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Application Progress of Mobile Health in Self-management of Patients with Osteoarthritis

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Abstract: *Osteoarthritis is a chronic and degenerative joint disease which poses a major threat to the health of the elderly and poses a serious economic burden on health care worldwide.Continuous self-health management has a positive impact on many aspects of OA, so self-management is recognized as the only alternative to surgical treatment. But patients generally have poor self-management ability. With the vigorous promotion of "Internet + health care", the intervention of mobile medicine makes self-management more practical in patients. This paper reviews the application of mobile health in self-management of patients with osteoarthritis in order to provide reference for better self-management of osteoarthritis.*

Keywords: *Mobile health; Osteoarthritis; Self-management; Review*

Osteoarthritis (OA) is a chronic inflammatory disease occurring in knee, hip, hand and spinal joints which often causes pain, stiffness and reduced movement [1], and is one of the main causes of disability in the elderly [2-3]. It is estimated that there are 300 million OA patients in the world, and knee osteoarthritis is the most common, accounting for 16% to 17% of the population aged 50 to 75 years [4]. Due to social trends such as aging, obesity and joint damage [5], people need to pay more attention to this disease. The latest OA treatment and management guidelines recognize that self-management can improve patients' self-awareness and promote them to play an active role in shared medical decisions [6]. However, due to the poor status of patients' self-management behaviors [7], effective self-management tools should be used to promote the change of patients' health behaviors. The usual way of self-management interventions used in the study are limited to face-to-face communication and telephone follow-up [8], to guarantee the patient adherence and in recent years because of the "Internet + Health" vigorously promote, mobile medical (mobile health) technology is gradually applied in the field [9], self-management support patients health and self management, There is great hope for promoting the treatment and management of OA, but the research of mobile health in OA self-management is still in its infancy in China. This paper reviews the application of mobile health in self-management of OA patients, aiming to provide a reference for better self-management of OA.

1. Introduction of mobile health

In 2006, the concept of mobile health was first proposed by Istepanian Rober, Royal Professor of Biomedical Engineering in the United Kingdom [10], and it is defined as a medical system that uses mobile communication and network devices to provide health services. Later, the Global Electronic Health Observatory of the World Health Organization defined it as: Medical and public health practices supported by mobile devices such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices [11]. Mobile medical changed the immobilized platform model, breaking the limited medical environment and resources, are not affected by time and space to manage patients, and more to support the patient's health and self management, in recent years, with the popularity of mobile devices and continuous technological progress and national attention to medical health, make mobile medical intervention in [12].

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2. The necessity of mobile medical application in self-management of patients with osteoarthritis

2.1 Osteoarthritis pose a serious health burden worldwide

Due to the irreversibility of OA symptoms, severe medical and health economic burden has been caused worldwide [13], and the annual medical cost in the United States alone amounts to 89.1 billion dollars [14]. Although total joint replacement is considered an effective treatment for OA, it should be considered only after the failure of conservative treatments such as health education, lifestyle change promotion, pain management, exercise and weight loss when overweight [15].

2.2 The quality of care in early OA conservative treatment can be improved by self-management

As the nursing quality of conservative treatment of OA is not ideal, the treatment effect is not good, and such unsatisfactory nursing quality can be improved by promoting self-management of OA patients [6]. Self-management is one of the biopsychosocial models which promotes the continuous treatment of OA through social psychological coping skills such as behavior change, role and emotion management [16]. Self-management of OA patients usually includes health education of OA symptoms and helping patients develop OA management goals and action plans. Studies have shown [17] that continuous self-health management has a positive impact on many aspects of OA, including pain relief, compliance improvement and quality of life improvement.

2.3 The intervention of mobile medical technology can improve patients' self-management behavior

However, self-management is still challenging for some patients. The lack of professional supervision and feedback will lead to a decrease in the number of OA patients participating in continuous medical treatment and rehabilitation, thus reducing the efficacy of the disease. In addition, the lack of medical equipment in rural areas will also affect the relevant efficacy. With the popularization and development of the Internet, mobile medical technology is increasingly applied in patient communication, monitoring and health education, and promotes patients to adhere to self-management [18]. There are three basic types of m-health. The first type is real-time interaction, which uses mobile devices to communicate in real time for medical diagnosis or consultation. The second type is non-real-time storage, that is, the required image data or information is stored in the equipment and replayed during consultation for remote diagnosis; The third type is remote monitoring, that is, physiological information is collected at the patient side and transmitted back to the doctor side for analysis, which is mostly used in the monitoring and management of chronic diseases. Difference from traditional medical care, mobile medical care expands time and space. Medical staff can conduct remote supervision and management of patients with the help of mobile devices, increasing real-time communication opportunities between patients living in remote areas and medical staff, and promoting self-management of patients [19].

