Original article

Effect of Internet technology on extended care in elderly patients with diabetic feet

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ABSTRACT

Objective: To evaluate the effect of Internet technology on continuing nursing in elderly patients with diabetic feet.

Method: From January 2015 to July 2016, 12 elderly patients with diabetic foot ulcers were enrolled from the Endocrinology Department in our hospital. We used “WeChat”, “E nursing” and other Internet technologies to perform remote extended care and to observe the foot ulcer outcomes.

Results: All foot ulcers healed with a wound healing time between 38 and 73 days (average 57.08 ± 12.69 days). Patients did not need to travel long distances to seek medical treatment for foot ulcers, improving their satisfaction.

Conclusions: The implementation of extended care for elderly patients with diabetic foot ulcers was based on the application of Internet technology. It is helpful to facilitate medical treatment, share high quality health resources and promote disease rehabilitation.

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1. Introduction

Diabetic foot is one of the most common and serious chronic complications of diabetes, affecting approximately 15% of diabetes patients who are diagnosed with diabetes at least once in their lifetime.1,2 With the increasing of age and course of the disease, the incidence of diabetic foot is increasing. Therefore, elderly patients have a high risk of experiencing diabetic feet.3 Due to aging, high blood sugar, lower limb ischemia and other reasons, diabetic foot ulcers heal poorly.4 Patients with diabetic foot ulcers often require continuing care after discharge. However, most elderly patients are unwilling or unable to continuously seek care at a health center because of the long journey, inconvenience of travel, economic conditions and other considerations. As a result, their condition can deteriorate and result in amputation or other life-threatening complications. Therefore, it is urgent to provide extended care services to these patients. In this study, 12 elderly patients with diabetic foot ulcers received extended care services via Internet technology and obtained good outcomes.

2. Data and methods

2.1. General information

From January 2015 to July 2016, 12 elderly patients with diabetic foot ulcers were enrolled from the Endocrinology Department and Diabetic Foot Integration Clinic in our hospital. Eight patients were male and four were female. The age of the patients was 61–79 years old (70.33 ± 5.76 years old), diabetes courses were 18–42 years (27.5 ± 7.37 years) and HbA1c was 6.7%–7.3% (6.99 ± 0.20%). While there were 9 cases with toe ulcers, there was only one each of dorsal, heel, and ankle ulcers. The Wagner classification was as follows: Grade I in 3 cases, Grade II in 8 cases and Grade III in 1 case. There were 3 cases associated with onychomycosis, 6 cases with finger lesions and 3 cases with both. All patients also had peripheral neuropathy, 2 patients had diabetic retinopathy, 4 patients had diabetic nephropathy and 4 patients had coronary heart disease (CHD). The ankle brachial index (ABI), measured by a Doppler blood flow detector, showed that 8 patients had mild vascular
lesions (0.7 ≤ ABI < 0.9) and 4 patients lacked obvious lesions (0.9 ≤ ABI ≤ 1.3).

2.2. Methods

2.2.1. Nursing care in hospital

First, blood glucose was strictly controlled in combination with systemic support treatment, such as neurotrophic drugs, vasodilators, anti-infection agents and others, to promote ulcer healing. Second, wound care was provided as part of systemic treatment, including peripheral neuropathy and peripheral vascular disease screening as well as observation of foot deformity, nail ringworm, corpus callosum, fungal infection, pain, skin temperature, footwear, X-ray examination for bone destruction, and microbial sampling for inspection. Then, we washed the wound with physiological saline and removed secretions and necrotic tissue to ensure the wound was completely clean. After debridement, a suitable wound dressing was chosen according to the ulcer properties. When the wound exudation increased or was infected, alginate silver ion dressing was changed once every 2–3 days. Otherwise, an oil gauze silver ion dressing was selected. Considering the wound packing, and excessive amount of dressing should not be used and the bandaging should not be too tight or thick to avoid compression. Patients were instructed to decrease their walking time, limiting weight-bearing on the foot. If patients had a fungal infection and nail deformity hyperplasia, malformed nails were removed to reduce local tissue compression and tension of the ulcer wound as well as to promote granulation tissues infiltration and healing. We also applied anti-fungal drugs to the nail edge and toe joints 1–2 times per day to control infection.

2.2.2. Extended care

After they received systematic treatment and care at the Department of Endocrinology and the Diabetic Foot Integration Clinic, a comprehensive evaluation was performed to determine whether to start an extended care model for elderly patients with diabetic foot ulcers. The medical expert team formulated a follow-up treatment and care program to support patients receiving continuous rehabilitation care at home. (1) Nursing experts, patients and their families participated in one-on-one remote communication using the "WeChat" platform. Patients and their families updated nursing experts on the status of their foot ulcers by sending photos, audio or text. According to the provided information, nursing experts gave wound care guidance and foot care health education to promote ulcer healing and prevent recurrence. (2) With the help of "E Nursing", an Internet communication platform, patients were able to submit questions to the nursing experts at any time. These experts consisted of clinical nurse specialists who provided 1-min voice responses to each question. They addressed patients' problems in a timely fashion by providing real-time, rapid responses through voice communication, promoting ulcer healing. "E Nursing" ensured effective information communication over a short time without interfering with the experts’ daily workflow.

