ORIGINAL ARTICLE

90-day readmission rates after cholecystectomy: A retrospective cohort study

Tasas de readmisión de 90 días después de la colecistectomía: un estudio retrospectivo de cohort

Nadir A. Hacim[1], Ahmet Akbas[1], Hasim F. Gullu[1], Yigit Ulgen[2], Onder Karabay[3], Serhat Meric[1], Talar V. Aktokmakyan[1], and Yuksel Altinel[1]*

[1]Department of General Surgery, Bagcilar Training and Research Hospital; [2]Department of Pathology, Bagcilar Training and Research Hospital; [3]Department of General Surgery, Beykent University. Istanbul, Turkey

Abstract

Objective: *Although readmission after surgical procedures has been recognized as a new problem, its association with cholecystectomy has not been solved. We aimed to investigate the rate of unplanned readmission after cholecystectomy and to evaluate the reasons and outcomes in these patients.* **Methods:** *All consecutive patients who underwent open and laparoscopic cholecystectomy were retrospectively evaluated. Hospital readmission within the post-operative first 90 days after the procedure was searched. The rate and reasons for hospital readmission were the primary outcomes.* **Results:** *There were 601 patients with a mean age of 53.2 ± 12.4 years. The rate of readmission was 6.16%. Obesity (p = 0.001), number of co-existing disease (p = 0.039), conversion to open surgery (p = 0.002), development of intraoperative complications (p < 0.001), use of drain (p = 0.001), and length of hospital stay > 1 day (p = 0.024) were significantly associated with higher readmission rates. Biliary surgical causes were detected in five patients (12.8%). Non-biliary surgical causes were seen in 34 patients (87.2%). Among these, post-operative pain, nausea, and vomiting were the most common diagnoses in 25 (67.6%) and 5 patients (12.8%).* **Conclusion:** *The readmission rate after cholecystectomy is low. Significant predictive factors may help physicians to be alerted during the discharge of the patients. Post-operative pain, nausea, and vomiting were the most common diagnoses.*

Keywords: *Cholecystectomy. Laparoscopic cholecystectomy. Patient readmission. 90-day readmission.*

Resumen

Objetivo: *Aunque el reingreso hospitalario posterior a la cirugía se reconoció como un problema nuevo, su asociación con la colecistectomía no ha sido resuelta. Nuestro objetivo fue investigar la tasa de reingreso al hospital no planificado después de la colecistectomía y evaluar las razones y los resultados en estos pacientes.* **Métodos:** *Todos los pacientes consecutivos que se sometieron a colecistectomía abierta y laparoscópica fueron evaluados retrospectivamente. Se investigó el reingreso al hospital dentro de los primeros 90 días postoperatorios. La tasa y las razones de la readmisión hospitalaria fueron los resultados primarios.* **Resultados:** *Se examinaron 601 pacientes con una edad media de 53.2 ± 12.4 años. La tasa de reingreso fue del 6.16%. Obesidad (p = 0.001), número de enfermedades coexistentes (p = 0.039), conversión a cirugía abierta*

Correspondence:
*Nadir A. Hacim
Dr. Sadık Ahmet Cd
Merkez Mah.
34200 Bagcilar, Istanbul, Turkey
E-mail: adnanhcm@hotmail.com

Date of reception: 25-04-2021
Date of acceptance: 26-08-2021
DOI: 10.24875/CIRU.21000371

Cir Cir. 2022;90(S1):70-76
Contents available at PubMed
www.cirugiaycirujanos.com

(p = 0.002), desarrollo de complicaciones intraoperatorias (p < 0.001), uso de drenaje (p = 0.001) y longitud de estancia hospitalaria > 1 día (p = 0.024) se asociaron significativamente con tasas más altas de reingreso. Se detectaron causas quirúrgicas biliares en cinco pacientes (12.8%). Se observaron causas quirúrgicas no biliares en 34 pacientes (87.2%). Entre estos, el dolor postoperatorio, las náuseas y los vómitos fueron los diagnósticos más comunes en 25 (67.6%) y 5 pacientes (12.8%).
Conclusión: *La tasa de reingreso después de la colecistectomía es baja. Factores predictivos significativos pueden ayudar a los médicos a estar alertas durante el alta de los pacientes. El dolor postoperatorio, las náuseas y los vómitos fueron los diagnósticos más frecuentes.*

Palabras clave: Colecistectomía. Colecistectomía laparoscópica. Readmisión de pacientes. Readmisión de 90 días.

