Differences between Patients Undergoing Laparoscopic Cholecystectomy with Discharge at the End of the Day *Versus* Overnight Stay: A Retrospective Study

Diferenças entre os Doentes Submetidos a Colecistectomia Laparoscópica com Alta ao Final do Dia *Versus* Pernoita: Um Estudo Retrospectivo

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Acta Med Port 2020 Sep;33(9):552-558 ▪ https://doi.org/10.20344/amp.12420

ABSTRACT

Introduction: Although laparoscopic cholecystectomy is an increasingly performed technique in the outpatient setting, it is not done in some Units due to lack of overnight stay. The objectives of this study are to identify the differences between patients with discharge at the end of the day *versus* overnight stay and the factors predicting overnight stay.

Material and Methods: A retrospective analysis of the pre, peri and postoperative data of patients operated between January/2014 and December/2017 was performed, and a statistical analysis of the variables.

Results: A total of 311 patients were included, 33.4% of whom stayed overnight. Of these, 81.7% were operated after 2pm. As predictors factors of overnight stay, the age (p = 0.001) was identified in the morning group, with a greater possibility of overnight stay (15.3%) from 61.50 years (Younden index = 0.396) and the surgery start time (p < 0.0001) in the afternoon group, with a greater possibility of overnight stay (77.1%) from 4:30 pm (Younden index = 0.492).

Discussion: Most patients stayed overnight due to the time at which recovery was completed, since no cause was identified (84.7%). If our unit would not have an overnight stay we would have an overall hospitalization rate of 8.4%, which corresponds to patients with an identified cause for overnight stay, and to admitted patients.

Conclusion: Ambulatory cholecystectomy can be performed in units that cannot cater for an overnight stay, provided that surgeries are performed during the morning period, patients are carefully selected and there is the possibility of admission.

Keywords: Ambulatory Surgical Procedures; Cholecystectomy, Laparoscopic; Hospitalization

RESUMO

Introdução: Apesar da colecistectomia laparoscópica ser uma técnica cada vez mais realizada em regime de ambulatório, não é praticada em algumas unidades por ausência de pernoita. São objetivos deste estudo identificar as diferenças entre os doentes com alta ao final do dia *versus* pernoita e os fatores preditores de pernoita.

Material e Métodos: Realizámos uma análise retrospetiva dos dados pré, peri e pós-operatório dos doentes operados entre janeiro de 2014 e dezembro de 2017, tendo-se procedido à análise estatística das variáveis.

Resultados: Foram incluídos 311 doentes, sendo que apenas 33,4% pernoitaram. Destes, 81,7% foram operados depois das 14 horas. Como fatores preditores de pernoita foram identificados a idade (p = 0,001) no grupo da manhã, havendo a partir dos 61,50 anos (Younden *index* = 0,396) uma maior possibilidade de pernoita (15,3%) e a hora de início da cirurgia (p < 0,0001) no grupo da tarde, sendo que os doentes operados após as 16 horas e trinta minutos (Younden *index* = 0,492) têm maior possibilidade de pernoita (77,1%).

Discussão: Grande parte dos doentes pernoitou devido à hora em que completou o recobro, uma vez que não se identificou uma causa para tal (84,7%). Caso a nossa Unidade não dispusesse de pernoita teríamos uma taxa global de internamento de 8,4%, que corresponde aos doentes com causa identificada para a pernoita e os doentes internados.

Conclusão: A colecistectomia em ambulatório pode ser realizada em unidades que não disponham de pernoita, desde que as cirurgias decorram no período da manhã, os doentes sejam selecionados de forma criteriosa e exista a possibilidade de internamento.

