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Fear of Movement in Patients with Coronary Heart Disease: A Comprehensive Review

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Abstract: *Cardiovascular disease (CVD)is a leading cause of death worldwide. Coronary heart disease (CHD), the most common type of CVD, is a major cause of morbidity and mortality. With the advancement of modern medicine, the survival rate and early prognosis of patients with CHD have been greatly improved, but long-term prognosis and quality of life still depend on secondary prevention.Exercise-based cardiac rehabilitation is a crucial intervention for the secondary prevention in patients with CHD, with benefits including improved physical condition, recovery from illness, improved drug treatment efficacy, enhanced immunity, lipid regulation, and improved myocardial blood supply and cardiac function. However, the prevalence of fear of movement in patients with CHD is high, which is an important factor affecting patient adherence to exercise and rehabilitation outcomes.This review summarizes the prevalence, influencing factors, and intervention measures in patients with CHD, to provide a reference for improving patient adherence to exercise and rehabilitation outcomes.*

Keywords: *coronary heart diseases, fear of movement, Cardiac rehabilitation*

1. Introduction

The 2020 “China Cardiovascular Health and Disease Report” shows that cardiovascular disease is the leading cause of death among urban and rural residents in China, with approximately 330 million people affected[1].Coronary artery atherosclerotic heart disease (CHD) is a common and prevalent cardiovascular condition[2].The Chinese expert consensus[3] suggests that all cardiac patients consider receiving exercise rehabilitation training as soon as possible after their condition is controlled. Cardiac rehabilitation is a multidisciplinary collaboration that mainly includes drug treatment, exercise prescription, diet and nutrition, smoking cessation intervention, sleep management, and psychological and social support. Physical activity and exercise occupy a core position in cardiac rehabilitation. They can not only improve the body's condition, promote recovery, and improve the effect of drug treatment, but can also enhance immunity, regulate blood lipids, promote myocardial blood perfusion, and improve heart function. Therefore, moderate exercise not only helps prevent cardiovascular disease but also plays a positive role in its treatment[4].

Fear of movement is a psychological phenomenon in which people have an excessive and irrational fear of movement because they are afraid that daily activities or exercise will cause harm to the body or re-injury. It is also known as kinesiophobia[5]. Although the safety and effectiveness of cardiac rehabilitation have been widely confirmed, most patients have weak self-management awareness and low compliance with exercise[6]. They may also doubt the safety of activities and avoid exercise or exercise less than prescribed. If a patient experiences a high level of fear of movement and avoids physical activity for a prolonged period of time, it can lead to deconditioning and the incapacity or disuse of the body's organs[7].This article provides a comprehensive review of the current research status on fear of movement in coronary heart disease patients, aiming to offer clinical researchers insights for anticipatory care and the development of effective intervention measures.

2. Concepts related to fear of movement

The concept of fear of movement (kinesiophobia) was first proposed by Kori et al[5] in 1990 in the context of low back pain to assess musculoskeletal pain. In 2012, Chinese scholar Hu Wen[8] translated it into Chinese as kinesiophobia, which refers to a patient's irrational fear of excessive movement or

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activity caused by a sense of vulnerability to painful injury or re-injury. It is often understood in connection with the fear-avoidance model[9].In the early days, kinesiophobia was mostly used in the field of chronic pain. Later, researchers gradually applied it to other fields. In 2012, Swedish scholar Back et al[10] first applied the concept of fear of movement to patients with coronary heart disease. In 2019, Lei Mengjie et al[11] introduced the fear of movement scale for patients with heart disease into China, opening up the exploration of fear of movement in patients with heart disease.Patients with coronary heart disease may experience chest discomfort, tightness, or pain. This experience may improve or disappear after drug or surgical treatment, but it may reappear later with increased exercise intensity or incorrect exercise methods. What patients fear is not the pain itself but the warning signs of physical discomfort. Patients are afraid that activities or physical exercises will harm or re-injure the body, so they may avoid activities or exercise altogether.