Introduction

Surgical treatment of symptomatic gallstones through open or laparoscopic cholecystectomy is one of the most frequent procedures performed throughout the world[1,2]. Although most of cholecystectomies are performed laparoscopically and even in an outpatient setting, hospital readmission can occur in a substantial number of the cases[3]. A quality standard of < 10% readmission rate after cholecystectomy within the post-operative 30 days has been also recommended[4]. After any medical or surgical treatments, hospital readmission has been regarded as a measure of hospital and surgical quality of care[1,5].

In the previous studies, avoidance from readmissions has been questioned due to different patients' conditions and factors[3]. Besides, it has been speculated that hospital readmissions may result from complications that were not recognized before discharge or inadequate discharge planning[6]. Thus, efforts have been developed to reduce the rate of such admissions and to improve delivery of care for patients undergoing cholecystectomy considering the medical importance and cost of unplanned readmissions following cholecystectomy[6,7].

The incidence, risk factors, and causes of unplanned hospital readmission after cholecystectomy have been analyzed in the previous studies[1,3-5,8-10]. The rate has varied from 2.4% to 6.7%, with an average of 3.3% depending on the different settings of cholecystectomy[7]. Identifying the factors responsible for unplanned readmissions may help physicians develop pre- and post-operative strategies to avoid such admissions.

Although most cholecystectomies have been performed laparoscopically, there are a limited number of studies, in which open cholecystectomy is considered for the calculation of readmission rates following cholecystectomy[1,5]. Thus, analysis of all laparoscopic, open, and converted cholecystectomies regarding hospital readmissions may be used to develop a discharge strategy to define risky patients for hospital readmissions.

In the present study, we aimed to investigate the rate of unplanned readmissions after cholecystectomy and evaluate the reasons and outcomes.

Materials and methods

Study

This study was a retrospective analysis of all consecutive patients who underwent open and laparoscopic cholecystectomy for benign biliary pathology between June 2019 and March 2020 at Bagcilar Training and Research Hospital, Istanbul, Turkey regarding hospital readmissions within the post-operative first 90 days after the procedure. The Local Ethical Committee (Bagcilar Training and Research Hospital, May 15, 2020, Approval number: 2020.05.1.02.034) approved the study. The researchers were in agreement with the Declaration Helsinki for the study. Written consent could not be taken from the patients due to the retrospective design of the study and deidentified nature of data used for the analyses.

Patients

All patients with a pre-operative diagnosis of "cholelithiasis," "cholesterolosis," "chronic cholecycstitis," and "acute cholecystitis" were searched using the hospital information system. Patients who were younger than 18 years, patients with coexisting common bile duct pathologies, current oncological diseases, and cholecystectomy combined with other surgical operations were not included in the study. All laparoscopic procedures were performed by the classical 3-or 4-port technique[4]. As an institutional policy, ambulatory, single incision laparoscopic, or robotic surgery were not used for cholecystectomy.

Variables including patients' demographics (age, sex, body mass index (BMI), comorbidities, the

American Society of Anesthesiologists (ASA) score, previous biliary pathologies necessitating interventions (endoscopic retrograde cholangiopancreatography (ERCP), and other percutaneous interventions), imaging findings, operative findings (type of presentation as elective or emergent, type of operation as open, laparoscopic and conversion, operation time, and intraoperative complications), and post-operative features (length of hospital stay and post-operative complications) were recorded. The operation time and length of hospital stay of all patients were grouped using the median value of each variable as cut off. The final gallbladder pathology was also recorded.

Besides, the reasons for hospital readmissions were classified, according to Rana et al.[9]:

- Surgical causes
  - Biliary such as acute pancreatitis, choledocholithiasis, and bile leak
  - Non-biliary such as abdominal pain, nausea and vomiting, wound infection, other wound problems including evisceration and herniation, intra-abdominal abscess, intra-abdominal hematoma, and drain *in situ*.
- Non-surgical causes

The length of hospital stay during readmission, the treatment modalities, and outcomes was evaluated.

