

# Cholecystectomy in the elderly: clinical outcomes and risk factors



Ann. Ital. Chir., 2021 92: 160-167  
pii: S0003469X22036909

Pier Paolo Brollo, Davide Muschitiello, Giacomo Calini, Rosanna Quattrin, Vittorio Bresadola

General Surgery Department and Simulation Center, Academic Hospital of Udine, Department of Medicine, University of Udine, Udine, Italy

## Cholecystectomy in the elderly: clinical outcomes and risk factors

**AIM OF THE STUDY:** Recent decades have seen a steady increase in the number of elderly patients undergoing cholecystectomy surgery. The objective of this study is to evaluate clinical outcomes in this cohort of patients and to identify any predictive factors correlative with adverse outcomes arising in the postoperative period.

**METHOD:** A retrospective study was conducted regarding patients aged  $\geq 65$  years who underwent cholecystectomy surgery. The independent variables considered to be related to the patient were: age, gender, co-morbidities, and severity of cholelithiasis. The clinical variables were type of procedure, length of stay and hospitalization. The outcomes considered were mortality, re-intervention, transfer to intensive care and post-operative complications.

**RESULTS:** 778 patients with an age between 65 and 74 and 508 patients with an age above 75 were reviewed. With the increase of age, patients who underwent cholecystectomy presented greater co-morbidity, more accesses in emergency, more cases of cholecystitis, which led to a higher number of interventions in open surgery. Considering postoperative outcomes: the need for intensive care, postoperative complications and mortality significantly increase in older patients. Negative predictive factors are the presence of co-morbidities, emergency access and cholecystectomy performed in open.

**CONCLUSIONS:** Elderly patients undergoing cholecystectomy are an increased surgical risk group in particular because of the presence of co-morbidities and because of the frequent need to perform an emergency procedure often for complicated lithiasis pathology. This implies a special attention towards these patients, and towards those over 75 considering, when possible, alternative treatments such as percutaneous drainage.

**KEY WORDS:** Cholecystectomy, Elderly, Outcomes, Risk factors

## Introduction

In recent decades there has been a progressive extension of life expectancy of the population which has been associated with a relative decline in the birth rate. This demographic change has led over time to a gradual increase in the proportion of the population over 65 years of age <sup>1</sup>. In this context, the investigation of the

management aspects of the elderly patient has become of fundamental importance in all medical fields. This aspect is of a primary importance in the surgical field, since the increase in the average age of patients has posed new challenges not only in terms of surgical technique, but also in pre- and post-operative management, as well as in the definition of the correct indication for treatment <sup>2,3</sup>. Cholecystectomy surgery is one of the most common procedures in general surgery, and in these years, there has been a continuous increase in elderly patients undergoing this procedure <sup>4-6</sup>. This surgery is performed both in elective and emergency, laparoscopically or laparotomically, in most cases for benign pathology <sup>7</sup>.

The primary objective of the study was to evaluate in the short term the clinical results in elderly patients undergoing cholecystectomy in relation to the increase of their age and secondarily to the identification of predictive factors correlated to the onset of negative outcomes in the postoperative course.

Pervenuto in Redazione Luglio 2021. Accettato per la pubblicazione Luglio 2021

Correspondence to: Prof. Vittorio Bresadola, Associate Professor of Surgery, Program Director of the General Surgery Residency Training, Department of Medicine, University Hospital S.M. della Misericordia, P.zza S.Maria della Misericordia, 33100 Udine, Italy (e-mail: vittorio.bresadola@uniud.it)

## Method

The study was conducted in an Italian Academic Hospital (AH) from March 2020 and July 2020. It consisted in a retrospective analysis of hospital discharge data regards patients aged  $\geq 65$  years who underwent cholecystectomy, identified by International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes (51.21, 51.22, 51.23, 51.24), as the primary procedure not associated with any other significant surgery during the 2008-2018 period. Data was collected, anonymously and in an aggregate form, from the Regional Socio-Health Information System (SISSR) and analyzed by extracting information about patients' demographic characteristics, admission urgency and diagnosis, surgery procedure, perioperative course, comorbidities and complications by using ICD-9-CM codes. In a second step two experienced surgeons reviewed all cases to exclude those with malignant biliary disease and with cholelithiasis complicated by acute pancreatitis or obstruction of the consensual bile duct. Therefore, the final number of patients resulted of 1286. At a later time, hospital clinical computerized records were consulted in order to implement information not available in the regional database. Patients were stratified into two age groups: younger those aged 65 to 74 years (A) and another group aged  $\geq 75$  years (B). This study protocol was approved by the Regional Ethical Committee in the session of June 8th, 2020.