3. Current status of fear of movement in patients with coronary heart disease

In 2013, Swedish researchers Back et al[12] surveyed 332 patients with coronary heart disease (CHD) and found that 20% of them had a high level of fear of movement. In 2018, Back et al[13] found that the incidence of fear of movement in patients with acute coronary artery disease was 19% two weeks after discharge and 21.1% four months later.American researchers Farris et al[14] found that 40% to 50% of patients with cardiovascular disease have fear of movement. Knapik et al[15] conducted an in-depth study on Polish elderly patients with CHD and found that 76.3% of patients were afraid of movement. Italian researcher Brunetti et al[16] mainly included patients with acute coronary syndrome and acute heart failure in their study, and the results showed that the incidence of kinesiology was 83%.Chinese researcher Sun Miaomiao[17] found that the incidence of fear of movement in young and middle-aged patients with CHD is 41.76%, with a score of (39.05 ± 7.36). The score is higher than the research results of Chen Sixing et al[18], which may be due to the time of investigation, which was one year after coronary intervention. Cui Guipu et al[19] found in a study of 350 patients with CHD that the average score of fear of movement items was (2.72 ± 0.58). Liu Tingyang et al[20] investigated and found that the fear of movement score of 275 patients after coronary heart disease intervention was (46.67 ± 19.96) points, with an incidence rate of 20%. In both studies, the fear of movement scores were at a high level, and the patients' willingness to exercise was also low.Song Xiaomei et al[21] found that the incidence rate of fear of movement in patients with coronary heart disease and angina pectoris was 47.2%, which was higher than the results of the previous two studies. This may be related to the fact that the study subjects were patients with angina who experienced chest pain or discomfort during increased physical load, making them concerned that exercise might trigger or worsen these symptoms.Zhang Lijun et al[22] investigated 157 elderly patients with acute ST-segment elevation myocardial infarction after PCI. The score of fear of movement was (39.52 ± 8.63), which was at a high level, and the incidence rate of fear of movement was 52.9%. Wang Zi an et al[23] conducted a longitudinal study on patients with acute myocardial infarction after PCI. The results showed that the level of fear of movement began to increase slowly 1 week after surgery, peaked at 2 weeks after discharge, and began to gradually decrease after 2 weeks, but after 3 weeks after discharge, it has not dropped to normal levels and below for several months.

The above-mentioned studies show that fear of movement is common in patients with coronary heart disease, and the level of fear is high and lasts for a long time, especially in those who have experienced acute cardiovascular events. Therefore, early identification and effective intervention measures are very important to improve the participation rate and compliance of exercise rehabilitation in patients with coronary heart disease.

4. Factors influencing fear of movement in patients with coronary heart disease

4.1 Demographic and sociological factors

4.1.1 Gender

Research shows that gender is an important influencing factor in fear of movement in patients with coronary heart disease. Although a foreign studies[16] showed that the level of fear of exercise during hospitalization for acute coronary syndrome and acute heart failure was not affected by gender, a survey by Back et al[13] of 106 patients with acute coronary artery disease showed that women had a higher fear of movement score than men at 4 months after discharge, with a difference of 2.7 points. This is consistent with the results of domestic studies[24] conducted in China.This may be related to the

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fact that women often play multiple social roles, such as professional women, wives, and mothers. When facing stress and burden, they are more sensitive and have some difficulties in emotional regulation, making it difficult to escape the negative emotional impact.

4.1.2 Age

Study[25] has shown that age is significantly related to the degree of fear of movement in patients. In a Finnish study[26], it was shown that men over 55 years old and women over 65 years old had higher fear of movement scores than young people. The mean value in humans was higher than in younger patients. Song Xiaomei et al[25] also mentioned in the study that older patients have higher levels of fear of movement. This may be due to physiological aging and decline in physical function with age, muscle tolerance may be reduced, and there are more comorbidities and complications. The impact on exercise capacity is related to daily activities.

4.1.3 Educational level

Educational level has also been shown to be an important factor affecting fear of movement in patients with coronary heart disease. Studies have shown that patients with lower education levels tend to have higher levels of fear of movement[27, 28]. This may be because patients with higher education levels pay more attention to disease prevention and health maintenance. They may be more proactive and more obtain comprehensive medical information, follow the advice of medical professionals, and adopt an active and healthy lifestyle. However, study[17] has pointed out that patients with a college degree or above have higher levels of fear of movement than patients with a junior high school or high school education. This may be related to the fact that the subjects of the two studies were young and middle-aged patients. Young and middle-aged people often face multiple pressures from family and society, including taking care of children, parents, and fulfilling family obligations while pursuing career development and achieving personal goals. Being diagnosed with coronary heart disease can be a sudden shock that can lead to increased anxiety and fear, making them more likely to fear physical activity.

