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ORIGINAL RESEARCH

Motivation and Barriers to Postoperative Rehabilitation Exercise in Type 2 Diabetic Patients with Rotator Cuff Injuries: A Qualitative Study

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Objective: Postoperative rehabilitation is particularly important for Rotator cuff injury. However, type 2 diabetic patients with RCI (T2DM-RCI) are at an elevated risk of rehabilitation failure. The factors influencing the postoperative rehabilitation management of these patients have yet to be elucidated. The objective of this study was to investigate the factors influencing the postoperative rehabilitation of T2DM-RCI patients.

Methods: Data was collected using a descriptive qualitative research design. The sample included 22 interviewees, who were recruited in Subei People's Hospital according to the purposive sampling method. Colaizzi's method was employed for the purpose of evaluation in the course of the data analysis.

Findings: Thematic analysis of the postoperative rehabilitation views of the interviewees identified eight sub-themes connected to three main themes in accordance with the Behaviour Change Wheel Theory. These were capability-related, opportunity-related, and motivation-related factors.

Conclusion: It is imperative to enhance the glycaemic control and health perception of T2DM-RCI patients. To this end, rehabilitation programmes, comprising exercise and dietary modifications, must be tailored to the specific needs of each patient. Furthermore, it is crucial to harness the potential of family and social support to motivate patients to maintain a positive outlook.

Keywords: postoperative rehabilitation, qualitative study, type 2 diabetic, rotator cuff injury, facilitating/obstructing factors

Background

The rotator cuff is a cuff-like tendon structure comprising the tendons of the supraspinatus, infraspinatus, subscapularis, and teres minor muscles on the anterior, superior, and posterior sides of the humerus.[1] This is a common site of shoulder injury, with an incidence of 50%.[2] Rotator cuff injury (RCI) refers to the trauma caused to the rotator cuff structure due to acute or long-term activities beyond its range of motion. A rotator cuff injury can results in a number of symptoms, including pain in the shoulder joint, restricted function, and weakened muscle strength. This can have a significant impact on an individual's work efficiency and quality of life.[3] Rotator cuff repair (ARCR) is an effective treatment for rotator cuff injuries (>90% success rate).[4,5] It is noteworthy that ARCR carries certain risks, especially for patients with comorbid type 2 diabetes (T2DM). These population have a higher than normal risk of postoperative joint stiffness and rotator cuff re-tear, and they also have a higher rate of surgical failure and post-rehabilitation failure risks.[6] Diabetes causes changes in tendon characteristics, tissues, cells and molecules that can increase the risk of tendinopathy fourfold and tendon tears or ruptures fivefold.[7,8] T2DM is a common underlying condition in patients with postoperative infections, poor incision healing, and delayed functional recovery, which restricts collagen synthesis, affects cytokine, angiogenesis, and growth factor levels, and further interferes with the healing of damaged tissue.[9] Therefore, it is of particular importance to enhance glycemic control in patients with RCI combined with T2DM in order to facilitate early joint rehabilitation.

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Previous researches has focused primarily on current status surveys and intervention trials.[10,11] However, trials run the risk of poorer rehabilitation outcomes in the absence of theoretical guidance. Drawing on specific theories can address this deficiency. The Behaviour Change Wheel (BCW) theory, a widely used theory in health bahaviour promotion, has had notable success in improving postoperative rehabilitation intentions.[12] Poulsen et al[13] developed an optimised multidisciplinary rehabilitation programme with the BCW theory for patients after hip fracture surgery to effectively improve physical function. In the exercise study of patients with knee osteoarthritis, the BCW theory can also effectively guide patients to do perform rehabilitation exercises at home.[14]

Given that post-operative rehabilitation behaviour is influenced by complex factors such as individual cognition, feedback information and the external resource environment, some of which are difficult to quantify accurately.[15,16] Thus, it is unrealistic to use a single method, such as a quantitative study, to obtain comprehensive research results. Taking this into account, a qualitative research may be well-suited to this topic. Qualitative research not only provides insights into recovery behaviour (by exploring patients' perceptions of their experiences during the recovery process), but also enables feedback on clinical treatments based on patients' perspectives.[17] Here, via using the COM-B model, for the first time, we comprehensively discussed the influencing factors of postoperative rehabilitation training based on the real experience of diabetic patients with combined RCI.

