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Quality of life assessment in patients after laparoscopic cholecystectomy

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Abstract: *Laparoscopic cholecystectomy is widely recognized as the gold standard for surgical treatment of gallstone disease. Despite its high efficacy and low rate of early complications after surgery, some patients still experience abdominal symptoms after surgery. The results of some studies show that approximately 25% of patients experience abdominal complaints requiring medical assessment one month after surgery. Active postoperative follow-up is considered to play a key role in improving patients' quality of life and identifying symptoms that remain after surgery for various reasons. With the growth of digitalization in health care, telemedicine technologies are opening up new opportunities to improve the effectiveness of postoperative monitoring. However, telemedicine services also face a number of challenges, including technical limitations, unequal access to digital technologies, the need to adapt clinical protocols, and the potential threat to patient data security. The present prospective study was conducted between 2024 and 2025 at two medical institutions in Ukraine. The study comprised 70 patients who underwent laparoscopic cholecystectomy for gallstone disease. The age of participants ranged from 24 to 67 years, with a mean age of 44.3 ± 10.8 years. Exclusion criteria included performing open instead of laparoscopic cholecystectomy, complicated intraoperative course, severe comorbidities (decompensated diabetes mellitus, malignancies, advanced heart failure), psychiatric disorders, lack of internet access, or refusal to participate in telemedicine follow-up. The patients were divided into two groups: the main group received postoperative support using telemedicine, while the control group received traditional outpatient care. Patients in the main group were at liberty to seek face-to-face outpatient care at any time. Quality of life was assessed using validated Ukrainian versions of the EQ-5D-5L and SF-36 questionnaires 1, 6, and 12 months after surgery. The results showed positive changes in quality of life for the entire group during the year after the intervention. The average EQ-5D-5L index increased from 0.90 to 0.95 over 11 months, and the physical and psycho-emotional components of the SF-36 increased from 70.3 to 82.6 and from 73.0 to 85.0, respectively. It is worth noting that at no stage of the observation were there any statistically significant differences between the main and control groups in terms of quality of life as assessed by the above-mentioned questionnaires. This finding indicates that telemedicine tools may be as effective as traditional postoperative supervision in terms of quality of life. The introduction of telemedicine into postoperative care is safe, effective and patient-centered, especially in cases where in-person consultations are not possible or require additional financial or time costs. The study suggests that telemedicine could be a valuable option of postoperative management for patients who have undergone laparoscopic cholecystectomy, highlighting its potential for wider integration into routine postoperative management.*

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Keywords: Cholecystectomy, Cholelithiasis, Postoperative Care, Quality of Life, Remote Consultation, Telemedicine, Treatment Outcome, Laparoscopic.

Introduction

Gallstone disease (GSD) is one of the most common disorders of the liver and bile ducts and affects 10–20% of adults in developed countries. Observations have shown that GSD is more common as people get older, and its prevalence is twice as high among women. This discrepancy is primarily attributed to hormonal factors, including estrogen levels, pregnancy, and the utilisation of hormonal contraceptives [1]. There are some other risk factors to consider, which include obesity, a sedentary lifestyle, and genetic predisposition.

Symptomatic gallstone disease can have a significant impact on patients' quality of life, often resulting in chronic pain, dyspepsia, and the potential for acute complications. Most medical researchers agree that laparoscopic cholecystectomy (LC) is the best option for treating cholelithiasis because it is safe, effective, relatively low-risk and patients make a quick recovery.

In Ukraine the number of cholecystectomies performed each year has increased over the past decade reaching a record high of 160.5 operations for every 100,000 people in 2023. Concurrently, the mortality rate showed stability, maintaining a consistent range of 0.21-0.25% [3].

Despite the LC proving successful in most cases, some patients experience ongoing or new abdominal symptoms in the postoperative period. The most prevalent complaints encompass intermittent abdominal pain, dyspeptic syndrome, bloating, and disturbances in bowel movements.

According to international studies, up to 13% of patients report symptoms six months after surgery, although an organic cause can be identified in less than 1% of cases [4]. Based on our preliminary findings [3], approximately 25% of patients experience intermittent abdominal complaints one month after surgery, requiring medical attention.

The pathogenesis of postoperative abdominal disorders in patients after LC is multifactorial. Symptoms can originate by both biliary and non-biliary factors. One of the common causes is dysfunction of the sphincter of Oddi, which can lead to intermittent or persistent pain, elevated liver enzymes, bile duct dilatation, or even recurrent pancreatitis [5].