4.1.4 Economic conditions

Family income and payment methods[17] are also important factors that affect patients' fear of movement. Differences in payment methods affect patients' hospitalization expenses. Self-pay patients are more likely to develop fear of exercise than patients with medical insurance. Patients with a high reimbursement ratio bear lower medical expenses, so they are more willing to perform scientific exercise under the guidance of professional medical institutions. These patients are also less likely to experience physical discomfort during exercise and therefore have less fear of movement. In contrast, lower-income families may limit their physical activity due to concerns about medical costs, potentially increasing levels of fear of movement. Therefore, when formulating a sports rehabilitation plan, the patient's family income and payment method should be comprehensively considered to develop a personalized sports rehabilitation program that is suitable for the patient and can be adhered to in the long term.

4.1.5 Social support

Social support can affect patients' physical and mental health. Wang Yaxin[29] investigated 342 patients with first-time acute myocardial infarction, and the results showed that social support has nothing to do with fear of movement. The results were consistent with the 265 coronary heart disease patients surveyed by Tang Liya[30] in the community. Wang Luyao's[31] study showed that social support indirectly affects the level of fear of movement in patients with acute myocardial infarction. Overseas study[32] on patients with stable coronary heart disease and acute coronary syndrome 2-3 weeks after discharge have shown that social support is negatively correlated with kinesiophobia.This may be because social support is rarely included in domestic research on factors affecting fear of movement. There are mature community care systems abroad, but there are still some gaps between my country's community development level and foreign countries. This reminds us that with government support and policy promotion, we should continue to improve the community service system, improve the quality and scope of community nursing services, and actively encourage family members to participate

4.1.6 Aarital status

Cui Guipu et al[19] have shown that the level of fear of movement in married patients is lower than that in widowed patients. Married patients with coronary heart disease may be more likely to receive encouragement and support from family members, adopt a healthy lifestyle, participate in physical exercise and social activities, which can alleviate their fear of movement, but most studies have not

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clearly concluded that marital status is an influencing factor of fear of movement. This may be because marital status is usually affected by many other factors, such as culture, socioeconomic status, individual personality characteristics ,which factors may complicate the study results. Further research may need to explore the potential association between marital status and fear of movement in more detail and validate it in a wider sample.

It's important to note that sociodemographic factors may have varying effects in different cultural and societal contexts, and individual differences can be significant. Therefore, when studying the factors influencing fear of movement, it's essential to take all these factors into account for a better understanding and addressing of this issue.

4.2 Self-efficacy

A patient's level of self-efficacy has an important influence on how they face difficulties and challenges. When self-efficacy is high, patients are more likely to take proactive actions, persist in their efforts, and have greater confidence that they can complete tasks. On the contrary, patients with low self-efficacy are more likely to feel frustrated when faced with difficulties and may choose to avoid or give up. Wang Yaxin[30] found that the lower the self-efficacy of patients with first-episode acute myocardial infarction, the higher their level of fear of movement, which is consistent with the results of other domestic studies[32-34]. Foreign studies[35] also emphasize the need to adopt intervention strategies to enhance the self-efficacy of patients with coronary heart disease to improve compliance with cardiac rehabilitation exercises.

4.3 Physical exercise

Wang Xiaoxu et al[36] investigated 154 patients after percutaneous coronary stent implantation. The results showed that sedentary behavior in the past week is an influencing factor of fear of movement. A sedentary lifestyle will lead to physical weakness, which will further Reduce the patient's willingness to participate in physical activity[37]. Cui Guipu et al[19] found that patients who lack exercise habits have higher levels of fear of movement. A foreign study[26] showed that patients with more physical activity in leisure time have lower levels of exercise fear. At the same time, the researchers also found that moderate to high physical activity can significantly reduce the risk of patients with coronary heart disease developing high levels of fear of movement. Therefore, medical staff should publicize the benefits of moderate physical exercise to patients on physical and mental health, and provide relevant knowledge on cardiac rehabilitation to improve patients' enthusiasm for exercise.

