

Effectiveness of rehabilitation of elderly people after cholecystectomy in outpatient settings

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Abstract

Purpose. To determine the dynamics of functioning, activity and participation using the International Classification of Functioning (ICF) as a criterion for the effectiveness of rehabilitation of elderly people after laparoscopic cholecystectomy (LCC). To conduct a comparative analysis of the levels of functioning, activity, and participation of elderly people according to the ICF in the post-acute and long-term phases of rehabilitation in outpatient settings.

Material & Methods. The study included elderly people aged 60 to 74 years after LCC (n=80), including men (n=18) and women (n=62). The study is a simple randomized trial using a simple random selection method with a draw. A control group (CG) and a main group (MG) were formed. Individuals in the MG received rehabilitation using a biopsychosocial approach in the subacute phase of rehabilitation. They were assessed for impairment in functioning, activity, and participation using the ICF, with results based on clinical instruments depending on the domain of the ICF. Statistical analysis. Calculations included the measurement of the median (Me) and the upper and lower quartiles (25%; 75%). The Mann-Whitney U-test was used to compare independent samples and the Wilcoxon T-test – to compare dependent samples; differences at $p < 0,05$ were considered statistically significant.

Results. After discharge from the surgical unit, individuals after LCC had impaired emotional function, sleep, digestive system, decreased respiratory function, pain, impaired postural balance, movement function, decreased exercise tolerance, decreased muscle strength, and decreased muscle endurance.

Conclusions. In the CG, the use of diet and symptomatic medication support showed a positive effect on the gastrointestinal tract, but did not significantly affect the functions of physical activity tolerance, endurance, trunk muscle strength, vestibular and other significant functions, which usually negatively affects the further rehabilitation prognosis and quality of life. The dynamics of functioning, activity and participation in elderly people was statistically significant in the MG. During the first 3 months, under the influence of therapeutic exercises, functional training, cyclical aerobic exercises and fall management, statistically significant positive changes occurred in vestibular functions, exercise tolerance, respiratory function, activity and participation. It was found that the effective impact of a physical rehabilitation program designed to address short- and long-term goals on function, activity, and participation based on the use of ICF in combination with symptomatic drug support was more significant at 12 months, especially on cardiovascular function, blood pressure, muscle strength, muscle endurance, sleep function, dietary compliance, and fitness.

Key words: physical rehabilitation, ICF, cholecystectomy, function, activity, participation, older age.



Introduction

According to the World Health Organization (WHO), digestive diseases will be one of the leading causes of morbidity in the 21st century, along with cardiovascular diseases (Lancet, 2023). According to the United European Gastroenterology (UEG) report, more than 332 million people in the European region live with digestive disorders.

HAIs account for a significant proportion of gross domestic income spent on healthcare, both globally and in Ukraine (Peery et al., 2015; Peery et al., 2019).

According to the Center for Public Health of the Ministry of Health of Ukraine in 2023, digestive diseases ranked 4th in the prevalence of diseases among the adult population of Ukraine and were in 3rd place among the causes of all hospitalized individuals in hospitals in Ukraine among the adult population (533308 cases, 8,87%) – 1584,91 per 100 thousand people and was second only to diseases of the circulatory system – 1st place (1294827 cases, 21,53%) – 3848,02 per 100 thousand people and neoplasms (651840 cases, 10,84%) – 1937,17 per 100 thousand people (medstat.gov.ua 2023). In Ukraine, gallbladder diseases are the most common reasons for hospitalization of people with digestive diseases, and acute cholecystitis is the most common reason for hospitalization for surgical treatment (medstat.gov.ua, 2023).

Laparoscopic cholecystectomy is currently the gold standard for treating individuals with cholecystitis. Compared to open cholecystectomy, individuals, especially younger ones, recover faster. However, according to numerous studies, elderly individuals require significant attention from a multidisciplinary team at all stages of rehabilitation due to the high risk of surgical and postoperative complications (Loozen et al., 2017; Golod et al., 2022).

Most scientific publications are devoted to improving surgical tactics and the effectiveness of medical treatment of postcholecystectomy syndrome (Loozen et al., 2017; Jensen et al., 2018).

Epidemiological studies (Lancet, 2023) indicate that lifestyle and behavioral risk factors for digestive disorders are socially constructed in most countries, meaning that exposure to these risks and the harm they cause are largely determined by a person's socioeconomic status and lifestyle.