Methods

Design

A descriptive study was conducted using a qualitative and deductive approach in this study.[18] The methodology included the use of semi-structured interviews, and the study was designed in accordance with the Comprehensive Standards of Research in Qualitative Studies (COREQ) guidelines.[19]

Participants

The study participants were from Northern Jiangsu People's Hospital of China. Inclusion criteria: (1) Consistent with the relevant disease diagnosis;[20] (2) Meeting the guidelines for the prevention and treatment of T2DM;[21] (3) Patients with moderate to small rotator cuff tears indicated by MRI and without major illnesses; (4) Patients within 6 weeks post-surgery (it is the optimal critical period for rehabilitation exercises); (5) their own consent to participate in the study; (6) communication accessibility. Exclusion criteria: (1) Patients with primary dysfunctions of the neck and upper extremities (prior to a rotator cuff injury); (2) psychiatric disorders; (3) Patients with acute or chronic complications of diabetes. The selection criteria for the interviewees were based on the maximum variation strategy. In the interview, the checklist was extended to a certain depth to obtain deeper reasons. After 22 interviews, data redundancy and information saturation were found, so the interviews were ceased.

Data Collection

Study enrollment and interviews took place between April 2023 and June 2023. The interview checklist included demographic information, disease information and exploratory questions about attitudes or experiences of adherence to rehabilitation exercises and glucose management. The list of interviews was developed on the basis of the previous study and was defined by a clinical nurse specialist, two rehabilitation physicians and a postgraduate nursing student.[22,23] The study began with two pre-interviews and the checklist was revised and refined based on the results of the interviews to ensure the rigour of the interviews. The final list is shown in Table 1. Semi-structured interviews were generally conducted in a location of the participant's choice, which should be quiet and private. The interview began with an open-ended question, "How do you feel about recovering from your surgery?" Such a question allows the interviewee to be less inhibited and nervous.

All interviews were audio-recorded. The interviewer focused on capturing the respondents' facial expressions and body language during the interviews. Each interview lasted between 30 and 60 minutes. Additional information about the interviewee was obtained through medical records after the interview so as not to interrupt the interviewee's thinking during the interview.

Table 1 Questions Guiding the Interview

Questions
1. How is your recovery progressing currently?
2. Do you believe early shoulder joint exercises post-operation are important?
3. When would you like to start?
4. How are you currently managing your shoulder joint rehabilitation exercises and blood glucose? If no: What's the reason for not do it? If yes: What are the effects after management? Why do you engage in shoulder joint rehabilitation exercises and control your blood glucose?
5. During the process, have you encountered difficulties/faced challenges/gained experiences? What factors influence your participation in shoulder joint rehabilitation exercises and blood glucose control?
6. Do you feel you need assistance in the process of shoulder joint rehabilitation exercises and controlling your blood glucose?
7. What else can you suggest?

Data Analysis

Within 24 hours after the interview, researchers transcribed the recorded content into text using NVivo 20 software and manual analysis. Colaizzi's seven-step method was employed for analysis: (1) Thoroughly read the interview text, forming a preliminary impression of the arthroscopic postoperative supportive needs of T2DM patients based on the research objectives; (2) Identify and extract frequently occurring words and phrases related to patients' feelings and needs; (3) Perform primary coding of the patients' repeated feelings and needs; (4) Reflect and scrutinise the primary codes to find meaningful common concepts and focus on the embryonic form of themes; (5) Define and describe the embryonic form of themes; (6) Repeatedly compare similar themes and descriptions to clarify the naming of each theme; (7) Return the transcribed textual material to the interviewees for review and make amendments and supplements based on the interviewees' feedback.

Ethics

This study was approved by the Life Sciences Ethics Review Board of Northern Jiangsu People's Hospital (2023ky086). This research was conducted in accordance with the Declaration of Helsinki. The purpose and potential benefits of the study were clearly explained to participants before the study began. Participants were promised that they could withdraw from the study at any time without discrimination. Participants were informed about the study and consented to the anonymous information being used for publication. All relevant identifying information about the participants was deleted after the study.

Finding

Interviews were conducted with 12 male and 10 female patients. 22 patients had received a more comprehensive rehabilitation programme. The demographic characteristics of patients were presented in Table 2. Based on the COM-B model, the study categorized the interview content into 3 main themes: Capability, Motivation, and Opportunity, each with several sub-themes.

Capability-Related Factors

Individuals who have the physical ability (physical skills, strength) and the psychological ability (knowledge, comprehension) to change behaviour.