4.4 Disease related factors

Studies have found that comorbidities such as heart failure, atrial fibrillation[12], hypertension[18], diabetes, stroke[19] and other diseases will increase patients' fear of movement. In addition, in the acute phase of the disease, the level of fear of movement is higher than in the stable phase[16], and the higher the cardiac function grade, the higher the level of fear of movement[24]. This may be because patients with multiple comorbidities often face complex health problems, and long-term illness and medical treatment lead to reduced physical strength and may cause discomfort during exercise. In addition, patients with multiple comorbidities may be overly worried that exercise will cause adverse events, resulting in fear of movement. Therefore, for patients with multiple comorbidities, health education can be provided on how to perform exercise safely. It is recommended to start with mild physical activities and then gradually increase the time and intensity of exercise to enhance the patient's enthusiasm and confidence in exercise.

4.5 Fatigue

Fatigue is a subjective feeling related to the body, emotion or cognition, which is affected by various factors such as physiological and psychological factors[38]. The North American Nursing Diagnosis Association defines fatigue as a chronic fatigue that cannot be completely relieved by rest and is accompanied by a decrease in mental and physical strength[39]. Fatigue has a higher incidence among patients with coronary heart disease[40], and affects patients' enthusiasm for cardiac rehabilitation[41].Qin Jingwen et al[27] found a moderate correlation between fatigue and fear of movement in 236 patients with chronic heart failure. Some researchers have also found that overcoming fear of movement can improve patients' fatigue symptoms[42]. Research also shows that

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fatigue is positively correlated with C-reactive protein levels[43], and correcting anemia can improve fatigue. Therefore, when medical staff implement exercise rehabilitation for patients with coronary heart disease, they need to evaluate the patient's laboratory results and fatigue level, appropriately adjust the exercise plan, and reduce the patient's fear of movement.

4.6 Psychological factors

4.6.1 Self-perceived burden

Self-perceived burden refers to the psychological and emotional pressure, burden or sense of burden that patients subjectively feel. It usually affects an individual's self-confidence and self-esteem, leading to emotional stress and anxiety. Study[44] has found that patients with coronary heart disease generally have higher levels of self-perceived burden, and self-perceived burden is positively correlated with the degree of fear of movement[17]. Coronary heart disease is caused by insufficient blood supply due to coronary artery stenosis. Patients may worry that exercise will induce serious cardiovascular events, such as angina or myocardial infarction. They may also worry about burdening their families and affecting work and social activities. When patients have a heavy self-perception burden due to worry about the disease, they can reduce the self-perception burden through positive self-acceptance, self-affirmation, and seeking social support.

4.6.2 Self-esteem and coping styles

Fear management theory[45] believes that self-esteem is people’s evaluation and perception of their own value and meaning of life. It is a distal defense mechanism of fear, while coping style is a proximal defense mechanism of fear. Cui Guipu et al[19] found that self-esteem can directly affect patients' level of fear of movement, and can also indirectly affect fear of movement through the surrender dimension in coping styles. To alleviate fear and uncertainty, people engage in a range of defensive mechanisms and behaviors, such as strengthening self-esteem. If patients with coronary heart disease have higher self-esteem, they may be more likely to accept their condition and be willing to try exercise rehabilitation. This suggests that clinical medical staff can help patients improve their self-esteem and better manage their fear of movement by encouraging patients to enhance self-affirmation, promote social identity and individual achievement. There are currently few studies on the impact of self-esteem, coping styles and fear of movement in patients with coronary heart disease. Therefore, we still need to further explore the relationship between these three.

4.6.3 Acute Stress Disorder

Acute Stress Disorder (ASD) is a psychological disorder that occurs after experiencing severe trauma or extremely stressful events. Research[29] shows that patients with acute myocardial infarction have significant stress disorders, which is an important factor affecting the level of fear of movement in patients with coronary heart disease. Stress disorders may cause patients to avoid exercise, further exacerbating fear of movement. Medical staff should focus on patients with acute cardiovascular disease, provide psychological counseling and social support as early as possible, and guide patients to release stress and vent their emotions. At the same time, psychological intervention methods such as mindfulness therapy and silent therapy can be used to help patients reduce the symptoms of acute stress disorder.