### INDEPENDENT VARIABLES

Age group was the primary independent variable of interest. Patient-level covariates included gender, comorbidities [calculated by using ICD-9-CM codes and Charlson comorbidity index (CCI)] and severity of cholelithiasis. The ICD-9-CM diagnosis codes used to classify comorbidities related to cholecystectomy were reported in Appendix 1. The CCI values were grouped in 3 classes: 0, 1-2 and  $\geq 3$ . The clinical severity of cholelithiasis was divided into two categories: (1) cholelithiasis only (ICD-9-CM codes: 574.20, 574.50, 574.90, 574.21, 575.3) and 2) cholecystitis with or without cholelithiasis (ICD-9-CM codes: 574.10, 574.40, 574.70, 575.1, 574.00, 575.0, 575.11, 575.12).

Clinical covariates included type of procedure (open or laparoscopy cholecystectomy, including conversion), admission urgency (elective vs non elective), length of stay (in days).

### OUTCOME VARIABLES

Post-operative outcomes of interest were (1) in-hospital mortality, (2) surgical re-intervention within 7 days or (3) 30 days from the first one, (4) transfer to Intensive

APPENDIX I - ICD-9-CM diagnoses used to classify comorbidities related to cholecystectomy.

Comorbidities	ICD 9 cm Codes
Diabetes	250
Obesity	278.0
Anaemia	280-284, 285 (excluding 285,1)
Coagulation disorders	286
Other haematological disorders	287-289
Hypertension	401-405
Ischemic heart diseases	401-405
Conduction disorders and arrhythmias	426, 427
Heart failure	428
Other heart diseases	391, 393-398, 420-425, 429.0-429.9, 0.932, 745, 746.3-746.6
Cerebrovascular diseases	430-438
Vascular diseases	440-448, 557, 557.1
COPD or respiratory distress	490-496, 518.81, 518.82
Chronic kidney disease	582, 583, 585-588
Chronic diseases (liver, pancreas, intestines)	571, 572, 577.1-577.9

APPENDIX II - ICD-9-CM diagnoses used to categorize complications related to cholecystectomy.

Complications	ICD 9 cm Codes
Affecting the biliary tract or abdominal organs	
a) general abdominal complications	998.1, 998.2, 998.3, 998.4, 998.5, 998.6, 998.7, 998.81, 997.4, 998.83
b) complications at the level of the biliary tract	567, 575.4, 575.5, 576.0, 576.3, 576.4, 577.0, 789.0
Affecting other organs or systems	997.02, 997.1, 997.3, 998.0, 410, 415.1, 431, 433.01; 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.11, 434.91

Unit (5) post-operative complications. Referring to the National outcomes program, developed by the Italian National Agency for Regional Health Services (AGENAS), complications were identified by ICD-9-CM codes and categorized as affecting the biliary tract or abdominal organs or other organs or systems (Appendix 2).

### STATISTICAL ANALYSIS

All analyses were performed with an anonymized data file by using the statistical software SPSS, V.20. Categorical variables were described through frequency distributions and chi-square test, while the continuous variables with means, standard deviations and t-test. To determine the predictors of a severe post-operative course, associations between independent variables and at least one of the clinical negative outcomes occurred

after cholecystectomy were calculated for each age group. Because some variables could have been confounding factors in comparison to the others, multivariate logistic regression model was used to adjust the odds ratios. The variables that did not maintain association in the final model were considered not associated after correction by confounding factors. Statistical significance was set at a  $P$  value  $\leq 0.05$ .

## Results

In the AH between 2008 and 2018 cholecystectomy was performed as the primary procedure during hospitalization in 778 patients aged 65 to 74 years, and 508 patients aged  $\geq 75$  years. Clinical characteristics of these patients are shown in Table I. Comorbidity increased with age, such that 52,4% (266/508) of those aged  $\geq 75$  years had Charlson scores of 0, and 15,9% (81/508) had

scores  $\geq 3$  compared with 62,6% (487/778) and 7,6% (59/778), respectively, for those aged 65 to 74 years. The four more frequent types of comorbidities codified by ICD-9-CM were the following same clinical conditions in both groups with different percentages. At the time of hospitalization 6,7% of patients (n. 778) aged 65 to 74 years presented hypertension, 3,6% diabetes, 2,2% ischemic heart disease, and 1,2% arrhythmias compared with 12,0%, 3,9%, 5,7%, and 5,3%, respectively, for those aged  $\geq 75$  years (n.508) (Table II). Obesity (1,7%) was the fifth comorbidity in the first group, while other heart diseases (1,6%) in the second group.

The percentage of patients aged  $\geq 75$  years admitted on an urgent basis was significantly higher than for the other group [41,9% (213/508) versus 27,4% (213/778),  $p < 0,05$ ]. Patients aged  $\geq 75$  years had a higher incidence of cholecystitis with or without cholelithiasis compared

TABLE I - Patients' characteristics and clinical outcomes in the two aged groups undergoing cholecystectomy, 2008-2018.

