

Original Article

Results of Hepatobiliary and Pancreatic Surgery According to DRG in a Level 2 Hospital Surgery Department During the Years 2005-2006

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Abstract

Objective. To assess the results of the hepatobiliary and pancreatic surgery of a surgery department during 2005-2006 using the diagnostic related groups.

Materials and method. The data were obtained from the CMBD-HA of the Catalan Health Service. We assessed the frequency, hospital stay and mortality of the surgical procedures. The results were compared with the 63 public hospitals, and the 8 of them belonging to the Catalan Health Institute.

Results. In our area, a clear trend is observed in referrals for certain types of complex procedures on the liver, pancreas and biliary system excluding cholecystectomy with or without associated morbidities (7%-11%) without exceeding the population percentage (12%). In our centre, the impact on hospital stay is more evident in complex procedures. The total savings in our centre during the years 2005-2006 compared with the XHUP hospitals group were 2212 days of hospital stay with an equivalent cost saving of more than one million euro. The frequency and the results of hospital stay and mortality of laparoscopic and open cholecystectomy were those expected for the population covered by a general hospital. The mortality in complex procedures was half of that of the whole public network or the ICS centres.

Conclusions. In the complex hepatobiliary-pancreatic pathology, the mortality, and cost savings in our centre

appear to be the result of, not only the high volume of procedures, but also to specialisation and factors related to the structure of the department, and surgeon training.

Key words: Surgery. Mortality. Morbidity. Quality control. Liver surgery. Pancreatic surgery. Biliary surgery.

RESULTADOS DE LA CIRUGÍA HEPATOBILIOPANCREÁTICA EN UN SERVICIO DE CIRUGÍA DE UN HOSPITAL DE SEGUNDO NIVEL SEGÚN LOS GRD DURANTE EL BIENIO 2005-2006

Objetivo. Evaluar los resultados de la cirugía hepatobiliopancreática de un servicio de cirugía durante el bienio 2005-2006, mediante los grupos relacionados por el diagnóstico.

Materiales y método. Los datos se han obtenido del Registro del Conjunto Mínimo Básico de Datos de los Hospitales de Agudos del CatSalut. Se ha valorado la frecuencia, la estancia y la mortalidad. Los resultados han sido comparados con los 63 hospitales públicos de Cataluña (XHUP) y con los 8 de ellos que pertenecen al Instituto Catalán de la Salud (ICS).

Resultados. Se observa, en nuestra área de influencia, una clara tendencia a la referencia para cierto tipo de procedimientos complejos (7-11%), sin superar la proporción poblacional (12%). En nuestro centro, el impacto en las estancias hospitalarias es más evidente en los procedimientos complejos. El ahorro total de recursos de nuestro servicio en el bienio 2005-2006 en relación con el grupo de hospitales de la XHUP fue de 2.212 días de estancia hospitalaria, cuyo coste equivale a más de un millón de euros. La frecuencia y los resultados sobre las estancias hospitalarias y la mortalidad de la colecistectomía son

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los esperados para la población que se atiende como hospital general. La mortalidad en los procedimientos complejos fue la mitad que la observada para el conjunto de hospitales de la XHUP o del ICS.

Conclusiones. En la patología hepatobiliopancreática compleja, creemos que la mortalidad y el ahorro de recursos en nuestro centro se deben no sólo al volumen, sino a la especialización y los factores relacionados con la estructura del servicio y el entrenamiento de los cirujanos.

Palabras clave: Cirugía. Mortalidad. Complicaciones. Control de calidad. Cirugía hepática. Cirugía pancreática. Cirugía biliar.

Introduction

Hepato-pancreato-biliary (HPB) surgery at Spanish tertiary hospitals usually concentrates in clinical facilities with specific dedication to this type of surgery. Recently the European Hepato-Pancreato-Biliary Association (EHPBA) has held meetings to establish the minimum criteria, interventions performed and necessary examinations for the examination call of the European Board of Surgery Qualification (EBSQ) for HPB surgery, which will be soon a reality. The self-evaluation is part of the hospitals' surgery services quality control. In this sense, in a previous publication we already tried to establish which were the equipments, minimum experience, and standards for the hepato-pancreato-biliary surgery.¹ The data showed in this study were empirical and based in our experience as a group and in the published literature—generally American.