It has been established that LCC can serve as a trigger for the development of further comorbidities that develop as a result of metabolic disorders (Lancet et al., 2023; Kawamata et al., 2023; Zhang et al., 2004; Tsai et al., 2014), which can be modified and reduced through the use of physical rehabilitation programs, using concepts that not only aim to eliminate the problem at the

level of structure and function, but also by influencing modifiable factors of chronic noncommunicable diseases (Kane et al., 2017, Meiqari et al., 2019).

Medication and diet (Pasanisi et al. 2018), although effective in most cases, cannot solve all the problems of people after LCC and require a broader view and intervention with physiotherapy and occupational therapy (Golod et al., 2024). Health management, behavioral strategies in the long-term stages are important (Litt et al., 2023) to restore activities and participation, especially for older people when dysfunctions are more pronounced.

All these issues require new conceptual approaches to assess the condition of individuals after LCC, to develop and implement a physical rehabilitation program for older adults aimed at improving the level of functioning, activity and participation to maintain an adequate quality of life, and to evaluate its effectiveness.

The ICF is used around the world as a tool for assessing functioning in areas such as social protection, insurance, work, economics, education, general and social legislation policy development, and environmental change. The ICF assesses the following major components of a person: bodily functions and structure, activities, participation, and environmental factors. For health care professionals, this assessment tool provides a broader view of health and the ability to better plan treatment, recovery, and rehabilitation for people with chronic illness or disability (ICF 2001).

The ICF framework is used globally to describe "functioning" and "disability," including visualizing functioning as a result of interactions with health status and contextual factors (Heerkens et al., 2018; Prodingier et al., 2019).

Material and methods of research

Study Design

The research was conducted at the Surgical department of the Ivano-Frankivsk Central City Clinical Hospital.

Subjects

The study included elderly people aged 60-74 years (n=80), including men (n=18) and women (n=62), who underwent LCC. The methods used in the study conformed to the ethical standards of the Declaration of Helsinki and were approved by the Ethics Committee of the Ivano-Frankivsk Medical University (IFNMU) as part of the research "Theoretical and methodological bases of physiotherapy for individuals after laparoscopic cholecystectomy" (state registration number 01119 U 2951). All subjects signed an informed consent to participate in the study.

Research methods

The presence of impairment in functioning, activity and participation was assessed using the ICF (according to the World Health Organization version of 2001). The computer program "Functional profile of the patient after cholecystectomy (PROFCHOL)" was used to assess the level of functioning of individuals after cholecystectomy using the ICF. The paper presents the results of the assessment of the degree of impairment according to the general classification of the ICF, "Function", "Activity and Participation" were evaluated at the outpatient stage of rehabilitation: P1 – primary examination; P2 – secondary examination in 3 months; P3 – final examination in 12 months.

The evaluation criteria according to the ICF were as follows: if there were no or minor violations, individuals received 0 points; 1 point if there were mild, minor violations; 2 points – moderate, significant violations; 3 points – severe, significant, intense violations; 4 points – absolute, total violations.

Individuals were randomly divided into the control group (CG), aged 65.83 ± 0.98 years, and the main group (MG), aged 65.95 ± 0.85 years, by simple random selection with lottery. With written informed consent, the CG individuals agreed to undergo all examinations in the post-acute period, and the MG individuals received rehabilitation intervention using a biopsychosocial approach in the outpatient phase for up to 3 months in the rehabilitation department of the hospital and in the long-term period from 3 months to 1 year in individual home programs with the possibility of monthly consultations. Exclusion criteria: individuals with neuropsychiatric pathology; refusal to participate in the study. There were three drop-outs in the post-acute phase: 2 men from the CG, 1 woman and 1 man from the MG for personal reasons. The evaluators were blinded during the interview, examination and data processing.

Statistical data analysis

The results were processed by mathematical statistics using the program IBM SPSS Statistics 23. Calculations included the measurement of the median (Me) and the upper and lower quartiles (25%; 75%). The Mann-Whitney U-test was used to compare independent samples and the Wilcoxon T-test – to compare dependent samples; differences at $p < 0,05$ were considered statistically significant.