	Age 65-74 years old (778)	Age $\geq 75$ years old (508)	p value
<i>Patients' characteristics</i>			
Gender			
male	53.2%	48.4%	NS
female	46.8%	51.6%	NS
Comorbidity (ICD-9)			
present	15.6%	21.7%	$< 0.05$
absent	84.4%	78.3%	$< 0.05$
Charlson Comorbidity Index (CCI)			
0	62.6%	52.4%	$< 0.05$
1-2	29.8%	31.7%	$< 0.05$
$> 3$	7.6%	15.9%	$< 0.05$
Severity of cholelithiasis			
cholelithiasis only	34.7%	26.0%	$< 0.05$
with cholecystitis	65.3%	74.0%	$< 0.05$
<i>Surgical approach and regimen</i>			
Type of cholecystectomy			
open	12.9%	20.3%	$< 0.05$
laparoscopic	87.1%	79.7%	$< 0.05$
Mode of admission			
urgent	27.4%	41.9%	$< 0.05$
planned	72.6%	58.1%	$< 0.05$
<i>Clinical outcomes</i>			
length of stay (days. SD)	4.9 (6.4)	7.2 (7.2)	$< 0.05$
in-hospital mortality	0.4%	1.6%	$< 0.05$
re-intervention within 7 days	1.3%	1.8%	NS
re-intervention within 30 days	1.8%	3.5%	NS
transfer to ICU	2.3%	4.9%	$< 0.05$
post-operative complications	1.7%	5.7%	$< 0.05$

NS: not significant; SD: standard deviation; ICU: intensive care unit.

TABLE II - Patients' comorbidities presented at the time of hospitalization in the two aged groups undergoing cholecystectomy, 2008-2018.

Comorbidity	Age 65-74 years old (778)	Age 75 years old (508)
Hypertension	6.7%	12.0%
Diabetes	3.6%	3.9%
Ischaemic cardiopathy	2.2%	5.7%
Arrhythmias	1.2%	5.3%
Obesity	1.7%	0.6%
CKD	1.0%	1.2%
Other cardiac diseases	0.6%	1.6%
Other chronic diseases	1.0%	0.6%
COPD or respiratory failure	0.6%	1.0%
Vascular diseases	0.6%	0.8%
Anemia	0.4%	0.2%
Cerebral vascular diseases	0.1%	0.6%
Heart failure	0.0%	0.4%
Coagulation disorders	0.1%	0.0%
Hematological diseases	0.0%	0.2%

CKD: chronic kidney disease; COPD: chronic obstructive pulmonary disease.

TABLE III - Type of post-operative complications in the two aged groups undergoing cholecystectomy, 2008-2018.

Type of complications	Age 65-74 years old (778)	Age 75 years old (508)
Affecting biliary tract or abdominal organs	2.1%	3.9%
Peritonitis and peritoneal infection	0.8%	2.2%
Fistula of the gallbladder	0.4%	0.1%
Perforation of the gallbladder	0.5%	0.1%
Hemorrhage or hematoma	0.1%	-
Perforation of the bile duct	0.1%	-
Fistula of the bile duct	0.1%	-
Affecting other organs or systemic	0.1%	2.6%
Pulmonary failure	-	1.2%
Pneumonia	0.1%	0.8%
Septicemia	-	0.4%
Urinary retention	-	0.2%

with the group aged 65 to 74 years [72,6% (376/508) versus 58,1% (508/778),  $p < 0,05$ ] and increased need for open cholecystectomy [20,9% (106/508) versus 12,9% (100/778),  $p < 0,05$ ].

Regards to the post-operative outcomes of interest, the events of in-hospital mortality, transfer to intensive unit, and post-operative complications occurred after cholecystectomy in significantly higher percentages among patients aged  $\geq 75$  years compared with the other group, such as reported in Table I. Of 508 patients aged  $\geq 75$  years, 8 (1,6%) died during the hospitalizations, 25 (4,9%) were transferred to intensive unit, and 29 (5,7%) experienced a postoperative complication compared with 0,4% (3/778), 2,3% (18/778), and 1,7% (13/778), respectively, of those aged 65 to 74 years. Also, the post-operative stay in days resulted longer in patients aged  $\geq 75$  years [7.2 ( $\pm$  7.2) versus 4.9 ( $\pm$  6.4);  $p < 0,05$ ]. Table III shows the type of complications in the two groups. Univariate analysis to measure the associations between predict variables and at least one of the clinical negative outcomes occurred after cholecystectomy was shown in Table IV.

After correction by confounding factors throughout multivariate analyses for patients aged 65 to 74 years the variables that resulted a predictor of negative outcome were presence of comorbidities (OR=4,6; 95% CI: 2,3-9,1;  $p < 0,05$ ), need for open cholecystectomy (OR=6,5; 95% CI: 3,3-12,9;  $p < 0,05$ ), and urgent admission to the hospital (OR=2,6; 95% CI: 1,4-5,2;  $p < 0,05$ ). The same predictor factors resulted of OR=2,2 (95% CI: 1,2-4,0;  $p < 0,05$ ), OR=10,3 (95% CI: 5,6-18,9;  $p < 0,05$ ), and OR=1,7 (95% CI: 1,1-2,7;  $p < 0,05$ ), respectively, in the older patients aged  $\geq 75$  years.