Outcomes

The rate and reasons for hospital readmissions within the post-operative first 90 days after cholecystectomy were the primary outcomes of the study. The risk factors of hospital readmissions were the secondary outcomes. Hospital readmission was defined as any hospitalization with a duration of at least 24 h at the emergency service or general surgery wards. If a patient had more than one hospital readmissions with the same complaints, repeated admissions were ignored. However, in a case of more than one hospital readmissions with different complaints, each admission was regarded as a new admission. Hospital admissions that were unrelated to the index operation were not included in the study.

Statistical analysis

Statistical analysis was performed using a statistical package (SPSS 15.0, Chicago, IL, USA). The normality of distribution of continuous variables was assessed using the Kolmogorov– Smirnov test. Continuous variables with and without normal distribution were presented as mean ± standard deviation and median with interquartile range (IQR) of 25-75%. Categorical variables were presented with frequencies with percentages. The Pearson Chi-square and Fisher's exact tests were used for categorical variables. The t-test and one-way analysis of variance (ANOVA) were used to compare the continuous variables with the normal distribution. The Mann–Whitney U-test was applied to compare continuous variables without normal distribution. $p < 0.05$ was considered statistically significant.

Results

There were 601 patients with a mean age of 53.2 ± 12.4 years. The baseline characteristics of the patients are summarized in table 1. Female-to-male ratio was 2. Most of the patients were female (66.6%), had BMI between 25.0 and 34.9 kg/m^2 (70.7%), had ASA scores of 1 and 2 (93.4%), and had no coexisting disease (59.7%). Diabetes mellitus was the most common coexisting disease seen in 76 patients (12.6%).

Pre-operative US revealed that cholelithiasis was detected in 541 patients (90%). Increased wall thickness was seen in 75 patients (12.5%). Pre-operative interventions as ERCP and PC were performed in 23 patients (3.8%) (Table 2).

Operative features are detailed in table 3. In 563 patients (93.7), the operation was performed as elective cholecystectomy. Laparoscopic cholecystectomy was the most common type of surgery in the study group (89.2%). The median length of operation time was 55 min, and in 310 patients (51.6%), the length of the operation was longer than 55 min. There were 47 intraoperative complications (7.8%) as bleeding and biliary injury seen in 42 and five patients, respectively. The bleedings from the cystic artery, liver bed, and the entry points for trocars were seen in five, 31, and six patients, respectively. The patients with intraoperative biliary injury were converted to open surgery. Primary repair over the T tube and hepaticojejunostomy was performed in two and three patients, respectively.

A total of 37 patients (6.16%) readmitted during the post-operative first 90 days. There were significant differences between the BMI of the patients in Group 1 and Group 2. The BMI of the patients in Group 1 was significantly higher than that of Group 2 ($p = 0.001$). Patients with Grade II and Grade III obesity were more frequently seen in Group 1 ($p < 0.001$). As the number