Results of the study

Individuals in both groups were able to receive dietary counseling and medication support as indicated. All individuals were familiarized with the recommendations on the specifics of postoperative nutrition and physical activity. The meth-

odology of physical rehabilitation for the MG was based on the assessment of an individual's functioning using the ICF. The process was problem-oriented and aimed at achieving long-term and short-term rehabilitation goals. A patient-centered approach was used, which included planning and implementing rehabilitation taking into account the needs, abilities and desires, personal factors of the person receiving rehabilitation assistance. Because each person's level of functioning, activity, and participation was unique, an Individualized Rehabilitation Program (IRP) was selected for each person in accordance with changes in the functional status of the person receiving rehabilitation services. Individuals were directly involved in the development, implementation, and modification of their rehabilitation program. The rehabilitation process was consistent, considering the actual changes in the functional state of the person, the response to the intervention. Physical activity gradually increased. The duration of therapeutic exercises was strictly individualized, considering the condition of each person. The entire rehabilitation process was aimed at achieving an optimal level of functioning and quality of life in the person's environment (Prodingier et al. 2019; Golod et al. 2024).

In more detail, the algorithm of rehabilitation intervention of the MG is presented in Figure 1.

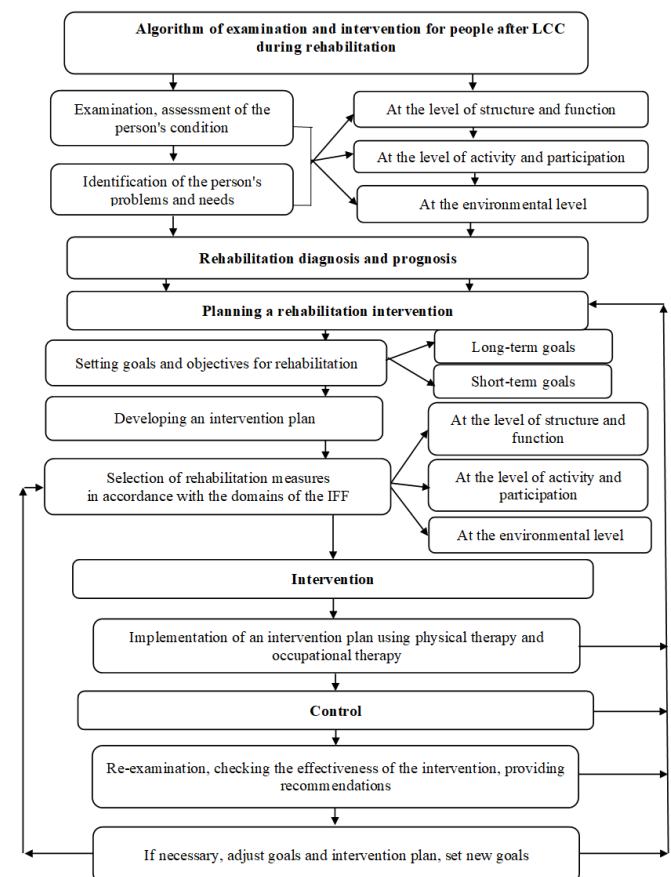


Figure 1. The algorithm of rehabilitation intervention of the MG.

The "Functional profile of the patient" was created with the help of the computer program PROFCHOL, which was used to enter existing disorders at the stages of rehabilitation (Golod et al. 2024). Its use facilitated the work of the multidisciplinary team of the rehabilitation department in assessing the level of functioning and activity of a person, setting rehabilitation goals and determining the scope of rehabilitation services in the development and implementation of individual rehabilitation programs. The use of the computer program allowed us to reduce the time spent on examination and coding according to ICF and to determine the effectiveness of rehabilitation intervention for people after laparoscopic cholecystectomy. All impairments of bodily functions included in the "Functional Profile of the Patient" were confirmed by standardized assessment tools, such as spirometry, 6-minute walk test, Borg scale, Berg balance test, Spielberger anxiety scales, hand dynamometry, and others, depending on the type of

dysfunction (Golod et al. 2022, 2023, 2024).

For individuals of the MG, the implementation of intervention programs included an interdisciplinary approach in each of the recovery phases, considering the individual problems and needs of the person. Rehabilitation means for impaired functions for people from the MG were selected in accordance with domains of ICF (Table 1).

Rehabilitation means in case of impaired activity and participation of persons with disabilities were selected according to ICF domains and personal factors (Table 2).

The results of the assessment of functioning, activity and participation of individuals after LCC are presented in Table 3.