Palavras-chave: Colecistectomia Laparoscópica; Hospitalização; Procedimentos Cirúrgicos Ambulatórios

INTRODUCTION

Gallstones (cholelithiasis) are among the most common health conditions, affecting 10-15% of the adult population;[1,2] 1-4% of the patients become symptomatic every year and with an indication for surgical treatment.[2,3] Laparoscopic cholecystectomy has become the gold standard treatment.[4]

Following the first laparoscopic cholecystectomy by Mühe carried out in 1985, the advances in surgical techniques, anaesthesia and perioperative care led to a progressive reduction in the length of hospital stays, up to outpatient surgery.[5,6] A high level of postoperative patient satisfaction, a quick return to normal daily activities[7,8] and cost-effectiveness allowing for a greater number of surgeries to be performed while maintaining a high availability of hospital beds are amongst the benefits of outpatient surgery, a contribution to a better management of healthcare resources.[9,10] Despite the benefits, outpatient laparoscopic cholecystectomy still has not been widely used in clinical

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Recebido: 06 de junho de 2019 - Aceite: 13 de novembro de 2019 | Copyright © Ordem dos Médicos 2020

practice. The preference of surgeons for the patients to stay overnight in the hospital for at least 24 hours is the main reason for this, in order to manage any possible complications within the immediate postoperative period.[8,11]

As an overnight stay is not available in all outpatient surgery centres, this study aimed to analyse the characteristics of patients undergoing outpatient laparoscopic cholecystectomy, the identification of the differences between day-stay *vs.* overnight-stay patients and predictive factors, improving the acceptability of laparoscopic cholecystectomy in centres where overnight stay is unavailable.

MATERIAL AND METHODS

This was a retrospective study of pre-, peri- and postoperative data of all patients who underwent outpatient laparoscopic cholecystectomy between January 2014 and December 2017 at the General Surgery Department of *Hospital de Pedro Hispano, E.P.E. - ULS de Matosinhos*. All patients requiring hospital treatment (n = 9; 2.8%) in the immediate postoperative period (for clinical monitoring, food intolerance or poorly controlled postoperative pain) were excluded from the study. A total of 311 patients were included in the study, divided into two groups: those discharged on the day following surgery (Group A – overnight-stay) and those discharged the same day as surgery (Group B – day-stay).

Both groups were analysed and compared (preoperative data) in terms of age, date of surgery (in years), gender, American Society of Anaesthesiologists (ASA) score, indication for cholecystectomy and comorbidities (previous episodes of acute cholecystitis, hypertension (HTN), type-2 diabetes mellitus (T2DM), obesity, dyslipidaemia, hypocoagulation, smoking, cardiac and/or respiratory pathology) and history of any abdominal surgery prior to cholecystectomy. Operative time, surgery start time (the morning period included all surgeries that started before 2PM while the afternoon period included those that started after 2PM), indication for intraoperative cholangiography, intraoperative bleeding, emergent conversion to open surgery or presence of anatomical abnormalities preventing from an easy mobilisation and identification of structures within the Calot's triangle during surgery were also analysed. Finally, data regarding postoperative morbidity (up to 30 days) were obtained by use of Dindo classification of surgical complications.[12]

The study, including data collection and analysis, was approved by the Ethics Committee of the *Unidade Local de Saúde de Matosinhos - Hospital Pedro Hispano* and was carried out in accordance with the Helsinki Declaration.

Statistical analysis

Categorical variables were described as number of cases and percentage (%) and continuous variables by mean ± standard deviation when following a normal distribution and median and interquartile range when not following a normal distribution. The differences between two independent variables were assessed by Student's t-test for independent variables or Mann-Whitney's U-test, according to the normality of the variables. The comparison between two or more categorical variables was performed using chi-square test and Fisher's test was applied whenever > 20% of the cells had an expected count < 5. A multivariate analysis was also performed to check which variables were independently associated with overnight stay through a logistic regression including the variables that were significantly associated with overnight stay in the univariate analysis. The Enter method was used to select the order in which the variables entered the model.

ROC (receiver operating characteristic) curves were drawn to assess the predictive risk of overnight stay and AUCs (area under the curve) were calculated for the variables significantly and independently associated with overnight stay in multivariate logistic analysis. The cut-off point was also calculated for each variable by calculating the Youden index.

