential for diabetic patients. Implementing early prevention measures can effectively mitigate the risk of diabetic foot and avert its occurrence [10]. Diabetic foot diagnostic criteria are based on the International Working Group on the Diabetic Foot (IWGDF): Patients at high risk for diabetic foot complications typically do not have active ulcers but may exhibit peripheral neuropathy; they may also have no foot deformities or peripheral arterial inflammation, or they might have a history of foot ulcers, lower extremity issues, or foot amputations [11]. Patients at risk of developing diabetic foot complications should undergo regular assessments of peripheral foot nerves and lower extremity blood vessels. This helps ensure early detection of any adverse foot conditions and prevents the worsening of the patient's condition due to inadequate management and treatment. Therefore, in-depth research is needed to identify the occurrence factors of diabetic high-risk feet, improve the level of health education for patients, and prevent the occurrence of diabetic foot [12].

2. Material and methods

2.1. General information

Ninety diabetic high-risk foot patients who met the inclusion criteria who were admitted to the Endocrinology Department of a general hospital in Macau from January 2022 to December 2022 were selected as the research subjects. The patients were randomly divided into an intervention group and a control group (45 cases in each group) by mechanical sampling.

2.2. Methods

The control group underwent traditional health education, in which health education was carried out one-on-one or in groups. The educational approach was adjusted based on the patients' understanding, emphasizing the importance of grasping the health education content and following the educator's guidance. When patients were found to deviate from healthy lifestyle habits, they were encouraged to make corrections and adopt healthier habits. The education program lasted for two weeks, with one-on-one education sessions in the first week lasting about 20 minutes, primarily focusing on diabetes knowledge. In the second week, health education sessions were carried out in groups lasting 40–50 minutes.

Meanwhile, the patients in the intervention group received routine health education under the concept of the Empowerment Theory, which took place through one-on-one sessions and group discussions. (i) Establishment of the health education team: The health education team of the intervention group consisted of an experienced diabetes specialist nurse and two specialized nurses. A graphic teaching manual was jointly prepared under the professional guidance of an attending physician and trauma therapist. Specialist nurses were invited to role-play as patients, and photographs were taken and made into pamphlets together with other relevant information. Regular training and assessments ensured the team's proficiency in diabetic foot prevention and

graphic education. The team held regular discussions to review the program, identify practical implementation challenges, and accumulate experiences to refine and mature the program. (ii) Additionally, patient information files were established, encompassing patients' basic information, medical history, complications, attending physicians, and specialized nurses. Furthermore, assessments were conducted to evaluate patient-related knowledge scores, including foot-related knowledge, patient empowerment abilities, and foot care capabilities.

2.3. Statistical analysis

Statistical analysis was performed using SPSS 25.0. Percentages were used to represent counting data, and χ^2 and t -tests were employed for analysis of count and measurement data, respectively. A significance level of $P < 0.05$ was considered statistically significant.

3. Results

3.1. Comparison of foot care knowledge scores before and after intervention between the two groups of patients

The scores of foot care knowledge in the intervention group were higher than those in the control group at one month and three months after the intervention, and the difference was statistically significant ($P < 0.05$). See **Table 1** for details.

Table 1. Analysis of variance for repeated measures of foot care knowledge scores of patients in the two groups before and after intervention

Group	Before intervention	One month after intervention	Three months after intervention	Time effect, F(P)	Time*grouping, F(P)
Control group	6.111 ± 2.357	7.089 ± 2.583 °	7.089 ± 2.583 °	473.589 (*)	289.743 (*)
Intervention group	5.422 ± 2.190	13.422 ± 0.543 △	13.422 ± 0.543 △		
<i>t</i>	1.4366	16.095	16.095		
<i>P</i>	0.1544	0.000	0.000		

Note: * indicates $P < 0.001$; △ indicates the comparison with the score of the patient's foot care knowledge before the intervention, $P < 0.001$; ° indicates the comparison with the score of the patient's foot care knowledge before the intervention, $P < 0.05$.

3.2. Comparison of foot care behavior scores before and after intervention between the two groups of patients

Before the intervention, there was no statistical difference between foot care behavior scores of the intervention group and the control group ($P > 0.05$). However, the scores of foot care behaviors of patients one month after the intervention and three months after intervention of the intervention group were higher than those of the control group ($P < 0.05$). See **Table 2** for more details.