Diagnose-related groups (DRG)²⁻⁴ is a classification system in which diagnoses and procedures are grouped in order to obtain various categories according to the clinical characteristics of the patients and the resources consumption that is required for their assistance. They were initially developed for hospitalized patients, but after their evolution, there are also DRG for outpatient treatment and for long-term care. Five types of variables are mainly used in order to define a DRG: diagnose codes (primary and secondary, complications can also be included), procedure codes (surgical or non surgical, as well as the special-trained staff requirement, or the need for facilities and special equipment), age (in years or months for the newly-born), sex, and patient situation at discharge (how they leave hospital and their destination: moving to another hospital, homecare, death, etc) Although classifications have changed frequently due to technological advances, the usage of new drugs or the emergence of new diseases, DRG are set in the same way as before.

Through the report of patient's hospital discharge, the Basic Data Minimum Set (BDMS) is generated in order to classify the patients and their diseases. In a second stage, when there is homogeneity between the health system DRGs, it is possible to use them to compare the performance

of the hospitals within that system. In a third stage, DRG is an excellent tool to adjust payment methods (reimbursement) to each hospital, for those health systems in which financing and providing health services are separated tasks. The aim of this study is to evaluate the results of the assisting work in the hepato-pancreato-biliary surgery of a second-rate hospital during years 2005-2006. This work was carried out according to the DRG of the BDMS.

Materials and Method

Centre Characteristics

Hospital Josep Trueta (Girona) is a second-rate hospital centre. As a general hospital, it accepts 90 000 people (the population of Girona), that is 1.3% of Catalonia's population. This hospital is a reference centre for 8 regional hospitals in the province of Girona (800 000 inhabitants) and it is the tertiary reference for certain surgery of high complexity for, approximately, 12.5% of Catalonia's population. The surgery service has 4 units: esophagogastric, endocrinal-abdominal wall-obesity-breast, colorectal, and hepato-pancreato-biliary.

Unit Structure and Surgeons' Formation and Training Process

On October 31, 2003 an agreement was signed between Hospital Bellvitge (Barcelona) and Hospital Josep Trueta (Girona) for the oncological and surgical HPB treatment, which was endorsed by the 2 centres' board of management. In this agreement it was established that surgeons from the reference centre will move to Hospital Josep Trueta to help with medium complexity operations, while the high complexity operations would be performed in the reference hospital, with the collaboration of Josep Trueta's surgeons. Due to the progressive increase of patients pending HPB surgery intervention, on January 15, 2005—start date of this study—a senior surgeon from Hospital Bellvitge was seconded to Hospital Josep Trueta.

The current team is made of 5 surgeons: 1 senior surgeon with 20 years of experience in HPB surgery and hepatic transplant, acting as unit chief; 1 senior surgeon with wide experience in laparoscope surgery and pancreatic surgery; and 3 junior surgeons with less than 5 years of experience in HPB surgery. The operations are classified according to their difficulty. Those of high difficulty are performed by the senior surgeons with juniors' help. Those of medium difficulty are performed by the junior surgeons helped by the seniors.

However, as junior surgeons gain more experience, they are progressively included in high difficulty operations, always supervised by the seniors.

There are also 2 endoscopist digestologists with exclusive dedication to endoscopic retrograde cholangiopancreatography (ERCP) and ecoendoscopy, and 2 radiologists with exclusive dedication to abdomen imaging (computerized tomography [CT] and magnetic resonance [MR]).

Specific Meetings and Sessions in HPB Surgery

There are 2 specific sessions in HPB surgery, apart from the usual sessions about complications and mortality, digestive tumors committee and the general session of the general and digestive surgery department. There is a specific weekly meeting with the endoscopists-digestologist and surgeons, in which admissions are checked, and the order of interventions procedures and kind of treatment to perform is decided. There is another specific meeting with radiologists, oncologists, and surgeons to discuss image explorations (mainly CT and MR) and set surgical indications, the intervention to be done and the type of surgery technique.

