

Clinically ill patients' experiences of early mobilisation after liver transplantation: a qualitative study using Pender's health promotion model

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The aim of this study is to explore the factors influencing early mobilisation behaviours and patients' needs in critically ill patients after liver transplantation (LT). This interview study used phenomenological research, and Pender's health promotion model (HPM) was used to construct the interview guide. With the use of purposeful sampling, a total of 19 critically ill patients who experienced early mobilisation after LT were recruited at three tertiary hospitals in Beijing from August to November 2022. Data were collected through semi-structured interviews and analysed using Colaizzi's seven-step method. Nine themes were categorised into the three domains of Pender's HPM. The first domain was individual characteristics and experiences: (1) symptoms of end-stage liver disease limiting premobility behaviours and (2) previous treatment experience affecting understanding of early mobilisation after LT. The second domain was behaviour-specific cognition and affect: (3) coexistence of benefits and concerns in early mobilisation after LT, (4) barriers to early mobilisation after LT, (5) high self-efficacy in early mobilisation after LT, (6) individual differences in early mobilisation and (7) support and encouragement

Introduction

Liver transplantation (LT) is the most effective treatment for end-stage liver disease [1,2] and can prolong the survival of patients [3,4]. Studies have shown that the 1-year and 5-year survival rates of postoperative patients are 83–92% and 71–87%, respectively [5–9], and the survival outcome is positive. However, due to patients' complex conditions after LT, including poor preoperative status, high surgical risk and postoperative immunosuppressive agents, they still face challenges in perioperative management [10,11].

In the early postoperative period, all patients undergoing LT are sent to the intensive care unit (ICU) for advanced life support and management. The ICU period plays an important role in promoting the early rehabilitation of critically ill patients after LT. With the widespread application of enhanced recovery after surgery in gastrointestinal surgery, orthopaedics, gynaecology and other fields, early

from family, wardmates and medical staff. The final domain was behavioural outcomes: (8) the need for sufficient staff, a quiet environment, safety, goals, guidance and family participation and (9) a strong willingness to comply with early mobilisation plans. The three areas and nine themes extracted in this study are helpful for the long-term development of early mobilisation in patients after LT. *International Journal of Rehabilitation Research* 46: 92–97 Copyright © 2023 The Author(s). Published by Wolters Kluwer Health, Inc.

International Journal of Rehabilitation Research 2023, 46:92–97

Keywords: critical illness, early mobilisation, liver transplantation, Pender's HPM, qualitative research

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Received 7 December 2022 Accepted 4 January 2023.

postoperative mobilisation has attracted more and more attention [12,13]. The 2022 guidelines for perioperative care of LT suggest that early activity after LT should be encouraged from the next morning after LT to discharge [14–16]. Physical rehabilitation can continue after discharge [17]. Early mobilisation can help restore organ function and prevent ICU-acquired weakness, lung infection, skin complications and deep vein thrombosis of the lower extremities, as well as improve the psychological state of patients [18]. Early mobilisation of critically ill patients after LT can help shorten the time from LT to the recovery of walking ability and reduce the length of hospital stay [18].

Understanding the early activity needs of patients and identifying influencing factors can positively impact the rapid recovery of critically ill patients after LT. Previous studies have mostly used data to investigate the factors related to early activities, but behavioural experience has not been fully explored. Therefore, this study undertook qualitative research to supplement the findings of studies. Theory can describe phenomena and explain how things work in nursing practice [19]. This study was guided by Pender's health promotion model (HPM) to discuss the

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early mobilisation behaviour of critically ill patients after LT. The HPM was developed from social cognitive theory and expected value theory and considers three domains: (1) individual characteristics and experiences, (2) behaviour-specific cognition and affect and (3) behavioural outcomes [20,21]. These domains can be used to predict effective factors/obstacles of health promotion behaviours, test the effect of intervention programmes to improve health promotion behaviours, examine models, determine the quality of life and health promotion behaviours and predict phases of change of relevant factors affecting health promotion behaviours [22]. The purpose of this study was to explore the experiences and feelings of critically ill patients engaging in early mobilisation after LT.

Materials and methods

Study design

In this study, a method of hermeneutic phenomenology was selected. Colaizzi's seven-step analysis method was used for data analysis.

