Long waiting lists and health care spending
The example of cholecystectomy

Ann. Ital. Chir., 2015 86: 327-332
pii: S0003469X15022186
www.annitalchir.com

Silvia Palmisano*, Chiara Benvenuto*, Biagio Casagranda*, Chiara Dobrinja*, Giuseppe Piccinni**, Nicolò de Manzini*

**Department of Medical, Surgical and Health Sciences, General Surgery Clinic, University Hospital of Trieste, Trieste, Italy*
***Department of Biomedical Sciences and Human Oncology, Unit of Endocrine, Digestive, and Emergency Surgery, Aldo Moro, University Medical School, Bari, Italy*

READ-ONLY COPY PRINTING PROHIBITED

Long waiting lists and health care spending. The example of cholecystectomy

AIM: *Cholecystectomy is among surgical procedures with the longest waiting list and a significant amount of patients waiting for surgery suffer from symptoms related to complications of cholelithiasis. The aim of this study is to evaluate the economic impact caused by waiting lists.*
MATERIAL AND METHODS: *A retrospective study was performed on patients undergoing intervention of cholecystectomy. 86 patients were included in the study. A comparative analysis was carried out among patients without complications (group A) and patients who faced complications while waiting for surgery, therefore requiring unplanned hospital admissions (group B), and patients who were operated in emergency for complications (group C).*
RESULTS: *The overall cost of health care amounted to 1.849,4 € for each patient of group A, 3.513,2 € for each patient of group B and 2.584,6 € for each patient of group C. Each patient of group B was about 1.9 times more expensive than an asymptomatic one (group A) and about 1.36 times more expensive than one operated in emergency (group C). The conversion rate of the groups was not statistically significant, whereas the length of hospital stays was: patients in group B had longer hospital stays compared to patients in groups A and C.*
CONCLUSION: *Early laparoscopic cholecystectomy for complicated cholelithiasis is the cheapest treatment considering the costs of health care, causing lower social costs related to absence from work and an improved perception of the quality of life.*

KEY WORDS: Cholecystectomy, Complications, Medical care costs, Waiting list

Introduction

Cholelithiasis is one of the most common and costly disorders among all digestive diseases, especially in the Western world [1].

Approximately 1/5 of the adult western population have gallstones, about 20% of which are symptomatic. The incidence among women is three times higher than among men.
The treatment of choice for symptomatic gallstone disease is laparoscopic cholecystectomy, which has gradually replaced the open surgery approach in surgical practice [2].
Despite an improved quality of life after surgery, cholecystectomy is one of the surgical procedures with the longest waiting lists [3].
However, many patients awaiting surgery are admitted with recurrent gallstone-related symptoms, resulting in a significant morbidity and considerable social costs for their treatments [4,5].

Pervenuto in Redazione Settembre 2013. Accettato per la pubblicazione Novembre 2013
Correspondence to: Silvia Palmisano, Department of General Surgery, University Hospital of Trieste, Strada di Fiume 447, Trieste, Italy. (e.mail: spalmisano@units.it)

The most common complications include: biliary colic, cholecystitis, cholangitis, choledocholithiasis, pancreatitis and perforation of the gallbladder, all of which are associated with high rates of mortality [6]. Chances for patients in the waiting list to be admitted for emergency cholecystectomy increase proportionally to the duration of the wait, especially after 20 weeks [7]. The aim of this study it to evaluate the mean waiting time for elective cholecystectomy, the number of patients experiencing complications and requiring acceptance in emergency rooms or hospital units while awaiting surgery and additional or repeated examinations, and therefore the economic impact of waiting lists in terms of health care spending.

