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Review article

The outcomes and influencing factors of telecare managing patients with type 2 diabetes

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ABSTRACT

Objective: This review aimed to examine the outcomes and influencing factors of telecare management of type 2 diabetes, to provide some advice for medical staff and to inform decision makers to promote the development of telecare in specific areas.

Sources of information: The reference articles were mainly selected from the CNKI, Wanfang Database, PubMed, Science Direct and other resources. Following a systematic, comprehensive search of databases, a total of 1062 qualitative, quantitative or mixed studies were initially selected; after careful review and screening, 45 studies were coded and analysed.

Inclusion criteria: The articles were selected using the words “diabetic”, “type 2 diabetes”, “telecare, telenursing, remote care or telemedicine”, “outcomes or effect” and “influencing factors”. Type 2 diabetic who were intervened by electronic equipment are included. The patients who just have type1 diabetes are excluded, and those who were treated without using electronic equipment also are excluded.

Results: Telecare produces positive results with a variety of outcomes, such as an improvement in the overall status of patients with type 2 diabetes, making full use of the medical staff resources and promoting the popularity of the hospital remotely; however, the factors which may prevent the development of telecare are various.

Conclusions: Telecare has a positive effect in all aspects. With the development of technology and gradual changes in the people's concept of e-health, telecare may have a brilliant future and may play a more important role in promoting human health.

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Diabetes has become one of the most serious problems in public health in the 21st century.¹ Previous studies have shown that the prevalence of diabetes in adults aged 20 and older has reached 9.7%; there are more than 92 million adults suffering from diabetes, and our country has the largest population with this disease in the world.² Among these adults with diabetes, 95%–97% of patients are type 2 diabetics.³ Telecare is a new type of care that provides health care services to clients by transmitting, managing and coordinating health information via electronic communication technology.⁴ Previous studies have shown that telecare can improve health awareness in patients with type 2 diabetes and reduce negative emotions, thereby improve their quality of life.^{5,6} To better promote the implementation of telecare in specific areas, this review will systematically examine recent studies that are relevant to telecare and that were used to manage patients with type 2 diabetes and will provide some useful advice for specialists and to inform decision makers.

1. Concepts related to telemedicine

Several definitions have been adopted for telemedicine, which may be summarized as a comprehensive applied science using computer, multimedia and other remote communication technologies to transmit medical information to diagnose, treat, nurse, teach and implement other medical activities.

1.1. Telemedicine

Telemedicine or Telehealth consists of the use of medical and other health information exchanged via electronic communications from one site to another with the intent of improving the health status of the consumers,⁷ including services and activities such as remote diagnosis, consultation, education and information services. Both the United States and Europe have developed better telemedicine than other countries. In the 1960s, the United States used remote communication and computer technologies in telemedicine, which greatly promoted the development of telemedicine. However, the use of telemedicine began relatively late in our country.

1.2. Telecare

Telecare enhances patient care, which involves the use of electromagnetic channels to transmit voice, data and video communication signals.⁸ Telecare services include remote monitoring, emergency, consultation and other remote nursing practices. Telecare is an important part of telemedicine and develops with the development of telemedicine.

2. Outcomes of telecare management of patients with type 2 diabetes

Type 2 diabetes is a complex condition that requires multiple lifestyle changes, including dietary changes, physical activity changes, taking medication and glucose monitoring.⁹ We analyse the outcomes of managed patients with type 2 diabetes by telecare using the following aspects.

2.1. Physiological outcomes

Currently, diabetes is treated mainly to stabilize blood sugar, slow the progression of the disease and control complications. However, only approximately 11.5% of diabetics have HbA1c < 6.5%, and the blood glucose levels of the vast majority (88.5%) of patients do not meet the target.¹⁰ Strict control of blood glucose can delay

and reduce the progression and incidence of complications. Noh and his colleagues¹¹ used a web-based integrated information system to control the levels of haemoglobin A1c (HbA1c) and postprandial glucose of type 2 diabetics and found that HbA1c and postprandial glucose levels were significantly lower in the intervention group. In addition, there was a higher frequency of telephone counselling and a more obvious decline in the extent of the patients' HbA1c levels. Moreover, compared to traditional health education, a web-based remote education system can be more convenient and effective.

2.2. Behavioural outcomes

Lifestyle modification and behavioural changes are the key components of diabetic management, particularly for type 2 diabetes.¹² Numerous studies have reported that lifestyle modification and disease management have a great effect on improving the control of blood glucose and reducing the complications related to diabetes.¹² Although diabetes self-management has been shown to be effective,^{12,13} many patients do not respond to it very well,¹⁴ and the increasing rates of diabetes make it imperative to identify several efficient and practical methods to perform diabetic self-management. The Internet and related mobile technologies are widely accessible, 24-h means to promote disease management and facilitate behavioural modification.¹⁵ Glasgow et al⁹ used web-based intervention to treat individuals with diabetes and found significant dietary changes in diabetic patients (e.g., eating habits and fat intake) compared to participants treated with non-web-based intervention. They observed that greater Internet use was associated with greater improvements in eating patterns. Glasgow also observed a correlation between greater Internet use and more physical activity.

2.3. Emotional outcomes

A meta-analysis found that approximately 11 percent of all patients with diabetes, who were assessed using standardized diagnostic interviews, suffered from depression.¹⁶ Depression is associated with poor mental health and harmful medical outcomes. People affected by comorbid depression exhibit a lower quality of life, a greater risk of diabetes-related complications and worse blood glucose control.^{17,18} Nobis used web-based intervention to treat the depression of the diabetic patients and found that the participants liked this method of intervention. Moreover, 95% of patients recommended this training to diabetic patients who needed mental help. Furthermore, the severity of depression in the intervention group was significantly lower than that in the observation group.⁶

3. Factors affecting the implementation of telecare in diabetes

The implementation of web-based interventions to assist with diabetic management has exploded over the past decade.^{19,20} Internet-based educational programs have demonstrated the ability to change behaviours and sometimes the patient's health status.²¹ The superiority of telecare has been well known,²² but telecare has not yet been adopted widely in our country. Many factors may affect the adoption and acceptance of these systems, which may be summarized in four aspects: factors related to computer equipment, knowledge and skills, patients and the medical staff.

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