Participants

A total of 19 critically ill patients who underwent LT were recruited from three hospitals in Beijing from August to November 2022 using purposive sampling. Criteria for inclusion comprised those aged ≥ 18 years, those undergoing LT for the first time, those willing to engage in early activity in the ICU, those with normal expression and comprehension ability and those agreeing to informed consent and voluntary participation in the study. Exclusion criteria comprised patients with severe organic brain diseases, epilepsy or psychological disorders combined with severe cardiovascular and cerebrovascular diseases, diabetes and respiratory diseases; patients with mental disorders and patients who could not follow the doctor's advice; patients who could not communicate effectively; patients who could not give informed consent; and patients participating in an intervention study that would impact this study. The sample size was based on the repetition of the data, and the investigation ended when there were no new themes presented during the data analysis (data saturation). This study included patients of different sex, ages, education levels and weights of grafts.

Data collection

This study was built upon the theoretical framework of Pender's HPM and previous research. The model, in addition to a literature review and expert consultation, was used to form the first version of the interview outline and to revise the interview outline after a preinterview with a research subject who met the inclusion criteria; the results of the preinterview were not included in the formal interview. The final interview outline is shown in Table 1. The interview was conducted one-on-one and face-to-face in a separate, quiet space the day the participants were transferred out of the ICU. Before the interview, the researcher

fully informed the participants of the purpose, content, method, transcription and recording of the interview and promised to abide by the principle of confidentiality. All patients provided informed consent before the interview, and each interview lasted 30–45 min. To ensure the quality of the interviews, the researchers conducting them received relevant training on qualitative research, mastered interview methods and skills and had experience in qualitative research and interviews.

Data analysis

Within 24 h after the end of each interview, the audio data of the interview content was transcribed verbatim into text data, and the collected data were coded and summarised according to the order of the interviews. Colaizzi's seven-step method was used to analyse the data: all records were carefully recorded, significant statements were selected, recurring ideas were coded, coded ideas were assembled, exhaustive descriptions were written, similar ideas were identified, areas of doubt were proven and respondents were returned to for verification.

Results

The participants' mean age was 53.1 years (range: 20–74 years). Thirteen (68.4%) were male. Of all the participants, 16 (84.2%) were married, and 10 (52.6%) did not attend higher education. The mean graft weight was 1337.3 g (range: 318–1850 g). Details are shown in Table 2.

Nine themes were categorised into the three domains of Pender's HPM.

Table 1 Outline of interviews on early mobilisation experience of critically ill patients after liver transplantation

Domain	Outline of interviews
Individual characteristics and experiences	1. How has your activity level changed since your liver transplant? How did you feel? 2. What kind of exercise did you try before liver transplantation? What are your gains?
Behaviour-specific cognitions and affect	3. What do you think is the benefit of early mobilisation after liver transplantation? 4. What factors do you think influenced the early mobilisation? How do you feel? 5. What is your preferred type of early mobilisation? 6. How determined were you to overcome the obstacles in the early mobilization? (0–10 points, the higher the score, the greater the determination) 7. What do your family members, friends or patients think about the early mobilisation of liver transplantation?
Behavioural outcomes	8. What kind of situation or environment do you like to carry out in early mobilisation? 9. Early mobilisation after liver transplantation can be extended to the ward. Would you like to follow the plan for early mobilisation? Why? 10. After the early activities, do you have any new needs/interests? 11. What suggestions and requirements did the doctors and nurses give in the early mobilisation of ICU? 12. What else do you need about early mobilisation?

Table 2 General characteristics of participants (n=19)