Study Methodology

The activity of conventional hospitalization and outpatient major surgery of patients that were assigned any DRG from the diagnostic category "Diseases and disorders of the hepato-biliary and pancreatic system" (version 20.0) was studied. They are related as follows:

— DRG 191 and 192: surgical procedures of pancreas and/or liver, with or without comorbidity. It comprises the hepatic resections for primitive or secondary and benign hepatic tumors, as well as hepatic parasitic disease (echinococcosis). It also comprises pancreatic resections and derivations for malignant cystic tumors, complicated acute pancreatitis, and chronic pancreatitis. It also comprises portal hypertension surgery, although currently it is not very frequent. It is subdivided as: 191 for patients older than 70 with comorbidities, and 192 for young patients without comorbidities

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– DRG 193-194: biliary surgical procedures, except for cholecystectomy with and without comorbidity. It comprises biliary-digestive derivations, radiological or endoscopic surgery, and interventionism of the main biliary tract by choledocholithiasis. Surgical treatment of malignant and benign tumors of the main biliary tract without hepatic or pancreatic parenchimatose resection. Biliary-digestive derivations for iatrogenic or inflammatory injuries of the main biliary tract, excluding cholecystitis. It is subdivided as: 193 for patients older than 70 with comorbidities and 194 for young patients without comorbidities

– DRG 197-198: open cholecystectomy with and without comorbidity. It comprises the gall bladder removal exclusively via open laparotomy. The most frequent indication is the urgent acute lithiasic cholecistitis and the laparoscopy conversions due to technical complexity. It also comprises the bladder benign and malignant tumors treatment through cholecistectomy without hepatic resection. It is subdivided as: 197 for patients with comorbidities, older than 70 years of age and 198 for young patients and without comorbidities

– DRG 493-494: laparoscopic cholecistectomy with and without comorbidity. It comprises the gall bladder removal via laparoscopy due to vesicular lithiasis with or without symptoms, generally elective, though there are also patients with acute cholecystitis. It is subdivided as: 493 for patients with comorbidities and older than 70 years and 494 for young patients and without comorbidities

Due to the low number of cases in some of the DRG, and with the purpose of being able to compare among the 3 types of centres analyzed, we have studied the stay separately (patients by years). The rest of the data are presented by DRG during the 2-year period.

The mean stay has been calculated starting from the admission date and the discharge date. Since the mean stay can be affected by extreme values in the DRG with low number of cases, the mean stay has been calculated too.

Data have been obtained from the Record of the Basic Data Minimum Set of Acute Hospitals (BDMS-AH), from the activity record division of the Catalanian Health Service (CatSalut).

The impact has been calculated, which is the reduction of hospital stays (stay differences multiplied by the volume during a particular period). The procedure frequency is expressed as a percentage of the procedures performed in our hospital in relation to the total procedures performed in the XHUP.

For the daily cost of hospital stay in a regular room the value of 495 euros was used, which is the representative of costs in Spain.

Definitions

CatSalut. It is the public entity responsible for purchasing the sanitary services for public coverage.

XHUP: Public Use Hospital Net [in Spanish]. Formed by 63 centres.

ICS: Catalanian Health Institute. It is a public entity, from the Health Department of the Generalitat de Catalunya (Catalonian Government), which is the sanitary services provider. It administers the 8 hospitals that, until the transfer of autonomous competences in health matters, formed part of the former INSALUD. Three of them are third-rate: Hospital General Universitario Vall d'Hebron, Hospital Universitario de Bellvitge, and Hospital Universitario Germans Trias i Pujol (Badalona). Three are second-rate: Hospital Universitario de Girona Josep Trueta, Hospital Universitario Arnau de Vilanova (Lleida), and Hospital Universitario de Tarragona Joan XXIII.

Summary of the Activity for the DRG 192 for the Period 2005-2006. Percentages Refer to XHUP^a

DRG	XHUP	ICS	Hospital Josep Trueta
191	1786	765 (43%)	128 (7.2%)
192	699	346 (50%)	74 (10.6%)
193	745	306 (41%)	56 (7.5%)
194	355	123 (35%)	40 (11.3%)
197	1493	543 (36%)	75 (5%)
198	1470	482 (33%)	56 (3.8%)
493	2572	1549 (60%)	65 (2.5%)
494	11 240	6494 (58%)	129 (1.1%)
Total	20 360	10 608 (52%)	601 (3%)

^aDRG indicates diagnose-related groups; ICS, Instituto Catalán de la Salud; XHUP, public use hospitals net, formed by 63 centres.

The remaining 2 are first-rate or regional: Hospital de Viladecans and Hospital de Tortosa Verge de la Cinta.

Results

Surgical Procedures Frequency

Hepato-pancreatic surgery with comorbidity (DRG 191). Our case study comprises 128 procedures, which represents 7.2% of the whole activity in Catalonia (Table). This frequency is 56% of the activity that would correspond to us according to the population of our area of specific influence.