## Discussion and Comments

In the recent years there has been an increase in the number of cholecystectomy procedures in elderly and frail patients for symptomatic cholelithiasis or acute cholecystitis. This phenomenon is related to an increase in life expectancy, to an improvement in the incidence of the lithiasic pathology in elderly patients but also to a better management of the peri-operative period<sup>8 9</sup>. In the literature, the age to define an elderly patient is not standardized considering that 65, 70 or 75 years are alternatively used as cut-off line<sup>10 11</sup>. The incidence of cholelithiasis and cholecystitis in the geriatric population over 65 years of age increases linearly as the general population ages<sup>12</sup>. Patients with an age of 75 or older are those who represent the real group of high-risk surgical patients<sup>11</sup>. In the literature, most studies compare the performance of groups of elderly patients undergoing cholecystectomy with groups of younger patients, without assessing variations occurring in the elderly patient cohort alone<sup>13</sup>. Instead, the design of this study focused on the elderly population alone to observe clinical and

outcomes changes correlated with its progressive aging. In general, advanced age is frequently associated with increased co-morbidity and more limited functional reserve<sup>14</sup>. Also, in this study with the progression of age, the elderly population undergoing cholecystectomy presents a significant increase in co-morbidity (using both ICD-9 and CCI index) but also a more severe lithiasic pathology (cholecystitis) at the time of hospital admission. A greater severity likely also related to a generally more nuanced symptomatology resulting in a possible delay in hospital admission and diagnosis<sup>15 16</sup>. A co-morbidity often associated with a limited functional reserve, typical of the frail elderly patient, is the element that frequently contributes to complicate the postoperative course of these patients<sup>17 18 19</sup>. In both of our two cohorts of elderly patients, with an increasing trend, the most frequent co-morbidities were found to be cardiovascular and diabetes. These patients have an increased risk for the development of postoperative complications and therefore require a more accurate preoperative evaluation and adequate monitoring<sup>11 20 21</sup>. The incidence of acute cholecystitis appears to be higher in the elderly population and increases, as in this study, with the increase in age among patients undergoing cholecystectomy intervention<sup>10,22,23</sup>.

Elderly patients undergoing surgical treatment are likely a cohort of subjects in whom alternative treatments, such as percutaneous drainage and/or antibiotic therapy, often preferred in the high-risk population, could not be pursued<sup>10,24</sup>. This would also explain why, in older patients, there is an increase in the number of emergency procedures, which probably cannot be waived, with a decrease in those in election where, in the presence of a non-acute pathology, a conservative approach is preferred<sup>25</sup>. Emergency cholecystectomy is associated with a higher incidence of complications and mortality than elective cholecystectomy. On the other hand, in some recent comparative studies, elderly patients undergoing percutaneous drainage of the gallbladder have shown an increased rate of mortality, complications, bleeding, and longer length of stay than those undergoing cholecystectomy, even in emergency settings<sup>26-28</sup>.

Furthermore, as indicated by Windbladh et al. in addition to increased 30-day mortality, frequently percutaneous drainage does not prove to be a definitive treatment, with 40% of patients subsequently requiring surgery<sup>29</sup>. A careful pre-operative evaluation on a case-by-case basis and a correct informed consent highlighting risks and benefits are therefore crucial in choosing the most appropriate therapeutic strategy in a frail patient<sup>27</sup>. The laparoscopic cholecystectomy in the elderly, despite being burdened by an increase in intraoperative and postoperative complications, especially in cases of acute cholecystitis, compared to the younger population, appears to be safe and to be preferred to the laparotomic approach<sup>30-5</sup>. In fact, it is characterized by a lower rate of post-operative complications and a shorter aver-

age length of stay<sup>31,32</sup>. Caglià et al. have analysed a series of 50 elderly patients (aged over 70) undergoing laparoscopic cholecystectomy and evaluated the correlation between age, gender, ASA score, comorbid illness, prior abdominal surgery, presentation, operative time and conversion rate, postoperative morbidity, and mortality rates and length of hospital stay. They conclude that, compared to open cholecystectomy, laparoscopic cholecystectomy is a relatively safe procedure that can be accomplished with acceptable low morbidity; in contrast to our study no evidence of any increased risk for conversion to an open cholecystectomy, delayed recovery, or prolonged hospitalization has been reported<sup>33</sup>.