A p-value < 0.05 was considered as statistically significant.

The statistical analysis was performed using the IBM SPSS Statistics version 24 software for Windows.

RESULTS

Patients aged 18-83, with a mean of 48.90 ± 13.64 years, mostly female (228; 73.3%) were included in the study (Table 1). Cholelithiasis (89.3%) was the main surgical indication and the remaining patients were submitted to surgery due to the presence of gallbladder polyps. The mean operative time was 53.59 ± 20.04 minutes, with a mean recovery time of 9.63 ± 5.68 hours. Hypertension (HTN) was the most prevalent comorbidity and 80.4% of patients were scored as ASA II (Table 1).

Patients who stayed overnight (group A, n = 104; 33.4%) were compared to those discharged on the day of surgery (group B, n = 207; 66.6%) (Table 1). With the exception of intraoperative haemorrhage, no significant differences were found regarding gender, type of surgical indication, surgical history, mean operative time and presence of intraoperative or postoperative complications.

Older age and higher prevalence of hypertension have been found in group A patients. No significant differences were found as regards the prevalence of the remaining comorbidities, even though a higher percentage of patients scored as ASA III were found in group A. A significantly later surgery start time has been found in group A patients and 81.7% of the patients in group A were operated on after 2PM, while around 81.6% of the patients in group B were operated on in the morning ($p < 0.001$) (Table 1).

Based on the differences between the two groups of patients, a comparative analysis was made between the patients who underwent surgery in the morning (60.5%) *vs.* those who underwent surgery in the afternoon (39.5%) (Table 2). A higher prevalence of obese patients was found in patients who underwent surgery in the afternoon when compared to those who underwent surgery in the morning; 89.9% of the patients who underwent surgery in the morning

Table 1 – Overnight-stay (Group A) *vs.* day-stay patients (Group B)

	Total	Group A	Group B	A *vs.* B
	n = 311 (100)	n = 104 (33.4)	n = 207 (66.6)	*p*-value
Surgery start time	12h17 (10h - 15h)	**16h (14h - 17h)**	**11h (9h - 12h)**	**< 0.001**
Surgical indication				
Cholelithiasis	278 (89.4)	91 (87.5)	187 (90.3%)	0.559
Gallbladder polyps	33 (10.6)	13(12.5)	20 (9.7)	
Abdominal surgery				
Upper	7 (2.3)	1 (1.0)	6 (2.9)	0.570
Lower	117 (37.6)	38 (36.5)	79 (38.3)	
Comorbidities				
HTN	**98 (31.5)**	**43 (41.3)**	**55 (27.3)**	**0.010**
T2DM	34 (10.9)	11 (10.6)	23 (11.1)	1.000
Obesity	65 (20.9)	23 (22.1)	42 (20.3)	0.768
Smoking	**70 (22.7)**	**15(14.6)**	**55 (26.7)**	**0.021**
Dyslipidaemia	87 (28.0)	34 (32.7)	53 (25.6)	0.228
Cardiac pathology	9 (2.9)	4 (3.8)	5 (2.4)	0.489
Respiratory pathology	17 (5.5)	5 (4.8)	12 (5.8)	0.798
Prior history of cholecystitis	7 (2.3)	2 (1.9)	5(2.4)	1.000
ASA score				
I	42 (13.5)	**11 (10.6)**	**31 (15.0)**	
II	250 (80.4)	**82 (78.8)**	**168 (81.2)**	**0.048**
III	19 (6.1)	**11 (10.6)**	**8 (3.9)**	
Intraoperative complications				
Anatomical difficulties	45(14.5)	19 (18.4)	26 (12.6)	0.174
Haemorrhage	**6 (1.9)**	**5 (4.9)**	**1 (0.5)**	**0.017**
Drain placemen	1 (0.3)	1 (1)	0	0.332

did not stay overnight, whereas only 30.9% of the patients who underwent surgery in the afternoon were discharged on the same day (p = 0.001). No identifiable cause for staying overnight was more frequently found in patients who underwent surgery in the afternoon and stayed overnight *vs.* those who underwent surgery in the morning (62.1% vs 2.7% respectively, p < 0.001).