Hepato-pancreatic surgery without comorbidity (DRG 192). This case study includes 74 procedures, which represents 10.6% of all the activity in Catalonia (Table). This frequency is 88% of the activity that would correspond to us according to the population of our area of specific influence.

Biliary surgical procedures (except cholecistectomy) with comorbidity (DRG 193). Our case study comprises 56 procedures, 7.5% of the whole activity in Catalonia (Table).

Biliary surgical procedures without comorbidity (DRG 194). This case study includes 40 procedures, 11.3% of all the activity in Catalonia. This activity is practically all the activity corresponding to our area of influence (90%) (Table).

Open cholecistectomy with comorbidity (DRG 197). Our case study comprises 75 procedures, 5% of all the activity in Catalonia (Table). This activity is 4 times greater than the one that would correspond to us taking into account the population that we deal with as a general hospital.

Open cholecistectomy without comorbidity (DRG 198). This case study includes 56 procedures, which represents 3.8% of all the activity in Catalonia (Table). This activity is 3 times greater than the one that would correspond to us taking into account the population that we deal with as a general hospital.

Laparoscopic cholecistectomy with comorbidity (DRG 493). Our case study comprises 65 procedures, 2.5% of all the activity in Catalonia (Table). This activity is 2 times greater than the one that would correspond to us taking into account the population that we deal with as a general hospital.

Laparoscopic cholecistectomy without comorbidity (DRG 494). This case study includes 129 procedures, which represents 1.1% of all the activity in Catalonia (Table). This activity is a little lesser (88%) than the one that would correspond to us taking into account the population that we deal with as a general hospital.

Stay

The annual mean stay (in days) for each year according to the different DRG of our hospital, compared to the group of the XHUP and the ICS centres, is represented in Figures 1-4. A difference in favour of shorter stays in all the DRG in our centre with regard to those of ICS can be observed. With regard to the comparison to the XHUP, the differences are also favorable to our centre, although less marked, except in the laparoscopic cholecistectomy without comorbidities that in 2006 was slightly greater (Figure 4).

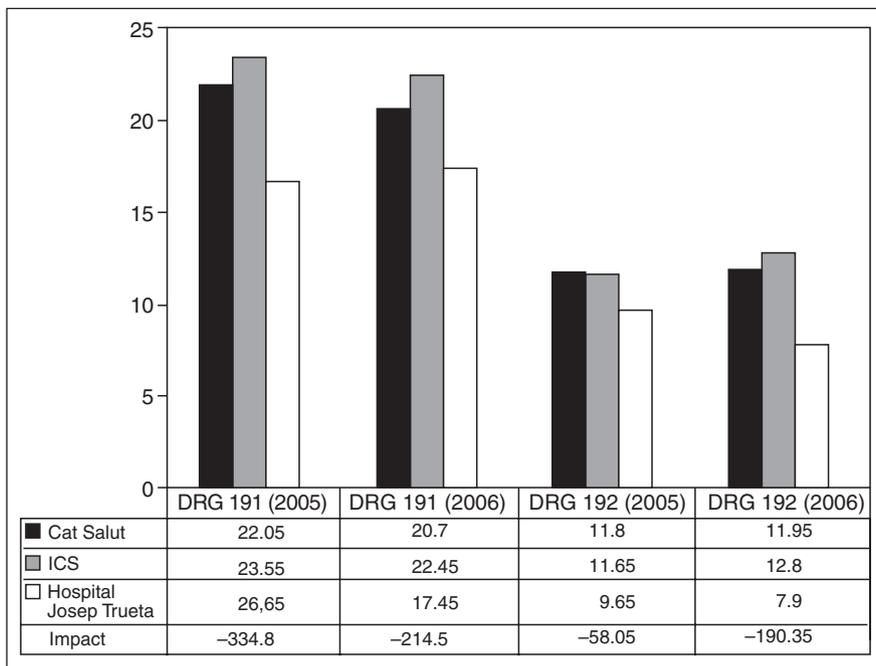


Figure 1. Mean stay in days of the diagnose-related groups (DRG) 191 and 192. Surgical procedures on pancreas, liver and portal hypertension with comorbidities (DRG 191) and without comorbidities (DRG 192). The impact has been calculated (stay reduction multiplied by volume/year) regarding the group of hospitals of XHUP. ICS indicates Catalanian Health Institute.