On the other hand, as observed in this study, the use of laparotomy increases with age, due to the greater complexity of the patient both in terms of presence of comorbidities and complicated pathology.<sup>34-35</sup> This result is also confirmed in the recent literature, although with very different percentages probably because the choice is operator related. Serban et al. report a laparotomic approach rate of 61.75% in patients over 60 years old, while in the study of Kuwabara et al. the percentage of patients over 70 years old undergoing laparotomic cholecystectomy is 20.5%<sup>34-36</sup>. Similarly, increasing age should be considered a preoperative risk factor for conversion to open surgery (range 5% - 25%)<sup>17,23,37</sup>. In their retrospective study, Costantini et al. have evidenced an increased rate of laparotomic conversions in a large cohort of patients undergoing laparoscopic cholecystectomy for gallbladder calculosis (906) with a series of pre- and intra-operative risk factors (age over 60 years, diabetes, previous supramesocolic abdominal surgery, ultrasound signs of cholecystitis, white cell count over  $9 \times 10^3/\text{dl}$ , previous acute myocardial infarction and preoperative ERCP, intraoperative adhesiolysis). However, they did not correlate this surgical approach with the patients outcome<sup>38</sup>. Similarly, Vardar et al., in their retrospective study, have shown how patients with age (median 56, IQR 52-71.2), adhesions, edema in the gallbladder, bleeding, previous scar tissue have an increased risk of conversion in a large cohort of 1224 patients undergoing laparoscopic cholecystectomy<sup>39</sup>. Open access in acute cholecystitis appears to be associated with a higher rate of complications, as well as a predictor of the use of greater economic resources. The recommendation is therefore to prefer a laparoscopic approach within the first 48 hours<sup>34</sup>. As already described in the literature, the increase in age has also determined an increase in the number of days of hospitalization, probably related to a greater fragility of these patients and a more complex clinical condition, resulting in a slower post-operative recovery, as well as a more frequent access to hospital in emergency and use of laparotomy surgery<sup>15,40</sup>. As regard mortality, this is significantly increased in the group of patients over 75 compared to those in the less elderly group (6% vs 4%), in agreement with what reported by other authors where it results to be

between 0 and 4%<sup>8,17,41-43</sup>. Generally, the most frequent causes are related to the presence of cardiorespiratory comorbidities and septic complications related to an acute or complicated cholelithiasis disease<sup>11</sup>. The analysis of the results of this study confirms the need to give special attention to the elderly patient, especially after 75 years, when there is an indication for cholecystectomy surgery. In fact, this is associated with an increased risk of postoperative complications and hospitalization in the intensive care unit, which are correlated with increased mortality and higher management costs<sup>10,35</sup>.

Therefore, for a correct therapeutic choice, an adequate preoperative assessment must always be carried out, even in emergency, which allows a stratification of the operative risk through the evaluation of the presence of comorbidities and the severity of lithiasic disease. In the cohort of patients investigated, the main post-operative complications were abdominal peritonitis and biliary fistulas/leaks, in addition to respiratory complications as found in other reports<sup>44</sup>. Moreover, in the present study in patients older than 65 years the need for a laparotomy approach, the presence of comorbidities and emergency admission significantly and independently increased the risk of a complicated clinical course, the need for ICU, the length of stay and mortality. On the other hand, the presence of cholecystitis, a clinical condition that increases with age, does not appear to be a negative predictor, as also reported in the analysis of Chong et al.<sup>15</sup>. We are of course aware of the limitations of the study. Indeed, like all retrospective studies, the data collection may have some bias or losses. For example, the impact of the conservative choice through percutaneous cholecystic drainage in this elderly population, which we often consider a priority, was not reviewed. Moreover, with respect to the choice of laparotomic surgical approach, it was not possible to discriminate when this was the initial choice of the surgeon or was instead the outcome of a conversion from an initial laparoscopic access. An eventuality that we know to be more frequent with increasing patient age<sup>11,19,45-47</sup>.

## Riassunto

Negli ultimi decenni si è assistito ad un progressivo prolungamento dell'aspettativa di vita della popolazione. Questo cambiamento demografico ha portato nel tempo ad un graduale incremento della quota di popolazione che rientra nella fascia di età superiore ai 65 anni. Tale aspetto è di importanza determinante in campo chirurgico, poiché l'incremento dell'età media dei pazienti ha prospettato nuove sfide non solo a livello di tecnica chirurgica, ma anche nell'ambito della gestione pre- e post-operatoria, nonché in fase di formulazione della corretta indicazione al trattamento. L'intervento di colecistectomia è una procedura che viene eseguita sia in elezione che in urgenza, per via laparoscopica o laparo-

TABLE IV - Odds ratios, 95% confidence intervals, and p-value of the association between predictors and at least one negative post-operative outcome in the two aged groups undergoing cholecystectomy, 2008-2018.