Table 2 Clinical and Demographic Characteristics

Description	N=22
Sex	
Male	12 (54.55%)
Female	10 (45.45%)
Age	
30–40	5 (22.73%)
40–50	4 (18.18%)
50–60	7 (31.82%)
>60	6 (27.27%)
Professional status	
Employed	14 (63.64%)
Unemployed	4 (18.18%)
Retired	4 (18.18%)
Level of education	
Primary school	3 (13.64%)
Secondary school	13 (59.09%)
University	6 (27.27%)
Marital status	
Married	17 (77.27%)
Divorced	2 (9.09%)
Unmarried	3 (13.64%)
Affected shoulder	
Left	12 (54.55%)
Right	7 (31.82%)
Bilateral	3 (13.64%)
Duration of diabetes (years)	
<1	3 (13.64%)
1~2	8 (36.36%)
≥2	11 (50.0%)

Physiological Sensitivity

The extent to which participants perceived their own physiological changes influenced their compliance with post-operative rehabilitation. Individuals found that rehabilitation training could bring about changes that promoted the recovery of physical function, such as moving their arms without pain, which motivated participants for long-term recovery,

> I didn't stop at home as I did some rehabilitation activities in hospital which helped me regain some movement in my shoulder.

Participants reported that whether or not they received rehabilitation, and what type of rehabilitation they received, depended on how they felt about themselves during the exercise. Patients with a self-perceived good physiological state are more confident in following medical advice (standard joint movements and blood sugar management),

> I don't want to move just because it hurts and I have to wait.

> I didn't follow my doctor's rehab advice exactly, and I stopped doing some movements that were causing discomfort in my shoulder.

Adverse experiences of surgical treatment increase patients' susceptibility to accidental injury, particularly in those who have suffered RCI due to intense activities,

> Honestly, the pain was so bad that there was no way I could keep up with the training. So I gave up a lot. (bitter smile)

Capacity to Manage Disease

The level of symptom management was a criterion for determining the timing and duration of rehabilitation. Patients believed that stable blood glucose levels and the absence of diabetes-related complications indicated better symptom management and were the basis for their willingness to engage in rehabilitation activities,

> Running every day and swimming every week was a way for me to control my blood sugar, so it (diabetes) will not be a concern for my postoperative rehabilitation.

> If I were not ill, I would do some exercise easily.

Pain is a barrier to patient compliance and persistence in rehabilitation, due to varying levels of pain tolerance, compliance and persistence vary, with some patients adhering to rehabilitation over the long term and others facing challenges due to pain,

> As long as the (physical) condition doesn't get worse, or the pain is manageable, I'm more than happy to do some joint activity.

> I tried exercising at home for a while, it was painful and then I gave up.

Disease Cognition

Disease cognition refers to the patient's inherent common sense beliefs about their illness. Ineffective cognitive patterns are a risk factor for subsequent health management. When patients lack understanding of diabetes, they may neglect their blood glucose levels or make lifestyles choices that worsen the condition, such as high-sugar diets or staying up late, due to cognitive biases.

> It's really bad, I just realised that staying up late can affect the recovery after surgery.

> Sweets are a must, especially after such a sad event (surgery), I need some cake to cheer me up.

A lack of understanding of the connection between diabetes and joint activities is also a concern, as it may prevent joint rehabilitation exercises from achieving their intended goals,

> What? Are they related? I always thought I could just control my diet and I would exercise before the operation, but I paused after the operation because I was waiting for my shoulder to feel better.

> I didn't know that diabetes was linked to rotator cuff damage, so I didn't stick to my insulin injections.

Opportunity-Related Factors

Opportunity refers to external environmental factors providing social opportunities (cultural background, interpersonal relationships) and physical opportunities (time, resources, place) for behaviour change.

Support from Advantageous Resources

Participants reported that access to health management resources could provide opportunities for long-term rehabilitation training. These opportunities was divided into three sub-themes: internal family support, which included familial companionship in rehabilitation and sufficient financial support. (ii) external social support, encompassing community facilities for rehabilitation exercises, company health benefits, and friends' support. (iii) continuous medical care support, including regular visits from family doctors and professional psychological therapy.

> After I was discharged from the hospital, I was contacted by a number of nurses and doctors who enquired as to my status and offered me their assistance.

> My daughter will accompany me to do exercises every day, which will facilitate my acceptance of these exercises and help me to overcome any feelings of solitude.

> Our community has a fitness facility, and I frequently utilise it for rehabilitation purposes. The equipment is of considerable utility.