Regarding the total stays saving (impact), the greater difference is observed in the hepato-pancreatic complex surgery (Figure 1) and in the main biliary tract surgery, excluding cholecistectomy (Figure 2). This difference is more evident when we analyzed DRG 191 and 193 referring to the same diagnoses in patients with comorbidities (Figures 1 and 2). In the DRG with comorbidities the stay reduction goes from 355 to 215 days a year.

In the open cholecistectomy the stays saving is also favorable to our centre, particularly when it is compared to

the XHUP. However, the impact ranges only between 95 and 50 days annually in favour of our centre (Figure 3).

Laparoscopic cholecistectomy, for its frequency and standardization, is the most frequent HPB surgery intervention in first-rate or regional hospitals. The impact regarding the XHUP is smaller, and it ranges between 47 and 4 annual stays. The mean stay in patients without comorbidities during 2006 was greater than that of XHUP, although lower with regards to ICS. The average stay from the XHUP and ours were, however, the same: 3 days.

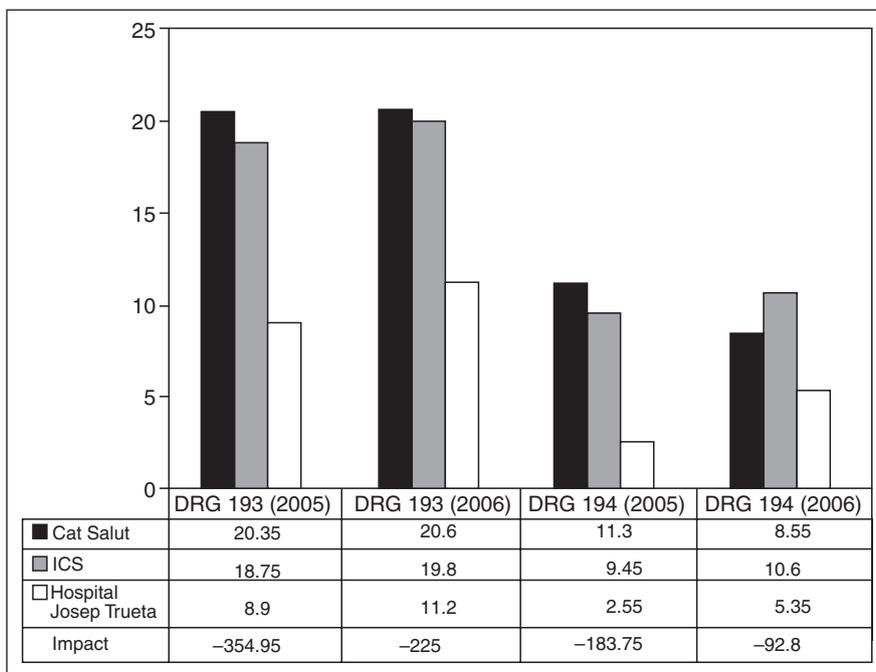


Figure 2. Mean stay in days of the diagnose-related groups (DRG) 193 and 194. Surgical procedures on biliary tracts excluded cholecistectomy in patients with comorbidities (DRG 193) and without comorbidities (DRG 194). The impact has been calculated (stay reduction multiplied by volume/year) regarding the XHUP. ICS indicates Catalanian Health Institute.