As can be seen from Table 3, after discharge from the surgical department in the subacute period of rehabilitation, individuals after LCC had impaired emotional function, sleep, digestive system, decreased respiratory function, pain, impaired postural balance, movement function, de-

Table 1. Rehabilitation aids for people from key populations according to ICF domains in case of functional impairment

Domain ICF	The function of the body	A means of physical rehabilitation
b134	Sleep functions	Positioning, sleep management, behavioral intervention strategies
b152	Functions of emotions	Behavioral cognitive therapy, pain management, stress management, physical activity counseling
b2351	The vestibular balance function	Therapeutic exercises, functional training, fall management, selection of adaptive aids, environmental modification
b280	Feeling of pain	Medications, therapeutic exercises
b410	Heart functions	Cardiac rehabilitation program
b4200	Elevated blood pressure	Cardiac rehabilitation program
b440	Respiratory functions	Breathing and therapeutic exercises, cyclic aerobic exercises, smoking cessation, physical activity counseling
b455	Physical activity tolerance functions	Components of cardiac rehabilitation programs: counseling on physical activity, cyclic aerobic exercises, strength exercises
b4552	Fatigue	Cyclic aerobic exercises, therapeutic exercises, energy conservation management
b515	Digestive functions	Medications, therapeutic exercises, diet therapy, health management, nutrition counseling
b525	Defecation functions	Medications, therapeutic exercises, diet therapy, health management cyclic aerobic exercise
b5350	Feeling of nausea	Medications, cyclic aerobic exercise, diet therapy, health management
b5351	Feeling bloated	Medications, cyclic aerobic exercise, diet therapy, health management
b5352	Feeling of intestinal colic	Medication, cyclic aerobic exercise, nutrition, positioning, health management
b7305	Strength of the torso muscles	Strength exercises, cyclic aerobic exercises, Nordic walking
b740	Muscle endurance functions	Cyclic aerobic exercises, therapeutic and breathing exercises, strength exercises, Nordic walking

Table 2. Means of rehabilitation for persons with disabilities according to the domains of the ICF in case of impairment of activity and participation

Domain ICF	Activities and participation	A means of rehabilitation
d4501	Walking long distances	Cyclic aerobic exercises, Nordic walking, therapeutic and strength exercises, auxiliary aids
d5100	Washing body parts	Ergotherapy aids, coordination exercises
d5204	Toenail care	Ergotherapy, therapeutic exercises, aids, flexibility exercises
d5402	Dressing of the lower extremities	Ergotherapy, therapeutic exercises, aids, flexibility, coordination exercises
d5701	Adherence to diet and fitness	Trainings on health management, diet, calorie intake, physical activity

Table 3. Results of assessment of functioning, activity and participation of individuals after LCC