CODE	Gender	Age	Marital status	Education status	Diagnosis	Transplant method	Graft mass (g)	Hospital
N1	Male	58	Married	Higher school education	Viral hepatitis	Orthotopic liver transplantation	1800	Beijing Friendship hospital
N2	Male	53	Married	Junior high school education	Cirrhosis	Orthotopic liver transplantation	691	Beijing Friendship hospital
N3	Female	20	Single	Undergraduate	Urea cycle disorder	Orthotopic liver transplantation	318	Beijing Friendship hospital
N4	Male	29	Single	Undergraduate	Decompensated cirrhosis	Orthotopic liver transplantation	980	Beijing Friendship hospital
N5	Female	62	Married	Undergraduate	Hepatitis B cirrhosis	Orthotopic liver transplantation	1315	Beijing Friendship hospital
N6	Male	45	Married	Higher school education	Alcoholic cirrhosis	Orthotopic liver transplantation	1335	Beijing Friendship hospital
N7	Female	64	Married	Primary school education	Cirrhosis	Orthotopic liver transplantation	1250	Beijing Youan Hospital
N8	Male	51	Married	Junior high school education	Cirrhosis	Orthotopic liver transplantation	1507	Beijing Youan Hospital
N9	Male	74	Married	Primary school education	Alcoholic cirrhosis	Orthotopic liver transplantation	1497	Beijing Youan Hospital
N10	Male	50	Married	Undergraduate	Cirrhosis	Orthotopic liver transplantation	1850	Beijing Youan Hospital
N11	Male	60	Married	Higher school education	Hepatocellular carcinoma	Orthotopic liver transplantation	1400	Beijing Tsinghua Changgung Hospital
N12	Female	74	Married	Undergraduate	Primary biliary cirrhosis	Orthotopic liver transplantation	1580	Beijing Tsinghua Changgung Hospital
N13	Male	54	Married	Higher school education	Hepatic lesions	Orthotopic liver transplantation	1500	Beijing Tsinghua Changgung Hospital
N14	Female	35	Single	Undergraduate	Primary biliary cirrhosis	Orthotopic liver transplantation	1642	Beijing Tsinghua Changgung Hospital
N15	Male	51	Married	Undergraduate	Cirrhosis	Orthotopic liver transplantation	1430	Beijing Friendship hospital
N16	Male	60	Married	Higher school education	Hepatocellular carcinoma	Orthotopic liver transplantation	900	Beijing Friendship hospital
N17	Female	56	Married	Higher school education	Acute hepatic failure	Orthotopic liver transplantation	1390	Beijing Youan Hospital
N18	Male	53	Married	Junior college	Liver failure	Orthotopic liver transplantation	1315	Beijing Youan Hospital
N19	Male	59	Married	Undergraduate	Cirrhosis	Orthotopic liver transplantation	1708	Beijing Youan Hospital

Domain 1: individual characteristics and experiences

Individual characteristics and experiences mainly refer to similar or identical behaviours as well as to personal factors that affect health behaviours, such as age, personality, ethnicity and socioeconomic status, which directly or indirectly affect behavioural outcomes [21,23,24].

Topic 1: symptoms of end-stage liver disease limiting premobility behaviours

Relying on experiences, the interviewees believed that moderate exercise is good for the body, but as their liver disease progressed, the interviewees’ daily activities were in the preoperative stage of LT due to ascites, fatigue and other reasons. Sixteen interviewees had walking habits and maintained a certain frequency of activities every week. The others mainly rested.

Topic 2: previous treatment experience affecting understanding of early mobilisation after liver transplantation

When critically ill patients received early mobilisation under the guidance of medical staff after LT, they spontaneously adjusted their early mobilisation behaviour based on their previous treatment experience.

Domain 2: behaviour-specific cognition and affect

Behaviour-specific cognition and affect in this study mainly refer to relevant factors that may affect individual behavioural motivation, including behavioural benefits, obstacles, self-efficacy, behaviour-related emotions, interpersonal influences and situational influences, which mainly have direct effects on behavioural outcomes [21].

Topic 3: coexistence of benefits and concerns in early mobilisation after liver transplantation

Respondents had limited understanding of medical knowledge but realised the benefits of early mobilisation through personal experiences of it during the ICU period, mainly focusing on promoting the recovery of postoperative pulmonary function, gastrointestinal function, mental state and life beliefs. The patients showed positive recognition and confidence. However, some respondents expressed concerns, worrying that early activity would affect the functional status and subsequent recovery of the graft.

Topic 4: barriers to early mobilisation after liver transplantation

Patients believed that the barriers affecting their early mobilisation were focused around postoperative fatigue, symptom distress (pain, diarrhoea, abdominal distension and cough), the large abdominal incision, multiple drainage tubes, sleep disturbance, discomfort from mechanical ventilation, anxiety and loneliness, lack of detailed guidance and lack of personnel assistance.