Table 2. Analysis of variance for repeated measures of the foot care behavior scores of the two groups of patients before and after the intervention

Group	Before intervention	One month after intervention	Three months after intervention	Time effect F(P)	Time*Packet F(P)
Control group	36.311 ± 3.469	37.533 ± 3.307 °	39.222 ± 3.535 △	772.748 (*)	448.039 (*)
Intervention group	35.044 ± 3.254	45.800 ± 2.590 △	57.467 ± 3.348 △▲		
<i>t</i>	1.787	13.201	25.138		
<i>P</i>	0.077	0.000	0.000		

Note: * indicates $P < 0.001$; △ indicates the comparison with the foot care behavior score of patients before intervention, $P < 0.001$; ° indicates the comparison with the foot care behavior score of patients before intervention, $P < 0.05$; ▲ represents comparison with patients one month after intervention in terms of foot care behavior scores, $P < 0.001$.

4. Discussion

Diabetic foot ulcer is one of the common complications of diabetic patients, and its prevention and treatment are essential. (1) Diet control is the primary measure for preventing and treating diabetic foot ulcers. Specialist nurses should guide patients to control their sugar intake and reduce high-sugar foods to lower blood sugar levels. At the same time, patients are encouraged to increase dietary fiber intake by eating fruits and vegetable. In addition, patients are advised to consume protein, fat, and minerals in moderation to keep the body functioning correctly. (2) Exercise help control blood sugar, enhance physical fitness, and improves immunity. Specialist nurses should encourage diabetic patients to perform moderate exercises like walking and Tai Chi. When exercising, one should pay attention to gradually increasing the intensity and avoid overexertion to reduce the risk of a foot injury. (3) Foot care is the key to preventing diabetic foot ulcers. Specialist nurses should instruct patients to keep their feet clean, wash them daily, pay attention to changes in their skin, and look out for skin lesions to treat them in time. At the same time, it is recommended that patients use appropriate footwear, avoid wearing shoes that are too tight or loose, reduce friction and extrusion, so as to prevent the occurrence of foot ulcers. (4) Good blood sugar control can reduce the incidence of diabetic foot ulcers. Specialist nurses should advise patients to monitor blood sugar regularly and take their medications according to their prescriptions to keep their blood sugar under control. Nurses should also guide the patients and their families to use blood glucose monitoring equipment correctly to improve self-management ability and compliance. (5) Infection prevention is crucial for preventing and treating diabetic foot ulcers. Specialist nurses should advise patients to keep their skin clean and wash their hands frequently to avoid skin damage and infection. Besides, the patients and their families should be guided on wound handling, such as using sterile dressings. If symptoms of infection are found, patients should seek medical attention promptly. (6) Stress plays a detrimental role in the onset and progression of diabetic foot ulcers. Specialist nurses should monitor patients' psychological well-being and offer psychological support and reassurance. Patients are encouraged to manage stress through techniques such as meditation and relaxation yoga to maintain a positive mood. Additionally, patients should be motivated to engage in social activities, bolster social support networks, and enhance their overall quality of life. (7) Rational drug use is crucial for treating and preventing diabetic foot ulcers. Specialist nurses should introduce to patients the effects, side effects, and proper administration of the medications in detail and remind patients to take them on them and in the right amount. Additionally, the patients should also be given the right prescription with a suitable type of drug and dosage. (8) Regular follow-up is helpful for timely detection and treatment of early symptoms of diabetic foot ulcers. Specialist nurses should advise patients to conduct regular foot examinations and deal with any abnormalities in time. At the same time, according to the patient's condition, adjust the treatment plan and follow-up time to improve the treatment effect and the patient's quality of life.

Paired comparisons were made for foot care knowledge scores among patients before the intervention, one month after the intervention, and three months after the intervention. The results showed that the foot care knowledge scores of patients one month and three months after the intervention were significantly higher than those before the intervention ($P < 0.001$). However, there was no statistically significant difference in scores between one month and three months after the intervention. The foot care behavior scores of the intervention group were 35.044 ± 3.254 , 45.800 ± 2.590 , and 57.467 ± 3.348 before the intervention, one month after the intervention, and three months after the intervention, respectively. On the other hand, the foot care behavior scores of the control group 36.311 ± 3.469 , 37.533 ± 3.307 , 39.222 ± 3.535 before the intervention, one month after the intervention, and three months after the intervention, respectively. The time effect was 772.748, and the time*grouping was 448.039. There were significant differences in these indicators $P < 0.05$ after the intervention between the two groups, indicating that the development trend of the foot care behavior scores of patients in the control group and the intervention group is inconsistent. However, what is clear is that the score

of the foot care behavior of the intervention group patients increases with the intervention time.

5. Conclusion

Specialist nurses play an essential role in preventing and treating diabetic foot ulcers in health education. Through guidance on diet control, exercise and exercise, foot care, blood sugar control, infection prevention, stress reduction, rational medication, and regular follow-up, diabetic foot ulcers can be prevented and managed effectively. At the same time, specialist nurses in health education must pay attention to their patients' psychological status and social support and improve their quality of life.

Disclosure statement

The authors declare no conflict of interest.

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