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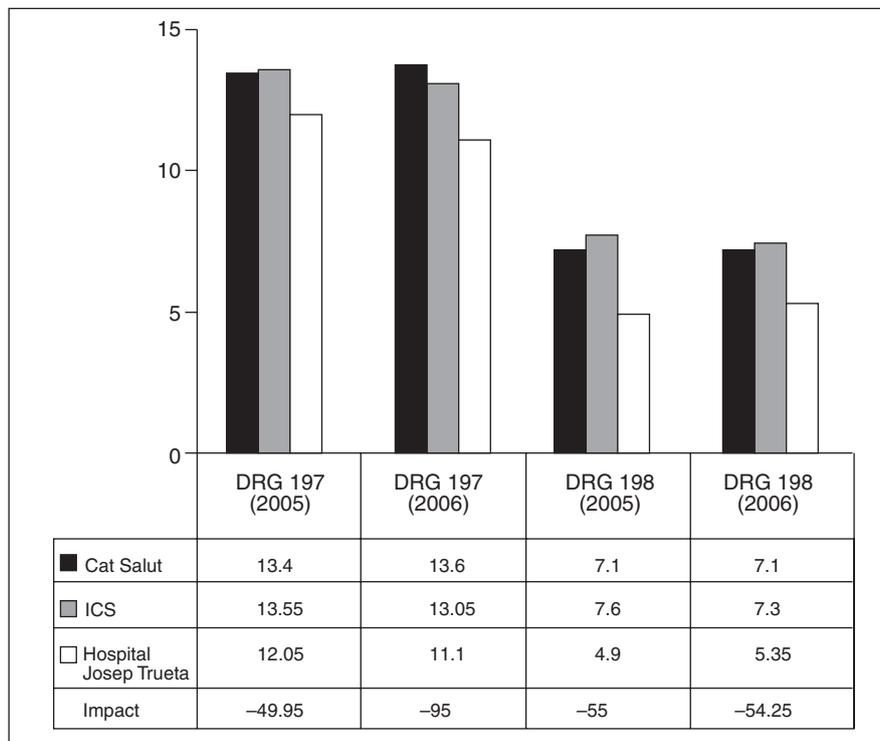


Figure 3. Mean stay in days of the diagnose-related groups (DRG) 197 and 198. Surgical procedures open cholecistectomy (by laparotomy) in patients with comorbidities (DRG 197) and without comorbidities (DRG 198). The impact has been calculated (stay reduction multiplied by volume/year) regarding the XHUP. ICS indicates Catalanian Health Institute.

In the period 2005-2006, our service saved a total amount of resources of 2211.8 days of hospital stay, regarding the Catalanian Health Service. This means a 2-year saving of 1 094 841 euros. This impact mainly focuses in DRGs 191, 192, 193, and 194 (Figures 1 and 2).

Mortality in Procedures

Due to the low mortality in certain procedures, such as cholecistectomy, it has been grouped by 2-year periods (Figure 5).

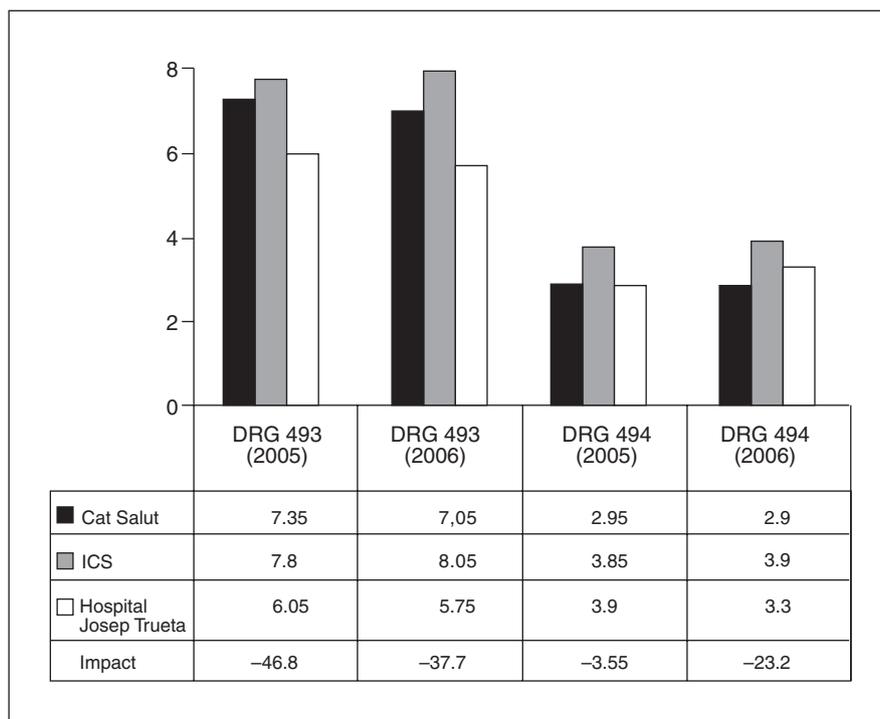


Figure 4. Mean stay in days of the diagnose-related groups (DRG) 493 and 494. Surgical procedures: cholecistectomy by laparoscopy in patients with comorbidities (DRG 493) and without comorbidities (DRG 494). The impact has been calculated (stay reduction multiplied by volume/year) regarding the XHUP. ICS indicates Catalanian Health Institute.