Postoperative management of patients involves a multifaceted approach, encompassing meticulous monitoring of the patient's condition, expeditious identification of any potential complications, and the judicious implementation of both pharmacological and non-pharmacological interventions when deemed necessary. In the context of the ongoing digitalisation of healthcare and the imperative to optimise resource utilisation, there has been an increasing use of telemedicine technologies in clinical practice. The use of teleconsultations has the potential to reduce the number of in-person visits, save time for both patients and healthcare providers, and ensure timely access to medical care. [6-8]

Telemedicine presents several challenges, including technical limitations, unequal access to digital technologies, the need to adapt clinical protocols, a potential increase in overall healthcare expenditures due to overutilisation of medical services, and additional risks to patient safety [9]. However, when these technologies are implemented in the appropriate manner, there is a possibility that they may not compromise the quality of life of patients in the postoperative period [10].

Aim

The aim of this study is to assess the impact of using telemedicine tools on patient`s quality of life in the postoperative management after LC.

Materials and Methods

The prospective study was conducted during 2024–2025 at two healthcare institutions: St. Paraskeva Medical Center (Lviv) and the University Clinic of Bogomolets National Medical University (Kyiv). The study included 70 patients who had LC for GSD. The inclusion criteria were patient age between 18 and 75 years; LC performed no more than 4 weeks prior to enrollment; confirmed diagnosis of

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GSD as the primary condition; signed informed consent to participate in the study; and access to a mobile phone or computer suitable for remote monitoring. Exclusion criteria: complicated surgical course (conversion to laparotomy or extended surgical intervention); early postoperative complications; confirmed malignant neoplasm of any localization; severe decompensated comorbid conditions (cardiac, renal, or hepatic failure); pregnancy or lactation; refusal to participate in the study; or inability to comply with the study protocol (lack of access to digital communication tools or limited ability to use them).

Patients were divided into two groups. The main group received postoperative care using telemedicine tools, including asynchronous remote questionnaires, teleconsultations, and video consultations (n = 35). The control group received standard outpatient follow-up without the use of telemedicine tools (n = 35). Patients were allocated to the main and control groups using stratified randomization to ensure balanced distribution between the two study sites (Lviv and Kyiv). Within each stratum, a computer-generated randomization sequence (Microsoft Excel, RAND function) was used to assign participants in a fixed 1:1 ratio. Allocation was implemented immediately after confirming eligibility and obtaining informed consent.

The EQ-5D-5L and SF-36 questionnaires, validated in Ukrainian, were used to assess quality of life. The validated forms were uploaded using Google Forms and distributed by email. Assessments were carried out 1, 6, and 12 months after surgery. Participants in the main group completed the questionnaires online via Google Forms, while patients in the control group completed paper-based versions during in-person visits to their physician. A visual analogue scale (VAS) ranging from 0 to 10 was used to evaluate overall patient satisfaction with medical care. Patients were asked to respond to the question: “How satisfied are you with postoperative care and the treatment process?” where 0 indicated complete dissatisfaction and 10 indicated maximum satisfaction.

The sample was characterized through the utilization of descriptive statistical methods, encompassing the calculation of mean values, standard deviations, frequencies, and percentages. The t-test for independent samples was utilized to compare the indicators between independent groups (main and control). In order to assess changes in quality of life over time (1, 6 and 12 months) within the same group, a paired t-test was used, as well as an analysis of variation with repeated measures (Repeated Measures ANOVA) to identify the dynamics of changes at three time points. Post-hoc pairwise comparisons following Repeated Measures ANOVA were performed using the Bonferroni correction to adjust for multiple comparisons. Effect sizes were calculated using Cohen’s d for t-tests and partial eta-squared (η^2p) for Repeated Measures ANOVA. The analysis of the obtained results was performed using the statistical software packages MedStat v.5.2 and EZR version 4.1.2. The study materials were reviewed and approved by the Commission on Bioethical Expertise and Research Ethics of the Bogomolets National Medical University (Protocol № 195 dated May 26, 2025). The study was conducted in full accordance with the ethical principles outlined in the Declaration of Helsinki (2013 revision). Personal data were anonymized and handled confidentially.

Results

Among the participants of the study, 45 (64.3%) were women and 25 (35.7%) were men, which is consistent with epidemiological data indicating a higher prevalence of GSD in women. The main group included 21 women and 14 men, while the control group consisted of 23 women and 12 men. There was no statistically significant difference in sex distribution between the groups ($p = 0.805$).