Table 1. Demographic and clinical features of the study groups

Variable	Overall (n = 601)	Group 1 (n = 37)	Group 2 (n = 564)	p
Age (year)†	53.2 ± 12.4	51.6 ± 13.4	53.3 ± 12.3	0.684
Sex‡				
Female	400 (66.6)	26 (70.3)	374 (66.3)	0.721
Male	201 (33.4)	11 (29.7)	190 (33.7)	
BMI (kg/m²)†	30.9 ± 5.0	35.1 ± 4.6	30.6 ± 4.9	0.001
BMI groups‡				
Underweight (< 18.5)	2 (0.3)	0 (0)	2 (0.4)	< 0.001
Normal (18.5-24.9)	63 (10.5)	0 (0)	63 (11.2)	
Overweight (25-29.9)	202 (33.6)	6 (16.2)	196 (34.8)	
Grade I obesity (30-34.9)	223 (37.1)	10 (27.0)	213 (37.8)	
Grade II obesity (35-39.9)	89 (14.8)	17 (45.9)	72 (12.8)	
Grade III obesity (≥40)	22 (3.7)	4 (10.8)	18 (3.2)	
Smoking‡	39 (6.5)	2 (5.4)	37 (6.6)	1.0
Number of coexisting disease‡				
None	359 (59.7)	23 (62.2)	336 (59.6)	0.039
1	162 (27.0)	6 (16.2)	156 (27.7)	
2	73 (12.1)	6 (16.2)	67 (11.9)	
≥3	7 (1.2)	2 (5.4)	5 (0.9)	
ASA grade‡				
1	301 (50.1)	17 (45.9)	284 (50.4)	0.008
2	620 (43.3)	13 (35.1)	247 (43.8)	
3	40 (6.7)	7 (18.9)	33 (5.9)	
Diabetes mellitus‡	76 (12.6)	6 (16.2)	70 (12.4)	0.449
CAD-CHF‡	41 (6.8)	4 (10.8)	37 (6.6)	0.307
COPD‡	38 (6.3)	5 (13.5)	33 (5.9)	0.075

†mean ± standard deviation, ‡n (%)
BMI: body mass index, ASA: the American Society of Anesthesiologists, CAD-CHF: coronary artery disease-congestive heart failure, COPD: chronic obstructive pulmonary disease.

Table 2. Distribution of imaging findings and pre-operative interventions

Variable	Overall (n = 601)	Group 1 (n = 37)	Group 2 (n = 564)	p
Cholelithiasis‡	541 (90)	32 (86.5)	509 (90.2)	0.402
GB polyps‡	20 (3.3)	2 (5.4)	18 (3.2)	0.352
Increased wall thickness‡	75 (12.5)	4 (10.8)	61 (10.8)	1.0
Scleroatrophic GB‡	11 (1.8)	2 (5.4)	9 (1.6)	0.143
Pre-operative interventions‡	23 (3.8)	1 (2.7)	22 (3.9)	1.0
ERCP	21 (3.5)	1 (2.7)	20 (3.5)	NA
PC	4 (0.7)	0 (0)	4 (0.7)	NA

‡n (%)
GB: the gallbladder, ERCP: endoscopic retrograde cholangiopancreatography, PC: percutaneous cholecystectomy.

of coexisting diseases increased, the rate of readmission significantly increased (p = 0.039). There were more patients with ASA Grade III in Group 1 compared within Group 2 (18.9% vs. 5.9%) (p = 0.008). There were no significant differences in age, sex, smoking history, type of coexisting diseases, and imaging features between the groups (p > 0.05 for all) (Tables 1 and 2). The patients with conversion and intraoperative complications were more frequently readmitted (p = 0.002 and p < 0.001) (Table 3). The use of drain was performed in 17.0% of the patients in Group 2, whereas 40.5% of the patients in Group 1 received an intraoperative drain during their index operation (p = 0.001).

Type of presentation and operation time revealed no significant difference between the groups (p > 0.05 for both). Although the median length of hospital stay was 1 day in both groups, there was a significant difference in the length of hospital stay (p = 0.013). The patients with a length of hospital stay longer than 1 day were more frequently found in Group 1 (p = 0.024).

The median time length for readmission was 8.0 days with a range from 1 to 73 days. Of those with readmission, seven patients (18.9%) readmitted within

Table 3. Operative features of the patients

Variable	Overall (n = 601)	Group 1 (n = 37)	Group 2 (n = 564)	p
Presentation‡				
Elective	563 (93.7)	35 (94.6)	528 (93.6)	1.0
Emergent	38 (6.3)	2 (5.4)	36 (6.4)	
Type of surgery‡				
Laparoscopic	536 (89.2)	29 (78.4)	507 (89.9)	0.002
Open	21 (3.5)	0 (0)	21 (3.7)	
Converted	44 (7.3)	8 (21.6)	36 (6.4)	
Operation time (min)β	55 (40-60)	55 (35-60)	55 (40-60)	0.875
Operation time group‡				
≤ 55 min	291 (48.4)	18 (48.6)	291 (51.6)	1.0
> 55 min	310 (51.6)	19 (51.4)	273 (48.4)	
Intraoperative complications‡				
None	556 (92.5)	28 (75.7)	528 (93.6)	< 0.001
Bleeding	42 (6.9)	8 (21.6)	34 (6.0)	
Biliary injury	5 (0.78)	3 (7.1)	2 (0.4)	
Use of drain‡				
Yes	111 (18.5)	15 (40.5)	96 (17.0)	0.001
No	490 (81.5)	22 (59.5)	468 (83.0)	
LOS (day)β	1 (1-1)	1 (1-2)	1 (1-1)	0.013
LOS group‡				
≤ 1	468 (77.9)	23 (62.2)	445 (78.9)	0.024
> 1	133 (22.1)	14 (37.8)	119 (21.1)	