Finally, patients who underwent surgery in the morning (before 2PM) and in the afternoon (after 2PM) were separately analysed, comparing patients who stayed overnight with those discharged the same day within each period of the day (Table 3).

Significantly older mean age as well as higher prevalence of hypertension and longer mean operative time have been found in patients who underwent surgery before 2PM and stayed overnight *vs.* those who did not stay overnight, with no differences regarding the other variables. Univariate logistic regression analysis of these three variables was then carried out (Table 4): age (p = 0.001), operative time (p < 0.001) and HTN (p = 0.019). After multivariate analysis, patient's age and mean operative time were significantly and independently associated with an indication for overnight stay (p < 0.0001). Using the ROC curves (Fig. 1A), patient's age (AUC = 0.759) was a good predictor of overnight stay in patients who underwent surgery before 2PM and 61.50 years of age (Youden index = 0.396) was the best cut-off point for an indication for overnight stay, with 15.3% odds for this to happen at this age. Median operative time is a fair predictor (AUC = 0.722). There was an identifiable cause for an overnight stay in all patients aged 46-60 (n = 6) who stayed overnight. In turn, no identifiable cause for overnight stay was found in all the patients aged 61-64 (n = 2) who stayed overnight. Finally, an identifiable cause for an overnight stay was found in around 62.5% of the patients older than 65 years of age (n = 8), while no identifiable cause was found in the remaining (37.5%) patients older than 65 and who have stayed overnight.

Significantly later median surgery start time has been found in patients who stayed overnight when compared to patients who did not stay overnight and had a lower prevalence of smoking (Table 3). After a multivariate analysis, median surgery start time was the only variable that was significantly and independently associated with the indication for an overnight stay (p < 0.0001) (Table 4). Using the ROC curves (Fig. 1B), it was found that median surgery start time was a good predictor of overnight stay (AUC = 0.797) and 16 hours 30 minutes (Youden index = 0.492) was the best cut-off point for considering an indication for

Table 2 – Patients submitted to surgery in the morning *vs.* in the afternoon

		Morning (< 2PM) n = 188 (60.5)	Afternoon (> 2PM) n = 123 (39.5)	*p*-value
Age (years)		49.22 ± 14.29	46.41 ± 12.62	0.061
Operative time (minutes)		55 (40-65)	50 (40-65)	0.109
Surgery indication				
Cholelithiasis		171 (91.0)	107 (87.0)	0.178
Gallbladder polyps		17 (9.0)	16 (13.0)	
Abdominal surgery				
Upper		6 (3.2)	1 (0.8)	0.359
Lower		72 (38.5)	45 (36.6)	
Comorbidities				
HTN		54 (28.70)	44 (35.8)	0.213
T2DM		21 (11.2)	13(10.6)	1.000
Obesity		**30 (16.0)**	**35 (28.5)**	**0.008**
Smoking		43 (23.0)	27 (22.1)	0.853
Dyslipidaemia		50 (26.6)	37 (30.1)	0.851
Cardiac pathology		5 (2.7)	4 (3.3)	0.743
Respiratory pathology		9 (4.8)	8 (8.5)	0.612
Prior history of cholecystitis		4 (2.1)	3 (2.4)	1.000
ASA score				
I		27 (14.4)	15 (12.2)	
II		154 (81.9)	96 (78.0)	0.267
III		7 (3.7)	12 (9.8)	
Intraoperative complications				
Anatomical difficulties		29 (15.4)	16 (13.1)	0.537
Haemorrhage		2 (1.1)	4 (3.3)	0.216
Drain placement		0 (0)	1 (0.8)	0.394
Day stay		**169 (89.9)**	**38 (30.9)**	**< 0.001**
Overnight stay		**19 (10.1)**	**85 (69.1)**	
Cause underlying overnight stay*	Inability to stand up	1 (0.5)	0 (0)	**< 0.001**
	Cannot tolerate diet	4 (2.2)	3 (2.6)	
	Abdominal pain	1 (0.5)	2 (2.5)	
	Unaccompanied patient	2 (1.1)	0 (0)	
	Patient monitoring	4 (2.2)	1 (0.9)	
	No identifiable cause	**5 (2.7)**	**72 (62.1)**	