Material and Method

A retrospective study was performed on patients undergoing intervention of cholecystectomy at the General Surgery Department, Division of General Surgery of the University of Trieste between January 2009 and August 2010. All of them were placed in a waiting list for surgery between April 2007 and April 2010.
Patients operated in emergency who were previously not in the waiting list (39), along with those operated in private surgical practice in an intramural setting (10) and those whose complete clinical details weren't available (8) have been excluded from this study.
Data on the studied population was collected, including the duration of their wait, details on their access in the emergency room and any hospitalizations taking place during the wait, examinations and treatments carried out in the meantime, as well as the types of surgical treatment and the length of their hospital stay.
A comparative study was made among patients with a preoperative period without complications (A group) and patients who faced complications while waiting for surgery, therefore requiring unplanned admissions, additional diagnostic tests (B group), and operations in emergency for complications while awaiting (C group).
The sum of all costs taken into account for our analysis includes:
1) The cost of drugs and surgical devices used for all activities during the assistance period:
- Hospital Ward: the total cost of administered drugs has been calculated according to data of consumption provided by the Economic Structure Report (Total cost per type of drugs / Total quantity of consumption);
- Operating Room: costs related to sutures, gauze, instruments, sterilization of the kit and the amortization costs of the laparoscopic column.
2) Hospital costs: the daily cost of meals (3 meals/ 1 day) and laundry service multiplied by the mean time spent within the hospital ward.
3) Medical and nursery staff of the department (or division): the cost of day care was calculated multiplying the average cost per day of hospitalization by the average of all days spent in hospital. Clearly, average costs do not reflect the quantity of resources used by a specific category of patients, but rather give a general overview. However, the amount of staffing for day-care ward is now defined in relation to the way Structural Complex Structures (number of beds) are allocated, rather than the intensity of the diseases treated.
Therefore, in order to quantify the average cost per day of hospitalization, a plan for the allocation of quotas for each unit of the business was developed, whereby the consumption of resources was quantified in terms of percentage for each place of business, in order to determine costs.
In order to estimate the total cost of the procedure of instrumental diagnostic and laboratory performance, values taken from the regional tariff report of ambulatory care were applied. The number of tests requested by patients has been recorded during our research by checking their clinic folders.
Moreover, concerning the operative aim pursued in line with the differential logic, we decided to split costs into 2 types: first-costs or direct-costs. This type of configuration derives from the sum of all direct costs, without any imputation of indirect costs[8].

Results

Among the 143 patients (62 male and 81 female) undergoing intervention of cholecystectomy between January 2009 and August 2010, 86 were included in the study, 39 of whom were male (45%) and 47 female (55%). The mean age was 58 years (age range 18-89).
Of those 86 patients, 19 (8 male and 11 female, mean age 51.3 years) suffered from complications of cholelithiasis while awaiting surgery (22%), while 67 patients were asymptomatic until the date of surgery for elective cholecystectomy (78%).
Among those 19 patients, 7 underwent cholecystectomy during the first acute admission (44 days on average from the date of the first examination), whereas 12 patients suffered from complications after an average of 99 days from the first examination. Such patients did not require emergency surgery, but 15 admissions to the emergency room and 10 admissions the general surgical ward.
The studied population was thus divided into three groups: A group: asymptomatic patients (78%), B group: symptomatic patients who were not operated in emergency (13.9%) and C group: patients operated in emergency for complications (8.1%) (Fig. 1).
The 67 patients in group A can be divided as follows: 31 male and 36 female, mean age 60.1 years. The mean time of wait until elective cholecystectomy was 192 days. Diagnostic tests required during the first surgical visit included chest x-ray, electrocardiogram and a complete blood test. On some patients, further test were carried

READ-ONLY COPY PRINTING PROHIBITED

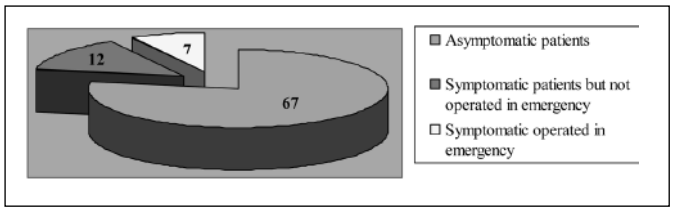

Fig. 1.

out, including 12 cardiology consultations, 13 MRI cholangio-pancreatography and 8 abdominal ultrasound. Diagnostic tests are summarized in table I.

The total cost of preoperative tests performed on these patients amounted to 18.217,3 € (271,9 € per patient). One patient was operated with an open technique (1.5%), 66 by laparoscopic access (92.6%), whereas 4 patients (5.9%) required a conversion of the intervention. The mean duration of the surgery for patients in this group was 70 minutes. The cost of surgery amounted to 61.037 € (911 € per patient). The average length of the hospital stay after the intervention of cholecystectomy was 2.61 days. The cost of hospitalization amounted to 44.655,5 € (666,5 € per patient). Costs of hospitalization also included the costs of drugs administered to patients. The cost of drug therapies for patients in group A was 221,1€ (3,3€ per patient). The total cost for the treatment of patients in group A amounted to 123.909,8 € (1.849,4 € per patient).

Among the 86 patients examined, 12 suffered from recurrent complications, but were not been operated in emergency (B group). Complications are listed in table II.