‡n (%), βmedian (interquartile range)
LOS: length of hospital stay .

Table 4. Distribution of the diagnoses in patients with readmission (n = 37)

Diagnosis			
Surgical‡		39 (97.5)	
	Biliary	5 (12.8)	
		Bile duct obstruction	4
		Bile duct injury	1
	Non-biliary	34 (87.2)	
		Post-operative pain	25
		N/V	5
		Intestinal laceration	1
		Wound infection/hematoma	3
Non-surgical‡		1 (2.5)	

‡n (%).
N/V: nausea/vomiting.

the first 24 h after the discharge, and 11 patients (29.7%) readmitted between 1 and 7 days after the surgery. The distribution of the diagnoses seen in patients with readmission is displayed in table 4.

Surgical causes of both biliary and non-biliary etiology were detected in 97.5% of the cases. Symptomatic treatment without any intervention was applied to the most of the cases (91.9%). Surgical treatment and ERCP were necessitated in two and three patients. There was no mortality in patients with readmission.

Discussion

In this retrospective study, we detected that the rate of readmission following cholecystectomy was 6.16%. Obesity, the number of coexisting diseases, conversion to open surgery, the development of intraoperative complications, the use of drain, and length of hospital stay > 1 day were significantly associated with higher readmission rates.

Inpatient or ambulatory laparoscopic approaches have been included in the earlier studies evaluating the readmission rates after cholecystectomy[3,4,6,8-12]. However, these studies show significant differences regarding the inclusion criteria. Some authors included only laparoscopic approach and excluded the converted cases[3,6,8]. It has also been mentioned that

conversion to open surgery is not an exclusion criterion, but there were no converted cases[9,12]. Only elective cases have been studied by some authors[6,10]. Besides, coexisting intraoperative cholangiography or laparoscopic bile duct exploration were also included in several studies[4,11]. Therefore, all these methodological differences should be considered during the evaluation of readmission rates after cholecystectomy. There were limited studies, in which all types of cholecystectomies, including laparoscopic, converted to open, and open through right subcostal incision were evaluated regarding readmission rate[1,5]. We, also, included all cholecystectomy approaches in the present study. Although the incidences of open and converted surgeries in these studies were low, we thought that admission rates after cholecystectomy might be generalized by using this approach.

In the previous meta-analyses and systematic reviews, the mean readmission rate was 3.3% ranging from 0% to 11.7%[7,13]. Other studies have reported similar readmission rates following cholecystectomy[1,3,5,6,8-11]. However, it should be kept in mind that the study groups in these studies have different demographic and clinical features. The period for these studies ranged from 30 days to 90 days[1,3,4,8,11]. We and others thought that a 30-day time period might underestimate the true incidence of complications and readmissions[1,5,6,12]. Although the readmission rates may increase as the period increases, we used a 90-day interval for the definition of readmission for a more comprehensive evaluation.

Post-operative pain, nausea, and vomiting were the most common causes of readmission besides surgical complications and infective diagnoses[7,11,13,14]. Such complications have been detected after both ambulatory and non-ambulatory laparoscopic cholecystectomy. McIntyre's meta-analysis[7] showed that surgical complications, including post-operative nausea and vomiting, were seen in 76% of reported cases. In some studies, post-operative abdominal pain was detected in more than half of the cases who readmitted following laparoscopic cholecystectomy[4,8]. Although there has been no optimal multimodal analgesic treatment after laparoscopic cholecystectomy, these patients might receive inadequate pain relief[11]. In the present study, we did not have data about the medications that were prescribed and their use by the patients due to the retrospective nature of the study. The association between post-operative pain management and readmission rates remains controversial, and prospective studies are needed to clarify this issue.