Domain ICF	The function of the body, activities and participation	The measurement of the median Me [25 %, 75 %]					
		Group CG			Group MG		
		P1	P2	P3	P1	P2	P3
b134	Sleep functions	2 [2; 3]	2 [2; 3]	2 [2; 3]	2 [2; 3]	2 [2; 3]	2 [2; 2]
b152	Functions of emotions	2 [1; 2]	2 [1; 2]	1 [1; 2]	2 [1; 2]	1 [1; 1]	1 [1; 1]
b2351	The vestibular balance function	2 [1; 2]	2 [1; 2]	1 [1; 2]	2 [1; 2]	1 [1; 1]	1 [1; 1]
b280	Feeling of pain	2 [2; 2]	1 [1; 2]	1 [1; 2]	2 [2; 2]	2 [1; 2]	2 [1; 2]
b410	Heart functions	3 [2; 3]	3 [2; 3]	3 [2; 3]	3 [2; 3]	3 [2; 3]	2 [2; 2]
b4200	Elevated blood pressure	2 [2; 3]	2 [2; 3]	2 [2; 3]	2 [2; 3]	2 [2; 3]	2 [1; 2]
b440	Respiratory functions	2 [1; 2]	2 [1; 2]	2 [1; 2]	2 [1; 2]	1 [1; 2]	1 [1; 2]
b455	Physical activity tolerance functions	2 [2; 3]	2 [2; 2]	2 [2; 2]	2 [2; 3]	2 [1; 2]	2 [1; 2]
b4552	Fatigue	2 [2; 3]	2 [2; 2]	2 [2; 2]	2 [2; 3]	2 [2; 2]	2 [2; 2]
b515	Digestive functions	3 [2; 3]	2 [2; 3]	2 [2; 2]	3 [2; 3]	2 [2; 2]	2 [2; 2]
b525	Defecation functions	3 [2; 3]	2 [2; 3]	2 [2; 3]	3 [2; 3]	2 [2; 2]	2 [2; 2]
b5350	Feeling of nausea	1 [0; 1]	0 [0; 1]	0 [0; 1]	1 [0; 1]	0 [0; 0]	0 [0; 0]
b5351	Feeling bloated	2 [2; 3]	2 [2; 2]	2 [2; 2]	2 [2; 3]	2 [2; 2]	2 [2; 2]
b5352	Feeling of intestinal colic	2 [2; 2]	2 [2; 2]	2 [2; 2]	2 [2; 2]	2 [1; 2]	2 [1; 2]
b7305	Strength of the torso muscles	3 [2; 3]	3 [2; 3]	3 [2; 3]	3 [2; 3]	3 [2; 3]	2 [2; 2]
b740	Muscle endurance functions	3 [2; 3]	2 [2; 3]	2 [2; 3]	3 [2; 3]	2 [2; 3]	2 [1; 2]
d4501	Walking long distances	2 [2; 3]	2 [2; 3]	2 [2; 3]	2 [2; 3]	2 [1; 2]	2 [1; 2]
d5100	Washing body parts	2 [2; 2]	1 [1; 2]	1 [1; 2]	2 [1; 2]	1 [1; 2]	1 [1; 2]
d5204	Toenail care	2 [1; 2]	2 [1; 2]	2 [1; 2]	2 [1; 2]	1 [1; 2]	1 [1; 2]
d5402	Dressing the lower extremities	2 [1; 2]	1 [1; 2]	1 [1; 2]	2 [1; 2]	1 [1; 2]	1 [1; 2]
d5701	Diet and fitness compliance	3 [2; 3]	2 [2; 3]	2 [2; 3]	3 [2; 3]	2 [1; 2]	1 [1; 2]

creased tolerance to physical activity, decreased muscle strength and endurance function, etc., which led to the development of rehabilitation measures depending on the dysfunction and activity limitation.

The results of the dynamics of functioning, activity and participation of individuals after LCC are presented in Table 4.

Discussion

Elderly people after LCC after discharge from the surgical unit, hoping for relief from the condi-

tion after surgery, had a large number of dysfunctions and a decrease in activity and participation, which required the development of a physical rehabilitation program (Golod et al., 2022; Golod et al., 2023; Golod et al., 2024).

Three months of rehabilitation intervention is not enough for a significant effect on cardiovascular function and blood pressure in elderly people after LCC; statistically significant dynamics in these functions were observed after 12 months of rehabilitation interventions.

The use of the ICF in outpatient settings in

Table 4. Results of dynamics of functioning, activity and participation of individuals after LCC

Domain ICF	The function of the body, activities and participation	p-value						
		the Wilcoxon T-test			the Mann-Whitney U-test			
		group CG P2 to P1	group CG P3 to P2	group MG P2 to P1	group MG P3 to P2	groups CG and MG P1 to P1	groups CG and MG P2 to P2	groups CG and MG P3 to P3
b134	Sleep functions	0,501	0,130	0,113	0,045	0,505	0,109	0,007
b152	Functions of emotions	0,282	0,126	0,010	0,282	0,447	0,003	0,033
b2351	The vestibular balance function	0,253	0,126	0,002	0,270	0,431	0,007	0,031
b280	Feeling of pain	0,031	0,247	0,045	0,247	0,282	0,268	0,268
b410	Heart functions	0,368	0,253	0,126	0,027	0,499	0,270	0,000
b4200	Elevated blood pressure	0,332	0,270	0,130	0,031	0,499	0,332	0,003
b440	Respiratory functions	0,499	0,282	0,009	0,130	0,640	0,033	0,027
b455	Physical activity tolerance functions	0,065	0,130	0,033	0,126	0,332	0,042	0,007
b4552	Fatigue	0,247	0,126	0,045	0,253	0,443	0,045	0,033
b515	Digestive functions	0,268	0,042	0,033	0,268	0,501	0,031	0,065
b525	Defecation functions	0,014	0,253	0,001	0,268	0,626	0,130	0,113
b5350	Feeling of nausea	0,033	0,126	0,004	0,368	0,505	0,247	0,253
b5351	Feeling bloated	0,045	0,130	0,027	0,253	0,635	0,126	0,130
b5352	Feeling of intestinal colic	0,253	0,247	0,033	0,247	0,497	0,033	0,033
b7305	Strength of the torso muscles	0,247	0,253	0,113	0,000	0,499	0,065	0,000
b740	Muscle endurance functions	0,065	0,113	0,130	0,000	0,621	0,113	0,007
d4501	Walking long distances	0,282	0,125	0,031	0,247	0,499	0,033	0,003
d5100	Washing body parts	0,031	0,253	0,009	0,247	0,253	0,282	0,332
d5204	Toenail care	0,247	0,126	0,002	0,268	0,501	0,027	0,007
d5402	Dressing of the lower extremities	0,033	0,247	0,000	0,332	0,501	0,253	0,268
d5701	Adherence to diet and fitness	0,062	0,130	0,000	0,000	0,368	0,000	0,000