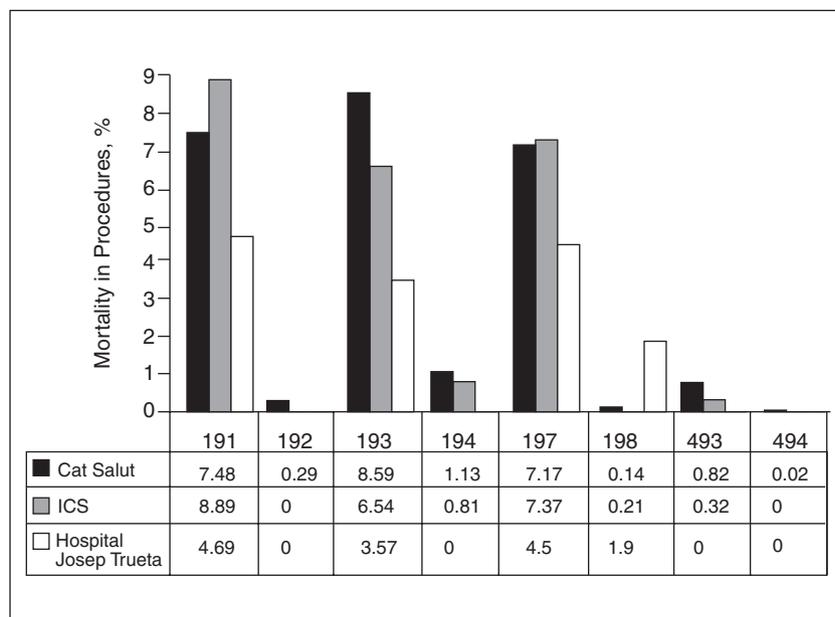


Figure 5. Hospital mortality grouped by diagnose-related groups. Period 2005-2006. ICS indicates Catalanian Health Institute.

In our centre, mortality is null (0%) in 4 of the 8 analyzed procedures: hepatectomies and pancreatectomies in patients without comorbidities (DRG 192), procedures on the biliary tract excluding cholecistectomy in patients without comorbidities (DRG 194), and laparoscopic cholecistectomy in patients with and without comorbidities (DRG 493 and 494) (Figure 5).

In DRG 191, pancreas and/or liver surgical procedures in patients with comorbidity, in our centre there were 5 (3.9%) deaths among 128 patients. This mortality is half, approximately, of that from XHUP (7.9%) or the ICS (9%).

In DRG 193, biliary surgical procedures excepting cholecistectomy in patients with comorbidity, in our centre there were 2 (3.6%) deaths among 56 patients; approximately, half of those from XHUP (8.6%) or the ICS (6.5%).

In DRG 197, open cholecistectomy in patients with comorbidity, in our centre there were 3 (4.5%) deaths among 75 patients. This mortality is significantly lower than that from XHUP (7.2%) or the ICS (7.4%).

In DRG 198, open cholecistectomy without comorbidity, among 56 patients, 1 (1.9%) patient with a gall bladder carcinoma, operated in emergency with a diagnose of acute cholecystitis, died in hospital due to the natural evolution of the disease. There were 2 (0.15%) deaths among the patients of the XHUP.

Discussion

The DRG were originally developed during the 70s, at Yale University (USA) in cooperation agreement framework with the Health Care Financing Administration, in care of the program Medicare, which finances health care to retired people (for any cause, disability, old-age, or death) based on a payroll tax. These first DRG were initially developed as a tool to manage costs and help clinics and hospitals to monitor the use and quality of their services. The application of DRG as a tool for controlling hospitals costs began in

1983, when Medicare started using them as the basis of a prospective payment system (PPS) that pays a fix amount for each patient seen.

DRGs constitute an excellent tool to compare hospitals performance within the system. They also adjust the payment methods (reimbursement) to hospitals.^{2,3}

In our study, taking into account the population in our area of influence (800 000; 12.5% in Catalonia), the frequency of the HPB surgery procedures of high technology, such as hepatic and pancreatic surgery (DRG 191 and 192) or biliary surgery excluding cholecistectomy, is lower than that corresponding to the population of our health area (between 7.2% and 11.3%) (Table). These data indicate a partial referral of these patients to other centres, maybe third-rate and probably from Barcelona. In any case they disregard over-indication, which would not be desirable in a second-rate hospital, although it may be of reference for certain types of pathology.