* From the 104 patients who stayed overnight, the cause underlying overnight stay was only available in n = 17 patients submitted to surgery in the morning and in n = 78 patients submitted to surgery in the afternoon.

overnight stay, with 77.1% odds. Approximately 92.5% of the patients who stayed overnight and underwent surgery after 4PM had no identifiable cause for an overnight stay.

DISCUSSION

Laparoscopic cholecystectomy is the treatment of choice for gallstones (cholelithiasis).[4] Over the past few decades, the advances in surgical technique, anaesthesia and perioperative care have allowed it to be performed as an outpatient procedure.[5,6] Several studies showed that outpatient laparoscopic cholecystectomy is feasible, safe and effective,[10,13-17] leading to cost reduction[18] and greater patient satisfaction.[7] However, the need for overnight monitoring has been one of the major discussions around outpatient laparoscopic cholecystectomy. Several studies have found that laparoscopic cholecystectomy can be safely performed without an overnight stay,[15,19] although describing the need for a careful patient selection.[8,20] Patient's age over 50, patients scored as ASA ≥ III, surgery start time after 1PM,[9] longer operative time, presence of acute cholecystitis, suspected choledocholithiasis and a history of upper abdominal surgery have been considered as risk factors associated with unplanned patient readmission and postoperative complications.[21,22] Adequate patient management within the

Table 3 – Overnight-stay *vs.* day-stay patients, according to surgery start time

	Morning (< 2PM)		*p*-value	Afternoon (> 2PM)		*p*-value
	Overnight-stay n = 19	Day-stay n = 169		Overnight-stay n = 85	Day-stay n = 38	
Age (years)	**60.88 ± 9.90**	**47.94 ± 14.16**	**< 0.001**	49.41 ± 11.971	48.41 ± 13.86	0.191
Operative time (minutes)	**67 (50-95)**	**55 (40-65)**	**0.001**	52 (39-60)	45 (35-61)	0.613
Comorbidities						
HTN	**10 (18.5)**	**44 (81.5)**	**0.015**	33 (38.8)	1(2.8)	0.291
T2DM	3 (15.8)	21 (10.7)	0.451	8 (9.4)	5 (13.2)	0.532
Obesity	1 (5.3)	29 (17.2)	0.319	22 (25.9)	13 (34.2)	0.344
Smoking	1 (5.3)	42 (25.0)	0.080	**14 (16.7)**	**13 (34.2)**	**0.031**
Dyslipidaemia	6 (31.6)	44 (26.0)	0.604	28 (32.0)	9 (23.7)	0.344
Cardiac pathology	0 (0)	5 (3.0)	1.000	4 (4.7)	0 (0)	0.310
Respiratory pathology	1 (5.3)	8 (4.7)	1.000	4 (4.7)	4 (10.5)	0.251
ASA score						
I	**0 (0)**	**27 (16.0)**		11 (12.9)	4 (10.5)	
II	**17 (89.5)**	**137 (81.0)**	**0.042**	65 (76.5)	31 (81.6)	1.000
III	**2 (10.5)**	**5 (3.0)**		9 (10.6)	3 (7.9)	
Intraoperative complications						
Anatomical difficulties	6 (31.6)	23 (13.6)	0.085	13 (15.5)	3 (7.9)	0.309
Haemorrhage	1 (5.3)	1 (0.6)	0.192	4 (4.8)	0 (0)	1.000