The presence of vague symptoms such as pain, nausea, vomiting, hypotension, dehydration, ileus, and fever is a problematic issue for the physicians[1,3,11]. Besides, most of these symptoms occur during the post-operative 1st week[3]. Almost half of the diagnoses in the post-operative 1st week were pain, nausea, and vomiting in the present study. Besides, post-operative nausea and vomiting are general complaints seen in 20-30% of surgical patients after the application of general anesthesia for any reason[15,16]. Therefore, unplanned readmission rates after cholecystectomy may not be used as a measure of quality.

The causes of readmission varied according to the classifications used in the previous studies. Some authors also recommended to standardize criteria regarding the reasons for readmission[5]. For that purpose, Rana et al.[9] classified the reasons for hospital readmissions following cholecystectomy as biliary and non-biliary surgical, and non-surgical causes. Regarding this classification, surgical biliary causes were detected in one-quarter of the cases[5,9,10]. However, there were only five cases (12.8%) with biliary complications in the present study. The variances in these subgroups may originate from the differences in the methodological properties of the studies and clinical features of the patients. Considering these differences, the causes of readmission in each study may not reflect the ideal situation. Thus, prospective standardized studies are needed to clarify controversial issues.

In the earlier studies, the authors found that there are some predictive risk factors for readmission. Older age, male sex, associated comorbidities, and emergency cholecystectomy have been considered significant risk factors for hospital readmission after cholecystectomy[3,11].

Besides, the presence of comorbidities, acute cholecystitis, chronic steroid use, and the length of the operation longer than 2 h was other factors[9]. In the present study, we found that obesity, the number of coexisting disease, conversion to open surgery, and the development of intraoperative complications were the significant risk factors for readmission. We also showed that there was a significant association between the use of drain and readmission. The use of drain may be used to highlight the complexity of the case[9].

Awolaran et al.[4] reported that a longer stay in hospital decreased the readmission rate. This finding was not supported by the studies focusing on ambulatory laparoscopic cholecystectomy[3,11]. We, also, showed that the length of hospital stay >1 day was significantly associated with readmission. Hence, great attention can be

considered when discharging the patients after the removal of *in situ* drains or the patients with longer hospital stays. Besides, it may be better to inform these patients about the increased risk of readmission.

Obesity is one of the most significant risk factors for post-operative morbidity and mortality[17]. Several authors questioned the impact of obesity on the outcomes of cholecystectomy. In Matteori's study[17], day case laparoscopic cholecystectomy has had similar readmission rates in obese patients compared with non-obese. They classified the patients as obese if their body mass index is $\geq$ 30 kg/m^2. Reeves et al.[18] showed that only super obesity is associated with increased hospital readmission. In this study, there was a significant association between readmission and Grade II and Grade II obesity. Hence, we may conclude that as the grade of obesity increases, the risk for readmission after cholecystectomy also increases.

The retrospective nature of the study and the use of an administrative database were the major limitations. This type of study may cause loss of some potentially important variables such as discharge medications, and status of pain just before discharge due to the inherent nature of data. Although we aimed to include the readmitted cases with medical reasons, we could not find all medical reasons directly related to surgical procedures due to the lack of surgical consultations. We obtained data from the medical records of the patients using the hospital information system. Hence, difficulties during the evaluation of medical reasons for readmission were another limiting factor. Subjective assessment of pain in these patients was another limitation due to the lack of any pain score.

Conclusion

In conclusion, readmissions after cholecystectomy are rare conditions. Significant predictive factors may help physicians to be alerted during the discharge of the patients. Post-operative pain, nausea, and vomiting were the most common diagnoses which were relieved, usually by conservative management. Identifying the risky patients for readmission, developing discharge programs, and adequate post-operative pain relief can be regarded as essential steps for a significant reduction in readmission rates.

Funding

The authors declare no funding was received fort his study.