Notes: 1. Differences at $p < 0,05$ were considered statistically significant.

2. P1 - primary examination.

3. P2 - Secondary examination in 3 months.

4. P3 - final examination in 12 months.

the post-acute and long-term stages of rehabilitation for people after cholecystectomy allowed us to track the dynamics of the level of functioning, activity and participation, which is consistent with the findings of researchers (Madden et al., 2014) who evaluated the use of the ICF as a tool for assessing the effectiveness of community rehabilitation. In particular, the researchers note that the ICF allows for a comprehensive analysis of experiences and health care needs (physical, mental, social) to ensure a comprehensive understanding of the health and functioning of people with chronic conditions. The authors report some limitations to its use and the need to classify the "personal factors" component. However, personal factors can be considered when planning and setting realistic rehabilitation goals, which significantly increases the motivation of individuals to implement IRP (Earde, et al. 2018).

The results of our research support the hypothesis (Karhula, et al. 2021; Yun et al., 2019) that person-centered care can positively influence rehabilitation outcomes.

It was the information provided to the person about the rehabilitation prognosis, the impact of existing bad habits and lifestyle that positively influenced the decision to continue rehabilitation in later stages of recovery (Golod et al., 2024).

Today, the use of the ICF in health care practice continues to generate much discussion and even resistance, especially among practitioners with a long history of using only a medical approach at the level of the structure and function of the human body. However, modern scientific research (de Oliveira et al., 2023; Huang et al., 2023; Veneri et al., 2018) demonstrates adequate internal consistency, high reliability and acceptable measurement error for use in sick and el-

derly people to assess indicators of body structure and function, activity and participation outcomes, namely (muscle strength, postural balance, physical fitness, cardiorespiratory function), activity (walking and mobility) and participation (social reintegration and quality of life).

The ICF helps to identify the most effective treatment and rehabilitation strategies (Parry et al., 2015).

The ICF is a guideline for physiotherapy, occupational therapy to describe the full range of human functioning and can be used for people after cholecystectomy at all stages of rehabilitation, both inpatient, outpatient and sanatorium-resort settings.

Conclusions

The results of our study indicate that the use of dietary and symptomatic medication support in the CG showed a positive effect on the gastrointestinal tract, but did not significantly affect the functions of physical activity tolerance, endurance, trunk muscle strength, vestibular and other significant functions, which usually negatively affect the further rehabilitation prognosis and quality of life. At the same time, the dynamics of functioning, activity and participation in elderly people aged 60 to 74 years after LCC was statistically significant in the MG that received rehabilitation intervention with the use of ICF in outpatient settings. During the first 3 months, there were statistically significant positive changes in vestibular function, exercise tolerance, respiratory function, activity and participation under the influence of therapeutic exercise, functional training, cyclic aerobic exercise and fall management. The effective impact of a physical rehabilitation program using a biopsychosocial, problem-oriented approach aimed at solving short- and long-term goals on function, activity and participation of elderly people after cholecystectomy in the outpatient phase of rehabilitation, based on the use of ICF in combination with symptomatic medication support, was more significant at 12 months, especially on cardiovascular function, blood pressure, muscle strength, muscle endurance, sleep function, dietary adherence and fitness.

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Supplementary Information

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