TABLE I - *Diagnostic test performed on the three groups of patients.*

Pre-operative exams	**Group A**	**Group B**	**Group C**
Abdominal ultrasound	8	13	8
Chest x-ray	67	19	7
Abdominal x-ray	0	3	1
Electrocardiogram	67	18	9
MRI cholangio-pancreatography	13	5	1
ERCP	0	2	1
Abdominal CT scan	0	2	2
Gastroscopy	0	2	0
Complete blood tests	67	37	9

TABLE II - *Causes and number of admissions to the emergency room and to general surgical ward.*

Complications	**Access to emergency room**	**Hospitalization**
acute cholecystitis	1	2
acute pancreatitis	2	4
acute cholangitis	1	1

Diagnostic tests carried out in the emergency room or in the general surgical ward lead to a total cost of 6129,6 € (510,8 € per person).

In addition to this sum, the cost of diagnostic tests required during the first examination must be considered, which in our hospital amounts to 2.749,2€ (229,1€ per patient) for 12 chest x-ray, 12 electrocardiograms, 12 complete blood tests, 2 cardiology consultations, 5 MRI cholangio-pancreatography, 2 endoscopic retrograde cholangiopancreatograpies (ERCP), 2 gastroscopies. Total health care spending for diagnostic tests among patients belonging to group B was 8.878,8 € euro (739,9 € per person).The mean time of hospitalization for preoperative complications was 4 days.

For patients in group B, the mean waiting time before surgery after the onset of the first complications was 134 days. All patients underwent laparoscopic cholecystectomy, however, in two cases (16%), converting the intervention was necessary. A drain was placed in 4 patients. The mean duration of surgery for patients in this group was 83 minutes. The cost of surgery was 11.708,4 € (975,7 € per patient). The average hospital stay was 3.5 days. The cost of hospitalization was 21.571,2 € (1.797,6 € per patient including costs of drug therapy which amounted to 420€ (35€ per patient) The total cost of the treatment for patients belonging to group B was 42.158,4 € (3.513,2 € per patient).

Diagnostic tests carried out on the 7 patients who experienced an emergency surgery (C group) are summarized in table 1 and compared to the tests needed by patients in other groups.

Diagnostic tests performed on patients in group C include both preparation tests for emergency surgery and all required exams during the first examination. The total cost of diagnostic tests was 2.993,9 € (427,7€ per patient). The mean waiting time before surgery was 44 days. In 4 patients, the operation of cholecystectomy in emergency was performed with a laparoscopic approach (57%), in 2 cases the laparoscopic approach was converted to open technique (29%), whereas in one case open cholecystectomy was performed (14%). A drain was placed in 5 patients. The mean duration of surgery for patients in this group was 86 minutes. The cost of surgery was 6.734,7 € (962,1 € per patient). The average length of their stay was 4.71 days (2-7). The cost of hospitalization amounted to 8.363,6 € (1.194,8 € per patient), including costs related to drug therapies, amounting to 198,8€ (28,4€ per patient). The total cost for the treatment of patients in group C was 18.092,2 € (2.584,6 € per patient).

Patients were administered the following drugs: Antibiotics (penicillins, cephalosporins, glycopeptides, nitroimidazoles), analgesics, anticoagulants, proton pump inhibitors and antiemetics. 2 out of 7 patients operated in emergency required blood transfusion during their hospital stay.

READ-ONLY COPY PRINTING PROHIBITED

TABLE III - *Health care spending*

	Preoperative diagnostic tests/€	Surgery/€	Hospitalization/€	Total for each patients/€	Total for all patients/€
Group A (67)	271,9	911	666,5	1.849,4	123.909,8
Group B (12)	739,9	975,7	1.797,6	3.513,2	42.158,4
Group C (7)	427,7	962,1	1.194,8	2.584,6	18.092,2
Total health care spending	184.160,4				

TABLE IV - *Comparative table*

	Group A 67pz	Group B 12pz	Group C 7pz
Mean waiting time before surgery	192 days	134 days	44 days
Type of surgery			
– laparoscopic	92.6%	84%	57%
– open	1.5%	0%	14%
– converted	5.9%	16%	29%
Mean length of stay	2.61	7.5*	4.71

*The mean length of stay for surgery and the mean time spent in hospital prior the operation for complications related to biliary lithiasis.