Table 4 – Logistic regression analysis for prediction of overnight stay

	Risk factor	Gross OR	95% CI	*p*-value	Adjusted OR	95% CI	*p*-value
Morning (< 2PM)	**Age**	**1.08**	**[1.03 - 1.13]**	**0.001**	**1.09**	**[1.03 - 1.15]**	**0.001**
	Operative time	**1.04**	**[1.02 - 1.07]**	**< 0.001**	**1.05**	**[1.02 - 1.07]**	**< 0.001**
	HTN	3.16	[1.20 - 8.28]	0.019	1.64	[0.50 - 5.36]	0.412
Afternoon (> 2PM)	**Surgery start time**	**3.00**	**[1.87 - 4.81]**	**< 0.001**	**3.05**	**[1.88 - 4.94]**	**< 0.001**
	Smoking	0.39	[0.16 - 0.93]	0.034	0.41	[0.15 - 1.15]	0.089

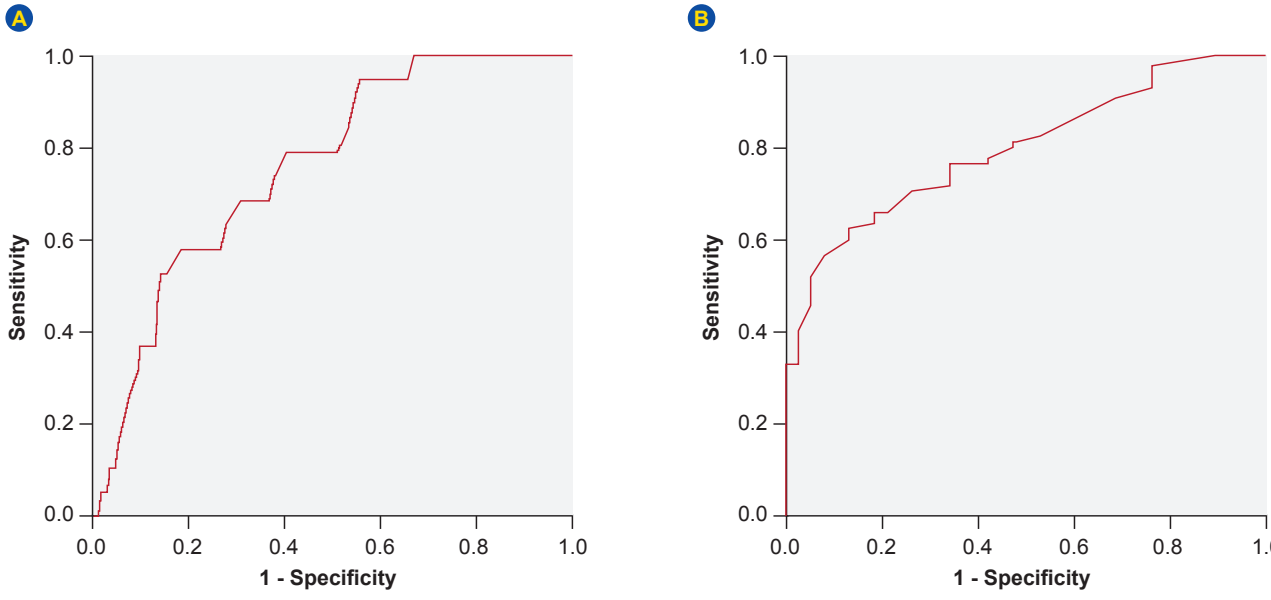

Figure 1 – ROC curves obtained for: (A) mean age of patients who underwent surgery < 2pm; (B) surgical start time of patients who underwent surgery > 2 pm

immediate postoperative period is also crucial, as more than half of hospital admissions in the immediate postoperative period are due to poorly controlled pain and a quarter of the cases due to nausea and vomiting.[22]