Detailed and Specific Rehabilitation Plans

The respondents indicated that planned home rehabilitation has a certain guiding effect on long-term training. However, the primary challenge is how to maintain stable blood glucose level while engaging in joint activities and controlling diabetes on postoperative recovery. The home rehabilitation programme has the following shortcomings: unclear rehabilitation goals, such as the degree of joint freedom of movement and specific blood glucose levels.

> I have been engaged in rehabilitative training for approximately six months, and I believe I have made a significant recovery. However, I am uncertain as to whether I should cease this training.

A further significant issue was the absence of any modification to the rehabilitation programme over an extended period. The content of the programme remained consistent throughout.

> My doctor did not adjust the rehabilitation plan for me, even if I was infected with COVID-19, he did not thought it had an impact.

Obtaining effective feedback on the effect of information proved challenging for respondents, and some difficulties in the rehabilitation process cannot be resolved.

> I was uncertain about certain questions, such as the recommendation to take supplements while limiting certain nutritional intake and some aspects of my joint mobility levels.

Motivation-Related Factors

Benefit from Rehabilitation

Patients who have previously benefited from rehabilitation management are more likely to express enthusiasm for postoperative rehabilitation content, particularly when they experience notable improvements in joint mobility and blood glucose management.

> The rehabilitation exercises I have been doing since my surgery were initially only 4 movements: forward flexion, abduction 0° and 45°, shrugs, pendulum training, and now the affected limb can be raised up to shoulder level.

> I am experiencing a positive physical and emotional recovery!

The study also revealed that if the efficacy of early rehabilitation is diminished due to non-compliance with medical instructions, patients are more likely to adhere to them.

> I had two operations. The doctor told me that my function was limited due to the lack of effective shoulder joint movement in the early stage, and I had to pay a great price to improve it. Now I have done a lot of rehabilitation training

Shame of Illness

Postoperative shame stems from the use of assistive devices, with several interviewee perceiving these protective gear as symbols of their injuries. Interviewees feared unemployment due to shoulder joint injuries.

> It was too ugly to wear protective gear to work, so I rejected. (didn't wear it)

> If company knew I couldn't work after three months on leave, I'd be fired.

Diabetes is sometimes mistakenly associated with obesity, an inappropriate and relatively shameful matter. Nevertheless, some also reflect that the unwillingness to face the risks of uncontrolled blood glucose forces them to implement dietary interventions for diabetes.

> I didn't want to be called fat, it made me sad, so I need to exercise more to manage my figure.

I wanted to get rid of diabetes. It was so difficult every time I had to eat different meals from other people because of special dietary requirements.

Desire for Reintegration

Moderate exercise and increased rest were important for the recovery of RCI. But, this inevitably lead to temporary disconnection from society, including an inability to engage in intense physical activities and gatherings. Patients who attempt to resume normal lives early are very enthusiastic about participating in postoperative rehabilitation.

I was a member of the Old People's Song and Dance Group, but out now.

My wife and kids have travelled alone many times and I would love to be with them.

Respondents reported that prolonged social isolation is associated with pronounced feelings of loneliness. They further asserted that the positive effects of family companionship are insufficient to offset the detrimental impact of a lack of social contact.

Although I spent every day with my family, I still want to get together with friends.

Discussion

As shown in this study, factors that affect patients' persistence in postoperative rehabilitation intentions fall under 3 categories: capability, opportunity and motivation. Specifically, factors such as capacity to manage disease, disease cognition, complete rehabilitation programme and shame of illness, are consistent with previous researches.[10,22]

When high physiological sensitivity were considered, it became evident that patients who exhibited positive self-perception demonstrated heightened sensitivity to changes in their bodies, which could make them favour rehabilitation management. This is understandable as it is always recognized that healthy bodily functions are the basis for exercise or sport.[24] In particular, patients who have undergone joint surgery as a result of exercise are reluctant to undergo further treatment for pain for the same reason. Conversely, the series of reactions produced by a change in blood glucose provides motivation for patients to control their glucose levels, which in turn stimulates hope for a cure.