The mean age of participants was 49.3 ± 13.1 years, ranging from 23 to 74 years. The mean age in the main group was 48.8 ± 13.2 years, and in the control group, 49.1 ± 12.7 years. There was no statistically significant difference in age between the main and control groups ($p = 0.919$). Table 1 and figure 1 show the mean EQ-5D-5L quality of life scores 1, 6, and 12 months after cholecystectomy in both groups. Despite a slight tendency toward higher scores in the main group, the difference between

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Table 1. Mean EQ-5D-5L quality-of-life scores (utility index) at 1, 6, and 12 months after laparoscopic cholecystectomy in the main and control groups

Group	1 month mean ± SD (utility index)	6 months mean ± SD (utility index)	12 months mean ± SD (utility index)
Main	0.91 ± 0.05	0.94 ± 0.04	0.96 ± 0.03
Control	0.89 ± 0.06	0.92 ± 0.05	0.94 ± 0.04

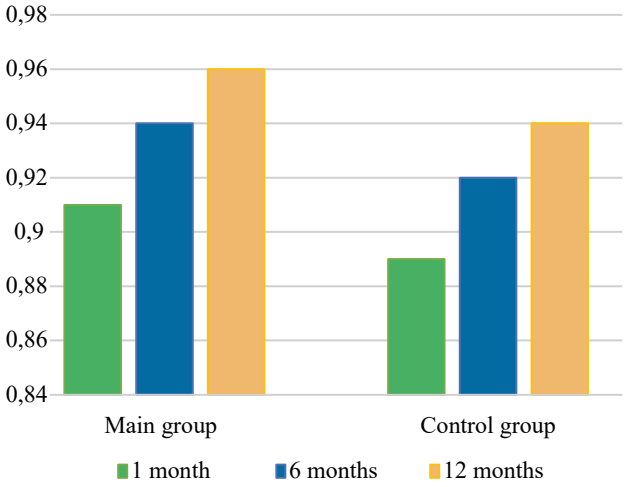

Figure 1. Mean quality of life scores according to the EфQ-5D-5L questionnaire (utility index) at 1, 6, and 12 months after laparoscopic cholecystectomy.

the groups was not statistically significant at any time point ($p > 0.05$).

Table 2 shows the mean scores of the physical (PCS) and mental (MCS) components according to the SF-36 questionnaire in the main and control groups 1, 6, and 12 months after LC.

Table 2. Mean SF-36 physical (PCS) and mental (MCS) component scores (points) at 1, 6, and 12 months after LC

Group	Time after surgery	PCS, Mean ± SD (points)	MCS, Mean ± SD (points)
Main	1 month	72 ± 9	74 ± 8
	6 months	80 ± 7	83 ± 6
	12 months	83 ± 6	86 ± 5
Control	1 month	70 ± 10	72 ± 9
	6 months	78 ± 8	81 ± 7
	12 months	82 ± 7	84 ± 6

None of the differences between the main and control groups reached statistical significance ($p > 0.05$).

Among the total sample ($n = 70$), a statistically significant improvement in quality of life was observed between 1 and 12 months after LC. Both groups showed an improvement in physical and psychoemotional components of quality of life, as measured by the SF-36 questionnaire, over the one-year period after the intervention ($p < 0.001$), which is consistent with the natural course of recovery after cholecystectomy. A statistically significant difference was also observed according to the EQ-5D-5L questionnaire between 1 and 12 months after surgery ($p<0.001$). These findings are presented in Table 3, Figure 2, and Figure 3.

The distribution of satisfaction values on the visual analogue scale (VAS) was found to be non-normal ($p< 0.00001$, according to the Shapiro-Wilk test). The mean level of satisfaction in the

Table 3. Statistically significant changes in quality-of-life indicators according to the SF-36 (points) and EQ-5D-5L questionnaires (utility index) between 1 and 12 months after laparoscopic cholecystectomy in the total sample

	Mean ± SD	p
EQ-5D-5L		
1 month	0.90 ± 0.06	p<0.001
12 months	0.95 ± 0.03	
SF-36 Physical Health		
1 month	70.3 ± 4.7	p<0.001
12 months	82.6 ± 3.7	
SF-36 Mental Health		
1 month	73.0 ± 4.3	p<0.001
12 months	85.0 ± 3.7	

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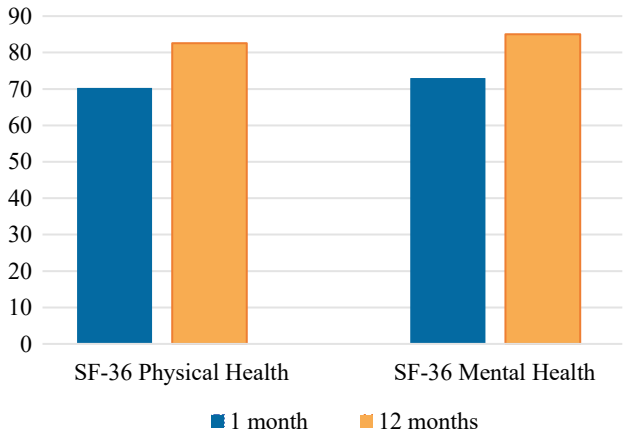