	Age 65-74 (778) Outcome present (37)			Age ≥75 (508) Outcome present (56)		
	%(n)	OR (95% CI)	p value	%(n)	OR (95% CI)	p value
Gender						
male	6.0% (25)	1.9 (0.9-3.8)	NS	11.0% (27)	1 Ref	
female	3.3% (21)	1 Ref		11.1% (29)	1.0 (0.6-1.7)	NS
Comorbidity (ICD-9)						
present						
absent	13.2% (16) 3.2% (21)	4.6 (2.3-9.1) 1 Ref	<0.05	18.2% (20) 9.0% (36)	2.2 (1.2-4.0)	<0.05
CCI						
0	3.9% (19)	1 Ref		9.8% (26)		
1-2	4.3% (10)	3.9 (1.6-9.3)	<0.05	13.7% (22)	1.5 (0.8-2.7)	NS
≥3	13.6% (8)	3.5 (1.3-9.3)	<0.05	9.9% (8)	1.4 (0.6-3.4)	NS
Severity of cholelithiasis						
cholelithiasis only	3.0% (8)	1 Ref		5.3% (7)	1 Ref	
with cholecystitis	5.7% (29)	2.0 (0.9-4.4)	NS	13.0% (49)	2.7 (1.2-6.1)	<0.05
Type of cholecystectomy						
open	16.5% (17)	6.5 (3.3-12.9)	<0.05	35.0% (36)	10.3 (5.6-18.9)	<0.05
laparoscopic	2.9% (20)	1 Ref		4.9% (20)	1 Ref	
Mode of admission						
urgent	8.5% (18)	2.6 (1.4-5.2)	<0.05	18.3% (39)	1.7 (1.1-2.7)	<0.05
planned	3.4% (19)	1 Ref		13.2% (39)	1 Ref	

OR: odds ratio; CI: confidence interval; CCI: Charlson Comorbidity Index; NS: not significant.

tomica, nella maggior parte dei casi per patologia benigna. Si tratta di un intervento chirurgico ormai solidamente protocollato e con indicazioni validate a livello internazionale, sottoposte a costante revisione.

Questo studio vuole apportare un contributo proprio in questo contesto, andando ad indagare come l'aumento dell'età e la presenza di alcuni fattori di rischio (tipo di approccio chirurgico, presenza di comorbidità, regime di ammissione ospedaliera) possano predire un possibile esito negativo post-operatorio (reintervento, ricovero in ambiente intensivistico, exitus del paziente).

L'impostazione è quella dello studio retrospettivo, nell'arco di tempo tra il 2008 ed il 2018, che comprende tutti i pazienti di età ≥ 65 anni sottoposti al solo intervento di colecistectomia (senza altre procedure chirurgiche maggiori concomitanti) all'interno del Dipartimento di Chirurgia dell'ospedale Santa Maria della Misericordia di Udine. L'intera coorte è stata divisa in due classi di età, 64-75 anni e ≥75 anni, e quindi sono state considerate le variabili gruppo di età, CCI, gravità della colelitiasi, tipo di procedura (colecistectomia aperta/laparoscopica, inclusa la conversione), regime di ricovero, durata del ricovero, come possibili fattori predittivi per l'outcome post-operatorio.

Dal punto di vista descrittivo i pazienti appartenenti alla classe di età ≥75 anni presentano una maggiore frequenza in termini di accessi urgenti, ricorso all'approccio laparotomico, complicanze, ricovero in terapia intensiva e mor-

talità post-operatoria. In analisi multivariata, per entrambe le classi di età, le variabili risultate predittive di esito negativo sono la presenza di comorbidità, la necessità di colecistectomia con accesso laparotomico o conversione laparotomica ed il ricovero urgente in ospedale.

I nostri risultati pongono in evidenza come, in accordo con l'attuale letteratura, la colecistectomia sia una procedura sicura anche nel paziente anziano, ma che richiede un'attenta valutazione del rischio in fase pre-operatoria in modo da indirizzare il paziente al miglior trattamento in base alle sue caratteristiche cliniche, nonché un adeguato monitoraggio post-operatorio in funzione della presenza o meno di determinati fattori di rischio per il peggioramento dell'outcome.

## References

1. ISTAT: *Indicatori demografici anno 2019*. <https://www.istat.it/it/archivio/238447>.
2. Mende A, Riegel A-K, Plümer L, Olotu C, Goetz AE, Kiefmann R: *Determinants of perioperative outcome in frail older patients*. *Dtsch Arztebl Int*, 2019; 116(5):73-82.
3. Partridge JSL, Harari D, Dhesei JK: *Frailty in the older surgical patient: A review*. *Age Ageing*, 2012; 41(2):142-47.
4. Kuwabara K, Matsuda S, Fushimi K, Ishikawa KB, Horiguchi H, Fujimori K: *Relationships of age, cholecystectomy approach and*