Day-stay *vs.* overnight-stay patients were compared in our study and patients were divided according to surgery start time (morning *vs.* afternoon) in order to assess the indication for overnight stay after outpatient laparoscopic cholecystectomy. The results showed that patient's age is a good predictor of overnight stay in patients who undergo surgery in the morning (before 2PM), with greater odds from the age of 61.50 years. Mean operative time is only a fair predictor of overnight stay. For the same operative time, in patients operated on in the morning, there is a 1.1-fold increase in the odds of overnight stay ($p = 0.004$) for each one year increase in age. For the same age, for each one minute increase in the operative time there is a 1.05-fold increase in the odds of overnight stay ($p < 0.001$). When patients are operated on in the afternoon (after 2PM), surgery start time is a good predictor of overnight stay and there are greater odds of overnight stay in surgeries starting after 4:30PM. The odds of overnight stay tripled ($p < 0.001$) in patients operated in the afternoon, for each hour of delay in surgery start time.

When morning and afternoon groups of patients were compared as regards the cause for overnight stay, we found that many patients stayed overnight without an identifiable cause (five patients (26.3%) in the morning group and 72 (84.7%) in the afternoon group). If we assume that these patients would be clinically fit for discharge on the same day, we reach the conclusion that the percentage of patients who actually needed an overnight stay would be similar in both groups, 6.5% in the morning group and 6% in the afternoon group. Therefore, most of these patients were not discharged on the same day due to the time at which their postoperative recovery was completed (only patients having had their recovery completed by 10PM were discharged). On the other hand, the fact that overnight stay is available in our clinic may have caused some patients not to be discharged on the same day, despite being fit for discharge, only for the patient's greater convenience.[23] Considering that there is no clinical records on morbidity and that during overnight stay no other problems were identified apart from those leading to patients' admission, that were initially excluded from the study, in case no overnight stay was available in our clinic, an overall 8.4% admission rate would have been found, corresponding to the inpatients and patients with an identifiable cause for overnight stay, compared to admission rates ranging between 8 and 26% found in literature.[8,9,13,19,24,25]

This study has some limitations. As this is a cross-sectional retrospective study, we can only affirm that there seems to be an association between the patient's age and surgery start time and the odds of overnight stay, considering the impact of other confounding variables that were not assessed or variables with an impact on the odds of overnight stay of patients undergoing outpatient cholecystectomy. On the other hand, the present study was carried out in a single hospital and the population may not be representative of other hospitals. The generalisation of the results to other populations should therefore be carried out in a cautious manner.

Finally, the way the reason for an overnight stay was recorded may have led to biased results, since it was assumed that patients with no recorded cause for overnight stay would have been fit for discharge. A 'lack of clinical criteria' option should be added to our overnight stay form.

Further prospective studies are required to confirm the conclusions of this study.

CONCLUSION

Outpatient laparoscopic cholecystectomy can be performed in clinics which does not provide overnight stays; surgery should ideally take place in the morning and patients should be carefully selected. The factors identified as predictors of the indication for overnight stay (patient's age, operative time and surgery start time) should be taken into consideration, keeping in mind that operative time is a multifactorial variable that depends on the patient's surgical history, existing anatomical variations and the surgeon's experience.

Numbers reflect the adoption of less restrictive criteria in our clinic, explained by the availability of overnight stay. Therefore, with a more careful patient selection and using only the morning period, the percentage of overnight stay could be significantly reduced. Outpatient laparoscopic cholecystectomy can be performed in clinics which does not provide overnight stays, as long as they are able to admit to the ward patients unfit for same-day discharge.

OBSERVATIONS

The authors declare that part of the results of the study were presented to the *VII Congresso Ibérico de Cirurgia Ambulatória / X Congresso Nacional de Cirurgia Ambulatória, Lisboa* – May 2018.

HUMAN AND ANIMAL PROTECTION

The authors declare that the followed procedures were according to regulations established by the Ethics and Clinical Research Committee and according to the Helsinki Declaration of the World Medical Association.

DATA CONFIDENTIALITY

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

CONFLICTS OF INTEREST

The authors declare that there were no conflicts of interest in writing this manuscript.

FINANCIAL SUPPORT

The authors declare that there was no public or private financial support in writing this manuscript.

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