Topic 5: high self-efficacy during early mobilisation after liver transplantation

Patients showed high self-efficacy in overcoming obstacles during early activity. Nine patients had no difficulty in overcoming obstacles, and 10 patients' determination to overcome obstacles was average, mainly due to fatigue, pain and other reasons, or the interviewees indicated some barriers that they could not overcome by themselves.

Topic 6: individual differences in early mobilisation

Early activities are mainly passive and active. Different patients have different levels of acceptance of passive activities, but they have greater expectations for getting out of bed.

Topic 7: support and encouragement from family, wardmates and medical staff

For early postoperative mobilisation, all patients were able to receive support and encouragement from their families. The family members mainly urged the interviewees to actively cooperate with the doctor, and without more detailed guidance, they believed the activity was helpful to the interviewees. The performance of wardmates had a demonstrable effect. During the ICU period, the facilitators and supervisors of early mobilisation behaviours were mainly doctors and nurses.

Domain 3: behavioural outcomes

Behavioural outcomes refer to the expected behavioural endpoints, or the results of the health behaviours ultimately chosen by individuals, and to their health decision-making and action preparation [21], mainly focusing on temporary needs and hobbies and promised action plans.

Topic 8: the need for sufficient staff, a quiet environment, safety, goals, guidance and family participation

After the early activity, patients considered temporary needs, including increasing human resources, providing a quiet environment and security, meeting the landing target, obtaining detailed guidance for early activity and needing family participation.

Topic 9: strong willingness to comply with early mobilisation plans

Most of the patients had a strong willingness to cooperate with the continuation of early activity later during their stay on the ward, and they were more inclined to early activity plans tailored to their own disease characteristics.

Discussion

Pender's HPM states that human beings are a biological, psychological and social organic whole that interacts with the environment [21,25]. Individuals will change their

motivation for pursuing health-promoting behaviours due to perceived behavioural benefits, behavioural barriers, self-efficacy and activity-related effects [20]. Studies have shown that about 73% of behavioural changes can be predicted by components of Pender's HPM [26]. At present, Pender's HPM has achieved positive application in terms of health behaviours in chronic diseases, such as coronary heart disease [27,28], hypertension [29], haemodialysis [30] and diabetic foot ulcers [31], as well as within the general population.

It is beneficial to analyse the factors influencing behaviour and to predict and explain health behaviours. This study considered the fact that, regarding LT, patients are in a state of chronic disease development until surgery, and perioperative care is the key to recovery. The guidelines emphasise the early mobilisation of patients in the ICU after LT [17], but few studies have focused on this. The present study referred to nine determinants in the three domains of Pender's HPM, and nine themes were identified through qualitative research methods: (1) symptoms of end-stage liver disease limiting premobility behaviours; (2) previous treatment experience affecting understandings of early mobilisation after LT; (3) coexistence of benefits and concerns in early mobilisation after LT; (4) barriers to early mobilisation after LT; (5) high self-efficacy in early mobilisation after LT; (6) individual differences in early mobilisation; (7) support and encouragement from family, wardmates and medical staff; (8) the need for sufficient staff, a quiet environment, safety, goals, guidance and family participation and (9) strong willingness to comply with early mobilisation plans.

In terms of individual characteristics and experiences, research by Chen *et al.* [32] shows that age, perceived benefit and self-efficacy were identified as significant predictors of elderly people participating in community health-promotion activities, which are important for predicting and detecting the health behaviours of this group.

In the present study, although patients over the age of 50 years with end-stage liver disease symptoms were limited, they still maintained a certain frequency of exercise activities, and previous surgical treatment experience affected their understanding of early mobilisation after LT, adjusting their activity. Although the influence of personal factors and previous early mobilisation behaviours cannot be fully determined, early mobilisation behaviours found to be different from guidance in clinical practice should be communicated and corrected in a timely manner.