- timing with the surgical and functional outcomes of elderly patients with cholecystitis. *Int J Surg*, 2011; 9(5):392-99.
5. Lord AC, Hicks G, Pearce B, Tanno L, Pucher PH: *Safety and outcomes of laparoscopic cholecystectomy in the extremely elderly: A systematic review and meta-analysis*. *Acta Chir Belg*, 2019; 119(6):349-56.
  6. Mayol J, Martinez-Sarmiento J, Tamayo Fj, Alvarez Fernández-Represa J: *Complications of laparoscopic cholecystectomy in the ageing patient*. *Age Ageing*, 1997; 26(2):77-81.
  7. Agabiti N, Stafoggia M, Davoli M, Fusco D, Barone AP, Perucci CA: *Thirty-day complications after laparoscopic or open cholecystectomy: A population-based cohort study in Italy*. *BMJ Open*. 2013;3(2):e001943.
  8. Pålsson S, Saliba G, Sandblom G: *Outcome after cholecystectomy in the elderly: a population-based register study*. *Scand J Gastroentero*, 2016; 51(8):974-78.
  9. Bergman S, Sourial N, Vedel I, et al.: *Gallstone disease in the elderly: Are older patients managed differently?* *Surg Endosc*, 2011; 25(1):55-61.
  10. van Heesewijk AE, Lammerts RGM, Haveman J-W, Meerdink M, van Leeuwen BL, Pol RA: *Outcome after cholecystectomy in the elderly*. *Am J Surg*, 2019; 218(2):368-73.
  11. Kirshtein B, Bayme M, Bolotin A, Mizrahi S, Lantsberg L: *Laparoscopic cholecystectomy for acute cholecystitis in the elderly*. *Surg Laparosc Endosc Percutan Tech*, 2008; 18(4):334-39.
  12. Lo C-M, Lai ECS, Fan S-T, Liu C-L, Wong J: *Laparoscopic cholecystectomy for acute cholecystitis in the elderly*. *World J Surg*, 1996; 20(8):983-87.
  13. Kamarajah SK, Karri S, Bundred JR, et al: *Perioperative outcomes after laparoscopic cholecystectomy in elderly patients: A systematic review and meta-analysis*. *Surg Endosc*, 2020; 34(11):4727-740.
  14. Kurian AA, Wang L, Grunkemeier G, Bhayani NH, Swanström L: *Defining "The Elderly" undergoing major gastrointestinal resections*. *Ann Surg*, 2013; 258(3):483-89.
  15. Chong JU, Lee JH, Yoon YC, et al.: *Influencing factors on post-operative hospital stay after laparoscopic cholecystectomy*. *Korean J Hepato-Biliary-Pancreatic Surg*, 2016; 20(1):12.
  16. Morrow DJ, Thompson J, Wilson SE: *Acute Cholecystitis in the Elderly: A Surgical Emergency*. *Arch Surg*, 1978; 113(10):1149-52.
  17. Bingener J, Richards ML, Schwesinger WH, Strodel WE, Sirinek KR: *Laparoscopic cholecystectomy for elderly patients: Gold standard for golden years?* *Arch Sur.*, 2003; 138(5):531-5; discussion 535-6.
  18. Turrentine FE, Wang H, Simpson VB, Jones RS: *Surgical risk factors, morbidity, and mortality in elderly patients*. *Crit Rev Oncol Hematol*, 2008; 68:S13.
  19. Lee SI, Na BG, Yoo YS, Mun SP, Choi NK: *Clinical outcome for laparoscopic cholecystectomy in extremely elderly patients*. *Ann Surg Treat Re*, 2015; 88(3):14551.
  20. Shpitz B, Sigal A, Kaufman Z, Dinbar A: *Acute cholecystitis in diabetic patients*. *Am Surg*, 1995; 61(11):964-67.
  21. Sandler RS, Maule WF, Baltus ME: *Factors associated with post-operative complications in diabetics after biliary tract surgery*. *Gastroenterology*, 1986; 91(1):157-162.
  22. Lirussi F, Nassuato G, Passera D, et al.: *Gallstone disease in an elderly population*. *Eur J Gastroenterol Hepatol*, 1999; 11(5):485-92.
  23. Yetkin G, Uludag M, Oba S, Citgez B, Paksoy I: *Laparoscopic cholecystectomy in elderly patients*. *J Soc Laparoendosc Surg*, 2009; 13(4):587-91.
  24. McGillicuddy EA, Schuster KM, Barre K, et al.: *Non-operative management of acute cholecystitis in the elderly*. *Br J Surg*, 2012; 99(9):1254-261.
  25. Wiseman JT, Sharuk MN, Singla A, et al.: *Surgical management of acute cholecystitis at a tertiary care center in the modern era*. *Arch Surg*, 2010; 145(5):439-44.
  26. Schlottmann F, Gaber C, Strassle PD, Patti MG, Charles AG: *Cholecystectomy Vs. Cholecystostomy for the Management of Acute Cholecystitis in Elderly Patients*. *J Gastrointest Surg*, 2019; 23(3):503-509.
  27. Loozen CS, van Santvoort HC, van Duijvendijk P, et al: *Laparoscopic cholecystectomy versus percutaneous catheter drainage for acute cholecystitis in high risk patients (CHOCOLATE): multicentre randomised clinical trial*. *BMJ*, 2018; 363:k3965.
  28. Hall BR, Armijo PR, Krause C, Burnett T, Oleynikov D: *Emergent cholecystectomy is superior to percutaneous cholecystostomy tube placement in critically ill patients with emergent calculous cholecystitis*. *Am J Surg*, 2018; 216(1):116-19.
  29. Winbladh A, Gullstrand P, Svanvik J, Sandström P: *Systematic review of cholecystostomy as a treatment option in acute cholecystitis*. *HPB*, 2009; 11(3):183-93.
  30. Kauvar DS, Brown BD, Braswell AW, Harnisch M: *Laparoscopic cholecystectomy in the elderly: increased operative complications and conversions to laparotomy*. *J Laparoendosc Adv Surg Tech*, 2005; 15(4):379-82.
  31. Kwon AH, Matsui Y: *Laparoscopic cholecystectomy in patients aged 80 years and over*. *World J Surg*, 2006; 30(7):1204-210.
  32. Lujan J, Sanchez-Bueno F, Parrilla P, Robles R, Torralba J, Gonzalez-Coste R: *Surg laparosc endosc percutan tech*. 1998; 8(3):208-10.
  33. Caglià P, Costa S, Tracia A, et al.: *Can laparoscopic cholecystectomy be safely performed in the elderly?* *Ann Ital Chir*. 2012; 83(1):21-24.
  34. Kuwabara K, Matsuda S, Fushimi K, Ishikawa KB, Horiguchi H, Fujimori K: *Relationships of age, cholecystectomy approach and timing with the surgical and functional outcomes of elderly patients with cholecystitis*. *Int J Surg*, 2011; 9(5):392-99.
  35. Kuy S, Sosa JA, Roman SA, Desai R, Rosenthal RA: *Age matters: a study of clinical and economic outcomes following cholecystectomy in elderly Americans*. 2011; 201(6):789-96.
  36. Serban D, Branescu C, Savlovski C, et al.: *Laparoscopic cholecystectomy in patients aged 60 years and over. Our experience*. *J Med Life*, 2016; 9(4):358-62.
  37. Pessaux P, Regenet N, Tuech JJ, Rouge C, Bergamaschi R, Arnaud JP: *Laparoscopic versus open cholecystectomy: A prospective comparative study in the elderly with acute cholecystitis*. *Surg Laparosc Endosc Percutaneous Tech*, 2001; 11(4):252-55.
  38. Costantini R, Caldalaro F, Palmieri C, et al.: *Risk factors for conversion of laparoscopic cholecystectomy*. *Ann Ital Chir*, 2012; 83(3):245-52.