Costs of the preoperative diagnostic tests, surgery and hospitalization for each patient in the three groups are reported in table III.
The mean waiting time before surgery, the type of surgery and the mean length of stay for each patient in the three groups are summarized in table 4.
The conversion rate of patients in group A was 5.9%, which, compared to the conversion rate in group B (16%) and group C (29%) was not a statistically significant value applying Fisher's exact test.
Patients in group B had a longer hospital stay than patients in group A, which in turn was a statistically significant value applying the t-Student test ($p<0.01$). The same test was also used to compare the mean length of stay of patients in group A and group C. The result was statistically significant ($p<0.01$)

Discussion

Waiting list management in all health care systems is one of the main problems perceived by citizens.
Waiting lists are determined by a series of complex factors, which briefly concern: a growing demand for health services due to aging populations and technological progress, the perception of the citizens' health conditions, the needs of assessment care from physicians (both general practitioners and specialists), the availability of adequate human, technological and structural resources for health care services, their appropriate use and overall organizational skills[9].
In times like these, where the economic crisis has led to a number of cuts in the health care system, rationalizing waiting lists is a priority goal for the national health system, along with focusing on efficiency and equity in order not to delay or prolong the times required for diagnosis and treatment[10].
Analysis of the data shows that the waiting time for elective cholecystectomy is 192 days, which is far too long and exposes patients to the onset of complications related to gallbladder cholelitiasis. 22% of patients awaiting surgery for cholecystectomy have developed complications requiring urgent interventions in 8.1% of the cases (group C) and 15 emergency hospitalizations and 10 admissions to the surgical ward for 13.9% of patients (group B). These results are comparable to the values obtained from Somasekar et al. who carried out a study in the UK and reported a complication rate of 23.7%[4] during the wait.
Figures of 14% and 5.6% have been reported respectively by Lawrentschuk and coll and Thornton and coll. [11, 5]. The difference in results is probably due to differences in waiting time before surgery, which was shorter in the last two studies, showing that the incidence of complications is directly proportional to the wait.
The laparoscopic approach was the most common in all three groups. However, analysis of data showed that, according to other studies, the rate of open cholecystectomy and conversion increased among patients with a history of complications (group B and group C). According to our experience, the conversion rate was 16% and 29% respectively, although such figures are not statistically significant[4].
The mean length of the hospital stay after intervention was 2.6 days for patients in group A. According to other studies, such result entails clear benefits in terms of hospitalization costs and in time off work[2]. In group B, the mean length of postoperative hospital stay was of 3.5 days after surgery. However, in order to calculate the total cost of hospitalization, an average of 4 days of hospital stay due to a preoperative complications must be added. The overall length of the stay for patients in

READ-ONLY COPY PRINTING PROHIBITED

group B was 7.5 day on average. Such value, compared to the mean hospital stay of patients in group A, was statistically significant.
In 1980, Fowkes and Gunn examined the relationship between cholecystectomy, waiting time before surgery and health care costs, demonstrating the feasibility of potential economic benefits of performing surgery before the onset of complications[10].
In this study, we estimated the cost of complications by evaluating the costs of diagnostic tests, hospital stay, surgery and drug therapies. The cost analysis shows that a patient suffering from complications during the wait and requiring numerous tests in addition to those taking place on the first examination (group B: 3.513,2 €) was about 1.9 times more expensive than an asymptomatic patient (group A: 1.849,4 €) and about 1.36 times more expensive than a patient operated in emergency (group C: 2.584,6 €). High costs are due to the cost of additional diagnostic test, the cost of hospitalization, as well as the type of surgery and drugs.
If all 86 patients included in this study had had a clinical course without complications, health spending would be estimated at 158.048,4 €. Cost analysis shows that the actual total health care spending was 184.160,4 € and subsequently, the specific cost for complications was 26.112 € (actual costs – theoretical costs). This is a significant amount of money which could be more useful when operating patients immediately in order to avoid the onset of complications, preventing morbidity and improving their quality of life.
Social costs and moral complications involved should be considered as well, as they can lead to a worsening perception of the quality of life and prolonged absence from work due to illness.

Conclusions

Patients developing complications while awaiting (group B) can lead to huge costs for the health care system, if compared with both patients without complication and even those operated in emergency.
Moreover, access to the emergency room and hospital admissions for complications increase public spending and reduce the quality of life as perceived by the citizens.
Early cholecystectomy for symptomatic cholelitiasis is cheaper from an economic point of view, as it reduces the likelihood of developing complications, prevents future hospital admissions and reduces the amount of illness-related absences from the work.