Figure 2. Mean quality of life scores according to the SF-36 questionnaire (points) in the total sample 1 and 12 months after laparoscopic cholecystectomy in the total sample

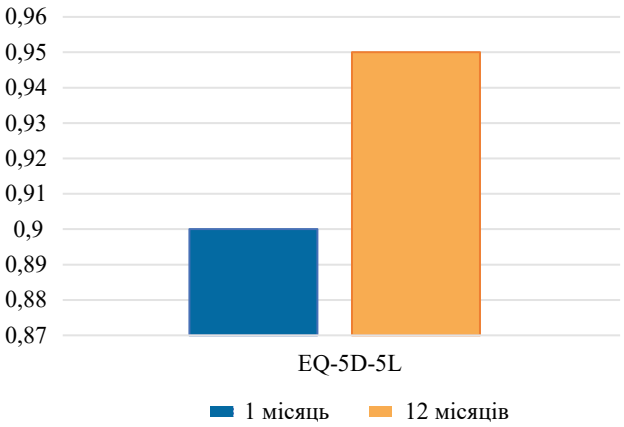

Figure 3. Mean quality of life scores according to the EQ-5D-5L questionnaire (utility index) 1 and 12 months after laparoscopic cholecystectomy in the total sample

total sample is Me (QI-QIII) 8.0 (8.0 - 9.0). The main group is characterised Me (QI-QIII) 9.0 (8.0 - 9.5) while the control group exhibits an average score of Me (QI-QIII) 8.0 (8.0 - 9.0). The data show a slight tendency for a higher median in the main group, but these differences are not statistically significant (p = 0.49).

Discussion

Since its introduction in the early 1990s, LC has gradually become the preferred method for gallbladder removal, largely due to the many advancements in medical technology that have taken place over the years. In the current medical practice, LC is considered the standard of care for a range of conditions, including symptomatic cholelithiasis, chronic cholecystitis, and even complications like gallstone pancreatitis. LC has been adopted in a number of high-income countries, where it appears to offer a number of advantages, including shorter hospital stays, faster recovery, and reduced overall healthcare costs. Its safety profile is well-established, with a reported mortality rate as low as 0.22%–0.4%, which further supports its role as a first-line surgical intervention. [11]

The findings of this study demonstrate that the use of telemedicine in the postoperative management of patients after LC provides outcomes that are comparable to those achieved through conventional outpatient follow-up. Both groups demonstrated statistically significant improvements in EQ-5D-5L and SF-36 scores over the 12-month period following surgery, which appears to be consistent with the natural course of postoperative recovery.

These results are consistent with previous research indicating a gradual enhancement of health-related quality of life after surgical treatment of gallstone disease. According to a meta-analysis by Deborah et al. (2022), postoperative EQ-5D utility scores typically approach 0.93, which aligns well with the values observed in this study and supports the external validity of our findings. [12]

Our study did not reveal clinically meaningful differences between telemedicine-based and traditional follow-up formats. This finding indicates that telemedicine support may serve as a viable alternative to conventional postoperative monitoring, aligning with current trends in the digitalisation of healthcare [6, 13].

According to recent studies, postoperative care incorporating telemedicine technologies offers several potential advantages, including a reduction in the number of in-person visits [7, 8], time and resource savings for both patients and healthcare providers [14], and high levels of patient satisfaction while maintaining clinical effectiveness [13, 15]. The aforementioned benefits of telemedicine-based approaches suggest their potential as a promising strategy in the postoperative management of patients with gallstone disease. The findings of this study demonstrate the high level of quality of life, which is consistent with the results reported by Taha

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et al. (2024). These researchers demonstrated a high level of satisfaction and improved quality of life among patients undergoing LC in Saudi Arabia [11].

Conclusions

Telemedicine can be a reliable and convenient alternative to conventional follow-up for patients after LC. Over the course of one year, patients in both the telemedicine and traditional care groups reported significant improvements in their quality of life after surgical treatment. Specifically, the EQ-5D-5L index rose from 0.90 to 0.95, and the SF-36 scores improved in both physical (from 70.3 to 82.6) and mental health domains (from 73.0 to 85.0), all with high statistical significance ($p < 0.001$).