39. Vardar YM, Akturk OM: *Can we predict the risk of conversion in elective laparoscopic cholecystectomy?* Ann Ital Chir, 2020; 91(2):181-86.
40. Baimas-George M, Kirks RC, Cochran A, et al.: *Patient factors lead to extensive variation in outcomes and cost from cholecystectomy.* Am Surg, 2020; 86(6):643-51.
41. Chau CH, Tang CN, Siu WT, Ha JPY, Li MKW: *Laparoscopic cholecystectomy versus open cholecystectomy in elderly patients with acute cholecystitis: Retrospective study.* Hong Kong Med J, 2002; 8(6):394-99.
42. Scollay JM, Mullen R, McPhillips G, Thompson AM: *Mortality associated with the treatment of gallstone disease: A 10-year contemporary national experience.* World J Surg, 2011; 35(3):643-47.
43. Decker G, Goergen M, Philippart P, Costa PM: *Laparoscopic cholecystectomy for acute cholecystitis in geriatric patients.* Acta Chir Belg, 2001; 101(6):294-99.
44. Nijssen MAJ, Schreinemakers JMJ, Meyer Z, van der Schelling GP, Crolla RMPH, Rijken AM: *Complications after laparoscopic cholecystectomy: a video evaluation study of whether the critical view of safety was reached.* World J Surg, 2015; 39(7):1798-803.
45. Simopoulos C, Botaitis S, Polychronidis A, Tripsianis G, Karayiannakis AJ: *Risk factors for conversion of laparoscopic cholecystectomy to open cholecystectomy.* Surg Endosc, 2005; 19(7):905-909.
46. Philip Rothman J, Burcharth J, Pommergaard HC, Viereck S, Rosenberg J: *Preoperative risk factors for conversion of laparoscopic cholecystectomy to open surgery-a systematic review and meta-analysis of observational studies.* Dig Surg, 2016; 33(5):414-23.
47. Qasaimeh GR, Banihani MN: *Laparoscopic cholecystectomy in the elderly and young: A comparative study.* Hepatogastroenterology, 2012; 59(113):22-25.

READ-ONLY COPY  
PRINTING PROHIBITED