3. Application of mobile health in OA patients' self-management abroad

3.1 SMS

SMS intervention was used earlier in foreign countries, and its effectiveness in promoting OA-related health behaviors has been verified [20]. It is still widely used today, and some studies have shown that health behaviors can continue even after SMS intervention is stopped [21]. Rachel et al. [22] used SMS to conduct a randomized controlled trial on patients with knee osteoarthritis who needed home exercise. On the 6th week of intervention, patients' own pain and exercise self-efficacy had a significant positive impact, and the intervention was widely accepted by patients, among which 96% of patients expressed their love for SMS service. 88% of patients thought SMS had a significant effect on promoting physical activity. Kim Bennell [23]to ensure that occupy the home exercise adherence of patients with knee osteoarthritis, adopted for 24 weeks half interactive SMS intervention, the study found that the main result of the SMS intervention group were superior to control group, prove that SMS intervened at 24 weeks, patients with knee osteoarthritis unsupervised family exercise plan comply with the conditions improve.

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3.2 App

Application (hereinafter referred to as App) is a kind of software that can be installed on mobile devices such as smart phones or tablet computers, usually free or low-cost [24]. Foreign studies show that the number of smart device users is expected to continue to grow in the next few years, and the growth trend is more obvious for the elderly, which will promote the development and use of App [25]. Early m-health interventions often relied on voice or text-based SMS services. The advent of apps and their increasing availability and ease of use have enriched m-health interventions that can be used for health behavior change. The latest OA management App launched abroad is an electronic self-management App based on the Fogg model of behavior change developed by T. Pelle et al. [26], named Dr.Bart App, which is equipped with four modules of health education, physical activity, vital signs and nutrition to support the use of OA patients in non-surgical treatment. The researchers assessed the short-term effects of App use at 3 and 6 months and found that App use significantly reduced the number of consultations at secondary healthcare facilities, improved knee/hip osteoarthritis outcome scores (KOOS/HOOS), and activated patients' confidence in coping with their own health knowledge and skills. However, in the study of Tanya Barber[27], some doctors reserved their attitude towards App, mainly because the patient group was mainly elderly, which might not be able to use App or lack of Wi-Fi support, leading to anxiety and worry of patients in the later stage. However, most patients still responded positively. It is believed that App can make the communication between patients and doctors more convenient.

3.3 Wearable devices

Wearable devices refer to devices that can be worn or worn on the human body. Monitoring is achieved through software support, data and cloud interaction [28]. Due to its convenience, wearable sensor systems and devices have been expanded in different application fields, especially in the field of medical care [29]. OA patients need long-term rehabilitation exercise, wearable devices can replace manual management and monitoring, real-time collection of patients' exercise information and feedback, according to the specific needs of each patient to help complete rehabilitation goals, promote their self-management, and maximize the quality of care. Athina Belsi et al. [30] conducted interviews with OA patients, and the results showed that wearable devices could not only promote communication between doctors and patients and clarify their management plans, but also achieve patient authorization and self-management to a certain extent, enabling patients to control and manage their own conditions more effectively. This is similar to the research results of Enrica Papi[31]. Although wearable technology has been recognized, its clinical application is currently poor. In most equipment, only simple data can be monitored, but complex data cannot be monitored, such as the standard of movement, posture, and there is also the problem of timely feedback.