Conflicts of interest

The authors have no conflicts of interest to declare.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

References

1. Fragua RL, Vázquez AM, Pérez CR, Velasco AA, Marcano AL, Peralta A, et al. Readmission rates after laparoscopic cholecystectomy: are they affected by ERCP prior to surgery? Rev Esp Enferm Dig. 2019;111:460-6.
2. Hasbahceci M, Uludag M, Erol C, Ozdemir A. Laparoscopic cholecystectomy in a single, non-teaching hospital: an analysis of 1557 patients. J Laparoendosc Adv Surg Tech. 2012;22:527-32.
3. Moghadamyeghaneh Z, Badami A, Masi A, Misawa R, Dresner L. Unplanned readmission after outpatient laparoscopic cholecystectomy. HPB (Oxford). 2020;22:702-9.
4. Awolaran O, Gana T, Samuel N, Oaikhinan K. Readmissions after laparoscopic cholecystectomy in a UK District General Hospital. Surg Endosc. 2017;31:3534-8.
5. Manuel-Vázquez A, Latorre-Fragua R, Ramiro-Pérez C, Lopez-Marcano A, Al-Shwely F, Plaza-Llamas R, et al. Ninety-day readmissions after inpatient cholecystectomy: a 5-year analysis. World J Gastroenterol. 2017;23:2972-7.
6. Fry DE, Pine M, Pine G. Ninety-day postdischarge outcomes of inpatient elective laparoscopic cholecystectomy. Surgery. 2014;156:931-6.
7. McIntyre C, Johnston A, Foley D, Sugrue ME. Readmission to hospital following laparoscopic cholecystectomy: a meta-analysis. Anaesthesiol Intensive Ther. 2020;52:47-55.
8. Simsek G, Kartal A, Sevinc B, Tasci HI, Dogan S. Early hospital readmission after laparoscopic cholecystectomy. Surg Laparosc Endosc Percutan Tech. 2015;25:254-7.
9. Rana G, Bhullar JS, Subhas G, Kolachalam RB, Mittal VK. Thirty-day readmissions after inpatient laparoscopic cholecystectomy: factors and outcomes. Am J Surg. 2016;211:626-30.
10. Sanjay P, Weerakoon R, Shaikh IA, Bird T, Paily A, Yalamarthi S. A 5-year analysis of readmissions following elective laparoscopic cholecystectomy-cohort study. Int J Surg. 2011;9:52-4.
11. Rosero EB, Joshi GP. Hospital readmission after ambulatory laparoscopic cholecystectomy: incidence and predictors. J Surg Res. 2017;219:108-15.
12. Down SK, Nicolic M, Abdulkarim H, Skelton N, Harris AH, Koak Y. Low ninety-day re-admission rates after emergency and elective laparoscopic cholecystectomy in a district general hospital. Ann R Coll Surg Engl. 2010;92:307-10.
13. Tang H, Dong A, Yan L. Day surgery versus overnight stay laparoscopic cholecystectomy: a systematic review and meta-analysis. Dig Liver Dis. 2015;47:556-61.
14. Akoh JA, Watson WA, Bourne TP. Day case laparoscopic cholecystectomy: reducing the admission rate. Int J Surg. 2011;9:63-7.
15. Apfel CC, Heidrich FM, Jukar-Rao S, Jalota L, Hornuss C, Whelan RP, et al. Evidence-based analysis of risk factors for postoperative nausea and vomiting. Br J Anaesth. 2012;109:742-53.
16. Dolin SJ, Cashman JN, Bland JM. Effectiveness of acute postoperative pain management: I. Evidence from published data. Br J Anaesth. 2002;89:409-23.
17. Gregori M, Miccini M, Biacchi D, de Schoutheete JC, Bonomo L, Manzelli A. Day case laparoscopic cholecystectomy: safety and feasibility in obese patients. Int J Surg. 2018;49:22-6.
18. Reeves JJ, Burton BN, Broderick RC, Waterman RS, Gabriel RA. Obesity and unanticipated hospital admission following outpatient laparoscopic cholecystectomy. Surg Endosc. 2020;10:1007.