As regards open cholecistectomy (DRG 197 and 198), our case study is higher than expected according to the population that is seen a general hospital in a city of approximately 90 000 patients (1.3% of Catalonia). The frequency of this procedure (3.8%-5%) is explained because most of these interventions for acute cholecystitis are done as emergencies (Table). Probably the infrastructure of operating rooms and the emergency staff of our centre are better qualified to help these patients in the night shift or when patients present comorbidities (DRG 193) or need for intensive care.

The case study for the laparoscopic cholecistectomy is expected for the population we see as a general hospital (Table).

The most remarkable results of this study are stay data in complex HPB surgery (DRG 191-194) of our surgery service. The stay of patients with comorbidities (DRG 191 and 193) is clearly lower than the average of XHUP hospitals and only these 2 DRG mean a saving of 1139 days during the period 2006-2007.

In the most usual surgery, such as cholecistectomy, results are also favorable, but the difference is less significant. Hospitalization is the most costly feature in health care; in Spain a cost of 495 euros is calculated per day of stay in a regular room. Therefore all the efforts directed to lower the hospital stay make for a considerable saving. In our study the costs saving due to the lowering stays only in these DRG was higher than a million euros. As it was expected, the stay results in the centres of ICS are less favourable with regard to XHUP, but explainable taking into account that ICS includes most third-rate hospitals and, hence, more complex and of higher risk patients.

As regards hospital mortality, we observe that in our centre it is null in 4 procedures and in the rest of them is half of that expected with regards to XHUP. In publications a clear tendency has been observed to the improvement of results in high volume centres for: hepatic, pancreatic, esophagus, urinary bladder and colon cancers and for coronary surgery, and aorta aneurysm surgery. These results are both influenced by the centre volume and by the volume of surgeons⁵⁻¹⁴ and are more significant when mortality decrease is analyzed. In USA, the Leapfrog Group¹⁵ recommends its companies to hire, for complex surgical procedures, only hospitals that reach a minimum threshold of procedures volume.

There is also an agreement in which volume, despite being the easiest factor to measure, is not enough to explain by itself the improvement in results among hospitals and surgeons.¹⁶ Just like any amateur golf player will admit that the hours of exclusive dedication are not enough to reach a professional level, there are many other factors that have been observed and may contribute to improve the results of a surgery service, apart from volume. These factors can be classified in those related to the surgeon and those related to the environment in which the surgeon works. The factors related to the surgeon include training, supervision by another surgeon with more experience, personal skill, motivation, the objective analysis of results, and the feedback from self-evaluation. These factors are very hard to measure objectively, in contrast with variables related to case studies and mortality. The result publication is a motivation for self improvement. In this respect, in Canada the non-restricted publication of the results in pancreatic surgery has been an improvement factor in the flow of patients and of mortality, not only in the high volume centres, but in every hospital.¹⁶

When the role of the system in which the surgeon works is considered, it is important to evaluate hospital structure. When it comes to assess the structure, the existence of technologically well-equipped operating rooms, intensive and intermediate care, and a proper staff with sufficient experience are important.¹⁶ In complex digestive oncological surgery, we must take into account that the centre and surgeon volume are factors related to the best results. However, it is also important that the patient receives surgical attention as near as possible to his home, with no need to travel too much to far high technology centres which are, sometimes, too overcrowded.¹⁶

In short, and according to the data shown, we observe that our results in the surgical treatment of complex liver, pancreas, and biliary tract diseases are within the limits mentioned by high volume hospitals considered as

references. We believe that there have been several factors that have contributed simultaneously to achieve these results. Our hypothesis is that a greater attention to the team surgeons training, service structure, objective analysis of results, and their publication are motivations for self improvement.

Conclusions

In our area of influence, there is a clear tendency to referencing for certain type of complex HPB procedures (7%-11%), without overcoming the population proportion (12%).

In our centre, the impact on mortality and hospital stays is more evident in complex HPB procedures with or without comorbidities.

The frequency and results on hospital stays and mortality of laparoscopic and open cholecistectomy are the estimated for the population assisted as a general hospital. In the complex hepato-biliary-pancreatic pathology, we think that low mortality and the reduction of resources in our centre are due to volume, specialization and factors related to the service structure and surgeons training.

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