Interviewees tended to weigh the resources available to their advantage (eg, support from within the family, social assistance, and medical care components) when considering the management components of their rehabilitation. The support of advantageous resources vary from person to person. Family support was an endogenous motivation for participants to achieve rehabilitation exercise and diabetes life management.[25] Accompaniment by family members was preferable to training alone. Because it gave the patient the confidence to aspire to a rapid recovery and to correct rehabilitation misconceptions. Furthermore, the involvement of family members in the rehabilitation process may facilitate the maintenance of high levels of compliance and consistency in rehabilitation management.[26] Therefore, the role of family members in the management of the patient's postoperative rehabilitation should be highlighted. In addition, several social assistance programmes were implemented to facilitate patients' recovery. These included the construction of patient circles to share experiences of post-operative life, the guidance of public welfare rehabilitation programmers, and the utilisation of community-owned healthcare resources. Abundant health care resources were also important. In this study, we found that most of rehabilitation management strategies employed for patients were derived from life experience. Additionally, there was a notable absence of scientific evidence pertaining to joint mobility and diabetes care. It was imperative that patients who had been discharged from the hospital establish postoperative active pain management and diabetic dietary programmes. It was recommended that healthcare professionals enhance discharge-related assessments, dynamically monitor and modify pain prescriptions for patients with moderate to high levels of pain, and furnish home rehabilitation care services or recommend out-of-hospital recreational facilities.[27] Implementing web-based tele-rehabilitation management would be advantageous for patients in more distant cities.

It was reported by patients that the individual who had poor sense of rehabilitation benefit could not adhere to long-term health rehabilitation management. A positive perception of the benefits of rehabilitation was found to be a significant factor in promoting the postoperative health management of patients. Patients indicated that the experience

of rehabilitation exercises, such as engaging in specific levels of physical labour, "remind" them to insist on rehabilitation. However, some patients were unable to fully comprehend the impact of rehabilitation. The pursuit of overly ambitious rehabilitation goals resulted in patients failing to realize the gradual improvement that was occurring. In light of this phenomenon, it is imperative that, in addition to evaluating the efficacy of rehabilitation programmes, patients are also counselled on how to accurately assess their rehabilitation progress. It is therefore essential to maintain regular communication with the patient in order to facilitate access to the patient's treatment expectations and care needs, and also to provide out-of-hospital care support in this way.[28]

In this study, we found that postoperative patients' desire for early restoration of good joint function and reintegration into normal social life were positive factors that stimulated their rehabilitation management. Post-operative patients with RCI were distressed by restrictions on social activities or frustrated by their inability to resolve problems with diet and daily living.[29] In the absence of adequate stimulation and realistic expectations of a normal social life, these patients were more likely to cease rehabilitation exercises without informing their physicians.

Strengths and Limitations

Qualitative research can capture the real experience of patients and reflect their needs more accurately, but there is an unavoidable limitation of qualitative research, which is that since the interpretation of the interviews rests with the researcher. It leads to a certain degree of subjectivity and bias in the results. The interviewees themselves may also have different answers to the same question at different times due to certain factors. Given that this study was conducted in only one region of China, more extensive qualitative research should be conducted in different regions in the future.

Relevance for Clinical Practice

Our findings highlighted the feelings and concerns of postoperative patients with type 2 diabetes combined with rotator cuff injury about rehabilitation training and blood glycaemic management. Respondents indicated that factors affecting postoperative rehabilitation management included physiological sensitivity to blood glucose changes, maintaining good joint function, addressing diabetic diet, and perceiving benefits of rehabilitation. We provide the following ideas for clinical practice based on respondents' feedback that focusing on patients' glycaemic management and cognitive abilities is necessary to provide assurance of rehabilitation adherence and effectiveness. Strengthening family support in terms of diet and exercise can help patients to maintain their confidence in recovery and good management behaviors. It is a prerequisite for out-of-hospital rehabilitation that healthcare professionals understand the patient's needs in terms of diet, insulin use, etc, and achieve stable control of their blood glucose. Appropriate social interaction can stimulate the patient's motivation to recover. In addition, the long-term and continuous nature of the training is important to ensure the effectiveness of postoperative rehabilitation, which requires that the patient's programme for each stage of rehabilitation has clear objectives.

Conclusion

To our knowledge, it is the first qualitative study to explore the management of postoperative rehabilitation in T2DM patients with rotator cuff injuries. This study indicated that postoperative rehabilitation behaviors in T2DM patients with RCI were associated with multiple factors including capability, opportunity and motivation (eg, glucose level, joint function, and dietary status). Understanding patients' needs, formulating diabetes diet plan to achieve glycaemic management, and strengthening family, social and other driving forces of rehabilitation are helpful to enrich rehabilitation resources, and motivate the patient to maintain a positive mood in order to reintegrate into society. Future research should be to consider how to apply these identified factors to develop a support program that better meets the needs of patients to improve the effectiveness and potential of their postoperative rehabilitation exercises.

Data Sharing Statement

Provide research data on reasonable and necessary requests considering privacy/ethical protection.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

All the authors declared no conflicts of interest in this study.

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