There were no significant differences between the groups at any stage of follow-up, which suggests that remote monitoring is just as effective as in-person visits in supporting recovery and well-being after surgery.

Further implementation of telemedicine in postoperative management protocols for gallstone disease appears justified. Such an approach may improve continuity of care, reduce the burden on healthcare system, and provide flexible, patient-centered follow-up options, particularly in settings with limited access to in-person consultations.

Financing

This study did not receive funding.

Conflict of interests

The authors declare no conflict of interests.

Consent to publication

Consent was obtained from participants included in the study.

AI Disclosure

The authors used ChatGPT (OpenAI, San Francisco, CA, USA) for language editing of the English text. The authors reviewed and verified all AI-generated content to ensure accuracy and integrity.

Author Contributions (CRediT taxonomy)

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Data Curation: Starodub Tetiana;

Writing – Original Draft Preparation: Starodub Tetiana;

Writing – Review & Editing: Bogomaz Volodymyr;

Visualization: Starodub Tetiana;

Supervision: Bogomaz Volodymyr;

Project Administration: Bogomaz Volodymyr;

All authors have read and approved the final version of the manuscript.

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Оцінка якості життя пацієнтів після лапароскопічної холецистектомії

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Анотація: *лапароскопічна холецистектомія широко визнана золотим стандартом хірургічного лікування жовчнокам'яної хвороби. Незважаючи на високу ефективність операції та низький рівень ранніх ускладнень, згідно з результатами попередніх досліджень, приблизно 25% пацієнтів відчувають абдомінальні скарги, що вимагають медичного обстеження через місяць після операції. Активне післяопераційне спостереження вважається ключовим фактором у поліпшенні якості життя пацієнтів та виявленні симптомів, що залишаються після операції з різних причин. З розвитком цифровізації в галузі охорони здоров'я технології телемедицини відкривають нові можливості для підвищення ефективності післяопераційного спостереження. Однак послуги телемедицини також стикаються з низкою викликів, серед яких технічні обмеження, нерівний доступ до цифрових технологій, необхідність адаптації клінічних протоколів та потенційна загроза безпеці даних пацієнтів. Дане проспективне дослідження проводилося в період з 2024 по 2025 рік у двох медичних закладах України. У дослідженні брали участь 70 пацієнтів, яким було проведено лапароскопічну холецистектомію з приводу жовчнокам'яної хвороби. Вік учасників коливався від 24 до 67 років, середній вік – 44.3 ± 10.8 року. Критеріями виключення були: проведення відкритої холецистектомії замість лапароскопічної, ускладнений перебіг операції, тяжкі супутні захворювання (декомпенсований цукровий діабет, злоякісні новоутворення, виражена серцева недостатність), психічні розлади, відсутність доступу до Інтернету або відмова від участі у телемедичному спостереженні. Пацієнтів було розподілено на дві групи: основна отримувала*

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післяопераційний супровід із використанням телемедицини, а контрольна - мала традиційне амбулаторне спостереження. За потреби пацієнти основної групи могли в будь-який час звернутися за очною амбулаторною допомогою. Якість життя учасників дослідження оцінювалася за допомогою валідованих українських версій опитувальників EQ-5D-5L та SF-36 через 1, 6 та 12 місяців після операції. Результати показали позитивні зміни в якості життя загальної вибірки протягом року після втручання. Середній індекс EQ-5D-5L зріс з 0.90 до 0.95 за 11 місяців, а фізичний та психоемоційний компоненти SF-36 зросли з 70.3 до 82.6 та з 73.0 до 85.0 відповідно. Варто зазначити, що на жодному етапі спостереження не було статистично значущих відмінностей між основною та контрольною групами за якістю життя, оціненою за допомогою вищезазначених анкет. Цей висновок свідчить про те, що засоби телемедицини можуть бути настільки ж ефективними, як і традиційний післяопераційний нагляд, з точки зору якості життя. Загалом вважається, що впровадження телемедицини в післяопераційний догляд є безпечним, ефективним і орієнтованим на пацієнта, особливо в тих випадках, коли очні консультації неможливі або вимагають додаткових фінансових або часових витрат. Проведене дослідження показує, що телемедицина може бути ефективною альтернативою післяопераційному веденню пацієнтів після лапароскопічної холецистектомії, підкреслюючи її потенціал для більш широкої інтеграції в рутинну клінічну практику.

Ключові слова: Дистанційна консультація; Жовчнокам’яна хвороба; Лапароскопічна холецистектомія; Післяопераційний догляд; Результати лікування; Телемедицина; Якість життя.

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