In terms of behaviour-specific cognitions and affect, patients after LT had both a sense of benefit and concerns about early ICU mobilisation, which is similar to the results of a qualitative study in the UK in 2020 [33]. That study identified the psychological benefits of the rehabilitative behaviours of early mobilisation for ICU

patients and relatives, including a sense of recovery and relief from feelings of helplessness, but also recognised the frustration of mobilisation exhaustion. The difference is that patients' sense of benefit after LT is not only derived from the physical rehabilitation behaviour itself but also results from the relief of symptoms caused by the activities. At the same time, patients' negative emotional concerns mainly focused on the function and status of the graft. For patients, grafts mean new life, and their importance is self-evident.

The present study confirmed that early barriers to mobilisation in the ICU include lack of personnel, postoperative fatigue, pain, multiple drainage tubes, sleep disturbances and lack of detailed guidance [34–37]. In addition, in the research results, a young patient said that the discomfort of mechanical ventilation seriously affected early mobilisation. The effects of the patient's sedatives and analgesics were indeed in a fluctuating state during treatment, and the confrontation between human and machine was serious. Other obstacles, such as troublesome symptoms (diarrhoea, abdominal distension and cough), a large abdominal incision, and so on, may be related to the symptoms of abdominal surgery. At this time, alleviating the patients' symptoms becomes the first priority of care.

All the patients in the study had high self-efficacy. On the one hand, the LT patients underwent the complicated experience of the preoperative waiting period, and the complications of their end-stage diseases were significantly relieved after LT. The discovery of these benefits may have given patients more confidence. On the other hand, the patients received timely support and encouragement from family and medical staff and gained hope from the experiences of their fellow patients. The guidelines also affirm the positive role of family participation [38]. Some studies have discovered that self-efficacy contributes to the improvement in activity [39]. There are many activities that can be engaged in the ICU [40]. In this study, different patients tended to engage in different activities. The activities of the 19 interviewees focused on blood circulation, ankle pump exercises, respiratory function exercises and getting out of bed but individual needs were still prominent.

In this study, the behavioural outcomes are attributed to the new needs of the patients after early mobilisation and its continuation. Patients' needs focused on adequate staff, a quiet environment, measures to feel well-tolerated, clear and appropriate rehabilitation goals, effective and detailed instructions and family involvement. It was also identified that setting clear and appropriate rehabilitation goals requires the participation of the rehabilitation practitioner and should take place within 4 days of admission to the ICU with the consent of the patient [33,41,42]. In addition, early mobilisation begins in the ICU, but it does not mean

that it ends after leaving. Patients who have experienced early mobilisation after LT also show a strong willingness to continue early mobilisation in the ward. However, there one interviewee strongly expressed a desire to be able to have a video call with his family members during early mobilisation. Although the ICU provides life support and is populated by medical staff, patients still feel anxious and lonely and need the company of their families.

One of the limitations of this study is that the interview did not extend to the ward. The treatment team expects that early mobilisation in the ICU will continue in the ward, which is an ideal behavioural result, but the interviews took place on the day the patients were transferred out of the ICU. As such, the behavioural results were established as new needs, and follow-up early mobilisation commitments (how they actually occur) must be further explored.

Conclusion

The findings on this topic will assist ICU medical staff in making better clinical decisions about the early mobilisation of patients after LT. When analysing the factors influencing early activity following LT, attention should be paid to the functional recovery of the patient's graft, the relief of liver disease symptoms, abdominal wounds, and so on, so as to meet the individual needs of patients and strive to achieve their expected activity goals.

Acknowledgements

The authors are deeply grateful for the assistance of all participants, and the nursing managers from the collaborating hospitals for supporting this study.

This study was funded by Capital's Funds for Health Improvement and Research (CFH,2022-2-1103), and did not interfere with the research design, research methods, data collection and analysis, report writing, etc. during the research process.

This study was conducted in accordance with the Declaration of Helsinki and approved by Bioethics Committee of Beijing Friendship Hospital, Capital Medical University (Approval No.2022-P2-032-01). Written informed consent was obtained from all participants.

All data generated or analysed during this study are included in this article. Further inquiries can be directed to the corresponding author.

L.Z., Y.J. and Y.G. conceived the study; W.H., Y.Z., T.Y. and Y.L. participated in its design and data analysis and statistics and L.F., W.Z. and Q.X. helped to draft the article. All authors read and approved the final article.

Conflicts of interest

There are no conflicts of interest.

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