4.6.4 Anxiety

Research shows that anxiety is the main factor affecting fear of movement in patients with coronary heart disease. Brunetti et al[16] investigated 160 patients with acute cardiovascular events and found that the incidence rate of anxiety was 54%, and the anxiety level was high. Studies such as Back[12] have confirmed that the level of fear of movement in patients with coronary heart disease is positively correlated with anxiety and depression. In a longitudinal study of patients with acute myocardial infarction, Wang Ying et al[46] pointed out that attention should be paid to patients' anxiety within one month after discharge, and sufficient family social support should be provided to alleviate negative emotions, thereby reducing the patient's fear of movement. Liu Tingyang et al[20] recommended that patients after coronary stent implantation be evaluated for fear of movement two weeks after surgery. Some studies[47] pointed out that patients' anxiety may be affected by their family members, causing patients to become more nervous and anxious. Anxious family members may not be able to provide the emotional support the patient needs. Therefore, it is crucial for patients with coronary heart disease and their families to actively manage anxiety issues. Medical workers can provide professional psychological intervention and health support and deal with anxiety issues in a timely manner to

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improve the entire family's ability to cope with the disease

4.6.5 Anxiety sensitivity

Anxiety sensitivity refers to an individual's belief that anxiety-related feelings have a negative impact on their physiological, psychological, and social evaluation, resulting in fear and fear of anxiety symptoms[48]. Individuals with higher levels of anxiety sensitivity are more likely to develop anxiety-related psychological disorders[49], which in turn affects physical and mental health. Research by Osuji E et al[50] showed that anxiety sensitivity is a factor affecting patients' fear of movement. Research by Farris et al[51] found that patients' anxiety sensitivity will increase patients' fear of movement and affect patients' participation in cardiac exercise rehabilitation. At present, there are no studies on anxiety sensitivity and fear of movement in China. In future studies, patients' anxiety sensitivity can be assessed and corresponding intervention measures can be given to reduce the psychological burden of patients.

5. Intervention for fear of movement in patients with coronary heart disease

5.1 Interventions Based on Cognitive Behavioral Theory

Cognitive behavioral theory is mainly derived from cognitive theory and behavioral theory, which believes that cognition, emotion and behavior are related to each other. Cognitive behavioral intervention is a psychological intervention method[52]. Its core is to adjust patients' thinking, beliefs and behaviors, correct bad cognitions, and reduce bad emotions and negative behaviors. Mindfulness-based stress reduction and acceptance and commitment therapy are currently widely accepted cognitive behavioral therapies. Study[53] has shown that cognitive behavioral intervention can improve negative psychological emotions such as anxiety and depression in patients with coronary heart disease, improve patients' self-efficacy, and reduce the risk of cardiovascular events. A randomized controlled trial conducted by Archer[54] in 2016 found that after cognitive behavioral intervention, the level of fear of movement in patients with coronary heart disease decreased and the patients maintained a good psychological state. Research by Karadas et al[55] confirmed that mindfulness-based stress reduction can reduce exercise fear and fatigue and improve the quality of life in patients with acute myocardial infarction. Farris et al[14] recommended that clinicians use cognitive behavioral intervention to reduce exercise fear, anxiety and depression in patients with cardiovascular disease. Domestic scholar Jia Xiaohui[56] found that cognitive behavioral intervention can reduce patients' fear of movement after coronary heart disease stent implantation, improve the scientific nature of out-of-hospital exercise, improve patients' anxiety and depression, enhance self-management behavioral abilities, and reduce cardiovascular adverse events. The risk of event occurrence is consistent with the research results of Guo Wenmin[57]. At present, the relevant research on cognitive behavioral intervention in the fear of movement in patients with coronary heart disease is only in the exploratory stage, and there are few reports in the literature. However, in foreign countries, cognitive behavioral intervention is generally used to intervene on fear of movement.