4. Application of mobile health in OA patients' self-management in China

4.1 Telephone return visit

Phone back on the phone as the carrier, in establishing a standardized way back and return visit to record book, on the basis of an established period of time to visit hospitalized patients, and the nutritional support, rehabilitation exercise guidance suggestions such as health education way [32], because of its simple operation, low cost and wide application field, the characteristics of it had become one of the most commonly used follow-up tools for medical staff in China and has been used for the longest time. Some researchers [33] distributed self-management manuals to patients with osteoarthritis who were injected with joint improvement fluid in the outpatient department, and conducted biweekly telephone follow-up guidance on the basis of self-management. Six months later, it was found that WOMAC index value decreased and AIMS2-SF score improved in patients who were followed up by telephone. The results showed that health education and encouragement to patients by telephone return visit made patients' self-management more binding and the recovery effect was more significant. However, there are certain limitations in telephone return visit. Medical staff can only provide oral guidance, and elderly patients with poor hearing or understanding may not be able to cooperate or self-manage under guidance. With the rapid development of the Internet, WeChat, App and other health education channels that are not limited to oral guidance appear in the public's view, and telephone return visit can still be used as an auxiliary tool.

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4.2 WeChat

WeChat is a mobile tool for transferring text, pictures, videos and documents through the network, and has become one of the main communication tools due to its convenience and ease of operation [34]. According to the 2019 WeChat Data Report, the monthly active users of WeChat were 1.151 billion, an increase of 6% compared to 2018, which shows that WeChat has become a part of the People's Daily life [35]. It is often used for social communication, entertainment, learning and sharing. In addition, WeChat has become an effective channel for spreading health information in China in recent years. WeChat group and WeChat public platform are mainly used to push relevant health knowledge, punch in daily exercise and provide guidance, etc., which are widely used in chronic disease care. Wang Yunlin [36] et al adopted the combination of WeChat online and community offline for elderly patients with knee osteoarthritis who exercise at home, which not only ensured the effectiveness of intervention, but also extended the time and space for patients to recover. The results showed that, Self-management intervention with WeChat as the carrier increased the patients' lower limb muscle tone, improved knee motion, balance and mobility. Zou Huihua [37] believes that the intervention of WeChat can promote patients to better understand the disease, supervise and urge their own behavior, and facilitate the communication between patients and medical staff.

5. Outlook and summary

To sum up, osteoarthritis is a chronic, debilitating and degenerative joint disease, brought a great threat to the health of the elderly, patients often produce chronic pain and physiological function obstacle, to delay the development and progression of disease, self-management become besides the surgical treatment of choice [6], mobile medical intervention makes more implement self-management in patients. Abroad for mobile medical research earlier, now formed a mobile medical research center based in colleges and universities, is a diversified and still SMS, App, wearable devices, and other media of OA system of self-management guidance and health education.The domestic new reform policy promotion in China, mobile medical also gradually emerged in the medical field of vision, to increase the development of mobile medical, In the 14th Five-Year Plan, China still listed medical digital service as a key work [38], which is expected to be further explored and studied. Mobile medical treatment in our country has been known and accepted in recent years, but still exist the following problems need to be addressed: (1) Underutilization.Most of the patients with OA are elderly and some of them live in rural or remote areas. Due to their weak learning ability, they may not be able to use mobile medical devices or exploit device functions, resulting in a low utilization rate of devices. Therefore, the application of mobile health in OA self-management can be promoted by simplifying device functions, enlarging device fonts, reducing traffic required by device application, regularly teaching the use of devices, and guiding patients' family members to assist in the use of devices; (2) Security needs to be strengthened.Network fraud was familiar and resistance, and information disclosure system needs to input personal information are provoke alert and refused, so called for mobile medical equipment must respond to purify the Internet environment, guarantee the safety of application problems, be patient information is not exposed, safe and effective for patients with a mobile medical treatment environment; (3) The form of mobile-health is currently simple.The above can be seen, the domestic application in OA patient self-management by telephone return visit as a starting point, currently only to WeChat group function or public platform most see more, the lack of a more targeted mobile medical system or equipment, with OA self management be taken seriously by the people, the related equipment also needs to create and further application, can draw lessons from foreign research, According to the characteristics and preferences of diseases, mobile medical devices suitable for Chinese people are explored.

Mobile medical technology has unlimited potential, which can increase patients' access to evidence-based and effective medical resources at a low cost. With the common development and progress of science and technology and medical care, we hope to continue to explore the functions of mobile medical technology and solve the remaining problems, and effectively bring good news to patients.

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