3. Results

In this study, diabetic foot care specialists provided free extended care services for elderly patients with diabetic foot ulcers in their downtime. Eight cases agreed to receive extended care services by "WeChat". Among them, one patient's foot ulcer wound was large and required remote nursing instruction 3 times a week for 30–45 min each time. Seven patients had smaller foot ulcers and were treated with remote care 1-2 times a week for 15–20 min each time. To understand the changes in the patients' conditions and provide individualized nursing instructions, clear pictures of the ulcer wounds were needed, which were sent to nursing experts via "WeChat" during each session. Four cases agreed to receive extended care services via "E Nursing". Each patient participated in 3–4 sessions consisting of eight one-on-one questions that experts answered. All 12 cases of foot ulcers were healed; the wound healing time was 38–73 days (average 57.08 ± 12.69 days). In the process of extended care services, nursing experts answered patients’ questions in a timely manner and provided professional and effective suggestions. Patients did not have to travel long distances to seek medical treatment for their foot ulcers, improving their satisfaction.

4. Discussion

4.1. Extended care for elderly diabetic foot ulcers is urgently needed

With their increasing ages and disease course, elderly patients with diabetes frequently also have peripheral neuropathy and vascular lesions, leading to diabetic foot ulcers that poorly heal over a long treatment time. The Japanese National Center for Global Health and Medicine found that the average healing times for neural, neuro-ischemic and ischemic ulcers were, respectively, 70, 113 and 233 days. The diabetic foot ulcer healing time is far longer than the average hospital stay for patients with diabetes; therefore, patients require long-term foot ulcer care after discharge. However, because of their chronic disease, aging and other reasons, elderly diabetic patients' self-care abilities are decreased and long-term care can be inconvenient. As a result, their medical adherence can be decreased to the point that foot ulcers do not heal and instead progress. Therefore, extended care is particularly important for elderly diabetic foot ulcer patients after discharge. An extended care model could reduce patients' discharge blood sugar levels and improve patients’ and their families' mastery of diabetic foot related knowledge, promoting ulcer healing. Wang et al found that the "Hospital-Community-family" extended care model could effectively promote the healing of diabetic foot ulcers in the elderly after providing extended care for 24 cases of elderly patients with diabetic foot ulcers.

4.2. Internet technology facilitated implementation of extended care and helped patients seek medical treatment

At the time of this study, our hospital was located in the Shanghai downtown area, but all cases lived in the suburbs of Shanghai. Because of the long journeys and inconvenience of traffic, patients hardly travel outside of their homes on their own; instead, they are often accompanied by family members. Such travel can consume significant resources such that many patients prefer home care over hospital care. However, patients face challenges when trying to receive professional diabetic foot ulcers care at home, which interferes with ulcer healing. Therefore, it is urgent to identify a new, convenient approach for nursing experts to help patients and their families perform professional foot ulcer care at home. Internet technology allows for convenient, quick, real-time remote information transmission, meeting the above requirements and providing conditions for the implementation of extended care in elderly diabetic foot ulcer's "WeChat" and "E Nursing" are offered over the Internet and allow nursing experts, patients and their families to participate in one-on-one remote communication by sending texts, pictures, videos, voice recordings and other information so that patients can receive professional diabetic foot ulcer care at home. This has facilitated patient treatment, decreasing the need to undergo a tiring journey, meeting
patients’ home care wishes, saving on human and material resources and improving patient satisfaction. At the same time, “WeChat” and “E Nursing” have powerful communication infrastructure that can help patients and their families ask questions at any time. The real-time, quick interaction ensured problems could be addressed in a timely manner without interfering with nursing experts’ daily workflow.

4.3. Internet technology facilitated high quality health resource sharing, and could promote disease recovery

At present, health resources are limited and unevenly distributed in our country. Some patients’ houses are quite far from medical service sites. The primary hospital medical resources are insufficient to meet the health care needs of elderly patients with diabetic foot ulcers. Therefore, patients need to travel to large hospitals that are far from their houses to receive effective care. As a result, large hospitals have been overloaded with an overwhelming workload, tiring medical staff and leading to doctor-patient conflicts. In this study, with the help of “WeChat”, “E Nursing” and other Internet assisted technology, patients only had to seek treatment at large hospitals in the early stage of treatment. When their problems became stable, they could continue professional foot ulcer care at home. The expert team consisted of clinical nurse specialists who had senior professional titles, a wealth of clinical experience, accurate comprehensive assessment capabilities and superb professional skills. The experts had a profound understanding of the patients when they were hospitalized and provided a continuous professional diabetic foot ulcer care program after discharge. They performed the overall evaluation according to real-time information feedback provided by the patients and then identified and addressed problems in a timely manner. If necessary, patients should be treated immediately to avoid further disease progression, and it is important for them to have access to extended care safety at home as well as high quality health resources that promote rehabilitation.

5. Conclusions

In today’s era of economic globalization, application of Internet technology is increasingly broadened. We hope that Internet technology can better meet the needs of patients, offering an extensive, rich and convenient approach for providing extended care services in the future. We plan to support the implementation of professional home care by developing additional multifunctional, effective, practical and user-friendly control App software that promotes the rehabilitation of patients and decreases the reliance on limited health resources.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Conflicts of interest

All contributing authors declare no conflicts of interest.

References