Riassunto

Lo scopo dello studio è stato valutare l'incidenza di complicanze correlate alla calcolosi della colecisti in pazienti in lista d'attesa per l'intervento di colecistectomia e quantificare le implicazioni economiche di quest'attesa in termini di costi sanitari relativi agli esami ematochimici, strumentali, alla degenza, all'intervento chirurgico e alle terapie somministrate.
La popolazione oggetto dello studio è stata di 86 pazienti, 39 uomini e 47 donne, inseriti in lista d'attesa per intervento chirurgico di colecistectomia in un periodo compreso fra aprile 2007 e aprile 2010. Di tali pazienti sono stati raccolti dati anagrafici, la durata del tempo d'attesa, dettagli sugli accessi in PS ed eventuali ricoveri durante l'attesa, esami e terapie eseguite, il tipo di intervento chirurgico effettuato e i giorni di degenza. È stato fatto uno studio comparativo di natura economica tra tre gruppi di pazienti: A: asintomatici durante l'attesa, B: complicati ma non operati in urgenza, C: complicati e operati in regime d'urgenza.
Utilizzando il tariffario regionale delle prestazioni di assistenza specialistica ambulatoriale e quello delle prestazioni di assistenza ospedaliera per acuti erogate in regime di ricovero diurno abbiamo stimato che un singolo paziente complicato ma non operato in regime d'urgenza abbia determinato un ingente spesa per il sistema sanitario (gruppo B: circa 3513,2 €) circa 1.9 volte in più se paragonata a un paziente che durante l'attesa non abbia sviluppato complicanze (gruppo A: circa 1.849,4 €) o 1.36 volte in più di un paziente precocemente operato in regime d'urgenza (gruppo c: circa 2.584,6 €). Nel nostro limitato, ma a nostro parere esplicativo, campione abbiamo stimato i costi specifici legati alla lunghezza delle liste d'attesa pari a circa 26.112 €.
In questo periodo di crisi economica, che ha portato numerosi tagli anche al sistema sanitario, questo significativo ammontare di denaro, a nostro avviso, potrebbe essere usato per razionalizzare le risorse prevedendo, per esempio, sedute operatorie aggiuntive per patologie molto comuni di interesse chirurgico, come la colelitiasi, al fine di abbattere le liste d'attesa e prevenire l'insorgenza di "costose" complicanze.

References

1. Festi D, Reggiani ML, Attili AF, Loria P, Pazzi P, Scaioli E, Capodicasa S, Romano F, Roda E, Colecchia A: *Natural history of gallstone disease: Expectant management or active treatment? Results from a population-based cohort study.* Journal of Gastroenterology and Hepatology, 2010; 25 (4):719-24.

2. Garner JP, Sood SK, Robinson J, Barber W, Ravi K: *The cost of ignoring acute cholecystectomy.* Ann R Coll Surg Engl, 2009; 91 (1):39-42.

3. Quintana JM, Cabriada J, Aròstegui I, Oribe V, Perdigo L, Varona M, Bilbao A: *Health-related quality of life and appropriateness of cholecystectomy.* Annals of Surgery, 2005; 241 (1):110-18.

4. Somasekar K, Shankar PJ, Foster ME, Lewis MH: *Costs of waiting for gall bladder surgery.* Postgrad Med J. 2002; 78 (925):668-69.

READ-ONLY COPY PRINTING PROHIBITED

5. Thornton DJ, Robertson A, Alexander DJ: *Patients awaiting laparoscopic cholecystectomy-can preoperative complications be predicted?* Ann R Coll Surg Engl, 2004; 86 (2):87-90.

6. Cheruvu CV, Eyre-Brook IA: *Consequences of prolonged wait before gallbladder surgery.* Ann R Coll Surg Engl, 2002; 84 (1):20-22.

7. Sobolev B, Mercer D, Brown P, Fitzgerald M, Jalink D, Shaw R: *Risk of emergency admission while awaiting elective cholecystectomy.* Canadian Medical Association Journal, 2003; 169 (7):662-65.

8 Brusa L: *Analisi e contabilità dei costi*. Padova: Giuffrè Editore, 2009; 26.

9. Lau R, Vair BA, Porter GA: *Factors influencing waiting times for elective laparoscopic cholecystectomy.* Can J Surg, 2007; 50 (1):34-8.

10. Fowkes FG, Gunn AA: *The management of acute cholecystitis and its hospital cost*. Br J Surg, 1980; 67(9):613-17.

11. Lawrentschuk N, Hewitt PM, Pritchard MG: *Elective laparoscopic cholecystectomy: Implications of prolonged waiting times for surgery*. ANZ J Surg, 2003; 73 (11):890-93.

READ-ONLY COPY
PRINTING PROHIBITED