5.2 Intervention based on the Behavior Change Wheel theory model

The Behavior Change Wheel (BCW) theoretical model points out that behavior change requires the joint action of motivation, opportunity, and ability, and requires education, persuasion, incentives, coercion, training, restrictions, and environmental reconstruction,model and implement nine intervention functions to influence and improve behavior. Nursing intervention based on BCW theory has been verified in different studies. Study[58] shows that nursing intervention based on BCW theory can enhance patients' self-efficacy, reduce sedentary behavior, and improve patients' health-promoting behavior levels and expectations. . Cai Yaxiu's research[59] shows that health education based on BCW theory can improve the disease knowledge level of young and middle-aged people at high risk of cardiovascular events, promote healthy lifestyles and behavioral abilities, reduce pre-hospital medical delay behavior, shorten medical treatment time, and improve patient prognosis. In addition, Xiong Siqi's[60] research confirmed that health education based on BCW can reduce the level of exercise fear and self-perceived burden in patients with acute myocardial infarction, and improve their daily life management ability and exercise awareness. At present, there are few intervention studies based on the wheel theory model of behavior change at home and abroad. Future researchers can use large sample and multi-center research designs to verify the effectiveness of intervention measures

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5.3 Intervention based on the fear-avoidance model

The fear-avoidance model was proposed by Lethem et al[61] in 1983. This theoretical model is considered to be the mechanism of fear of movement and emphasizes the early identification and intervention of fear of movement in patients with coronary heart disease. Research by Keessen et al[62] confirmed that patients with cardiovascular disease can use staged exposure intervention methods to gradually eliminate patients' fear through a step-by-step exercise rehabilitation program. Li Jinghui et al[63] found that high-intensity interval training can reduce fear of movement and improve the quality of life in elderly patients with coronary heart disease. Activity-based intervention for patients with fear of movement can reduce or even eliminate patients' fear.

5.4 Artificial intelligence and telerehabilitation models

In recent years, the rise of family-centered telerehabilitation models has promoted the development of the field of artificial intelligence and also solved the problem of interruption of rehabilitation training due to lack of effective and timely communication between doctors and patients[64]. Medical staff can chat with patients through WeChat official accounts, audio or video, adjust exercise plans according to needs, and provide health education and guidance including exercise, medication, nutrition, psychology and more. Patients can wear watches and smart clothing to exercise, and remotely transmit data to obtain patient information and exercise rehabilitation performance. At the same time, patients are prompted to complete their daily plans according to the smartphone application, which will reduce patients' fear of movement to a certain extent. However, the current intervention targets of digital technology are concentrated on young and middle-aged people, and the elderly are often not among the target groups of digital products. This is also a limitation of this technology.

6. Summary and Outlook

Patients with coronary heart disease are often accompanied by fear of movement, and some patients have fear of movement for a long time, which will prevent patients with coronary heart disease from participating in physical activities, thereby affecting the effect of exercise-based cardiac rehabilitation. Secondly, lack of moderate exercise may accelerate the progression of coronary artery disease, increase the risk of cardiovascular events, and be detrimental to the prognosis of the disease. In addition, fear of movement may have a negative impact on patients' daily life, preventing them from enjoying normal life and leisure activities, thereby reducing their quality of life. Finally, patients may worry that exercise will cause heart problems, thereby increasing mental stress and leading to increased anxiety and depression, further affecting their mental health. Therefore, early identification and effective management of fear of movement is crucial to help patients better participate in cardiac rehabilitation, promote physical and mental health, and improve quality of life. At present, research on the influencing factors and intervention measures of fear of movement in patients with coronary heart disease is still in the exploratory stage. In order to deeply understand the current situation of fear of movement in patients with coronary heart disease in my country, it is recommended that future researchers can use the fear of movement scale suitable for patients with coronary heart disease.In addition, cross-sectional research and longitudinal research can be combined, using a combination of qualitative and quantitative research methods, drawing on early intervention strategies for fear of movement in the field of chronic pain, and implementing comprehensive intervention based on physiology, psychology, nutrition, rehabilitation and other disciplines Strategies to better help patients with coronary heart disease overcome or eliminate fear of exercise, thereby reducing the occurrence of cardiovascular events, improving patient prognosis, promoting recovery and improving quality of life.

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