Revista Española de Enfermedades Digestivas
THE SPANISH JOURNAL OF GASTROENTEROLOGY

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DOI: 10.17235/reed.2017.4710/2016
Link: PubMed (Epub ahead of print)

Please cite this article as:
Tebé Cristian, Pla Roger, Espinàs Josep Alfons, Corral Julieta, Puigdomenech Elisa, Borràs Josep Maria, Pons Joan M. V., Espallargues Mireia . Towards the centralization of digestive oncologic surgery: changes in activity, techniques and outcome. Rev Esp Enferm Dig 2017. doi: 10.17235/reed.2017.4710/2016.

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OR 4710 inglés

Towards the centralization of digestive oncologic surgery: changes in activity, techniques and outcome

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Recibido: 8/12/2016

Aceptado: 17/03/2017

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Authors' contribution

All the authors declare that they have contributed to two or more stages of study design, gathering of data, analysis and interpretation of results, writing of the manuscript, critical revision, and consensus with respect to the final version.

ABSTRACT

The objective of the present study was to examine changes in the activity, surgical techniques and results from the process of centralization of complex digestive oncologic surgery in 2005-2012 as compared to 1996-2000. A retrospective cohort study employing the minimum basic data set of hospital discharge (MBDSHD 1996-2012) from public centers in Catalonia (Spain) was performed. The population consisted of individuals aged > 18 who underwent digestive oncologic surgery (esophagus, pancreas, liver, stomach or rectum). Medical centers were divided into low, medium, and high-volume centers (≤ 5, 6-10, and > 10 interventions/year, respectively). The tendency Chi-squared test was used to assess the centralization of patients in high-volume centers and hospital mortality evolution during the study period. Logistic regression was performed to assess the relationship between volume and outcome. A centralization of complex oncologic digestive surgery between 10% (liver) and 46% (esophagus) was obtained by means of a reduction in the number of hospitals that perform these interventions and a significant rise in the number of patients operated in high-volume centers (all types p ≤ 0.0001, except for esophagus). A significant decrease in mortality was observed, especially in esophagus (from 15% in 1996/2000 to 7% in 2009/12, p = 0.003) and pancreas (from 12% in 1996/2000 to 6% in 2009/12, p trend < 0.0001). A centralization of oncologic digestive surgery in high-volume centers and a reduction of hospital mortality in Catalonia were reported among esophageal and pancreatic cancers. However, no significant changes were found for others cancer types.

Key words: Digestive oncology surgery. Volume. Mortality. Outcomes. Variations. Regionalization. Clinical-administrative databases.

INTRODUCTION

The relationship between volume of medical interventions (not exclusively surgical) and outcomes (generally mortality) has been extensively analyzed over the last 30 years as demonstrated by the seminal article by HS Luft in 1979 (1) and the introduction of clinical-administrative databases. These include a considerable number of studies with a wide range of procedures, particularly the less common procedures with a high risk of complications (2). In addition, the widely employed conceptual framework of the trio consisting of structure, process and results (3) to assess the quality of healthcare has encouraged a wider analysis of the relationship between procedure volume (center, equipment, and surgeon) and outcome. There is a growing tendency to provide patients with information so that, as consumers, they can chose the most appropriate therapeutic alternative and the best professionals. This calls for a greater transparency so that it is possible to learn from those who obtain optimum results, both in health and economic terms.

With respect to the simple association between higher volume and better results, an adjustment had to be made that takes into account the possible differing initial basal risk among the patients analyzed (age, morbidities, severity, and surgical/anesthetic risk) as any other comparison would have been inappropriate (4). In the case of oncologic surgery, disease stage, the surgical procedure, the application of neoadjuvant therapies (chemotherapy and/or radiotherapy) and the presence of comorbidities, these are influential factors not only in relapses and survival (2,5) but also in hospital mortality. Complexity has been used to define a cut-off point (at the level of institution, equipment and surgeon) for an increased likelihood of poor results which are also probably influenced by factors related to the center's organization and the healthcare system in general. In addition, there is considerable heterogeneity among studies with respect to their methodological characteristics (design, adjustment variables, analysis, etc.) which hinders comparisons or extrapolation (6). As in diagnostic tests, an increase or decrease in volume threshold leads to variations in the percentage of incorrectly classified institutions and healthcare professionals (6). Moreover, the outcomes studied (generally in-hospital or 30-day mortality) have been questioned. In addition, other relevant outcomes have been proposed such as relapse and long-term survival in the case of oncologic surgery or average hospital stay and costs with respect to efficiency (7).

In spite of the limitations, the multiple studies that have analyzed the relationship between volume and outcomes generally report a persistently positive correlation between a greater number of interventions and better outcome for a certain number of oncologic surgical procedures (8,9). The literature is unclear about the factors that explain this association and to what extent other issues may intervene (equipment, emergency room care, organization as a whole, etc.) (2,10,11). In addition to specific studies, the Catalan Health Service (CatSalut) has made the activity and results of healthcare organizations public with regard to specific procedures in accordance with a group of performance indicators, the aim of which is to increase transparency and accountability (12).

We recently published a study showing that the relationship between volume and outcome in digestive oncologic surgery in Catalonia (Spain) from 1996 to 2000 has an inverse relationship for some cancers. Whilst the proportion of total gastrectomies and radical prostatectomies was greater in the high volume centers, an inverse tendency was observed for colostomies (13). However, the results from other studies performed in a similar environment to ours were not so clear (9,14,15), in contrast to some international studies (16,17).

Audits of processes and outcome in digestive oncology surgery have been performed during the previous decade since the implementation of the CatSalut oncology plan (18). There have been multiple discussions and debates among surgeons and researchers from the healthcare service about the need for a better planning of procedures in order to observe a relationship between the volume of interventions and the resulting outcome. In a similar manner to other European regions (1,19), the CatSalut started a restructuring process in highly specialized oncologic care which resulted in the 2012 directive to determine a limited number of centers that could perform this highly complex care under the minimum volumes and specialization criteria (20).

The aim of this study was to examine the changes in activity (volume), main surgical techniques (variability in their use) and outcome (mortality) of the progressive process of centralization of digestive oncologic surgery in the period 2005-12 in centers belonging to the Integral Healthcare System of Catalonia (SISCAT), taking a previous study as a reference (1996-2000).

METHODS

Study population

This was a study of retrospective cohorts with a minimum basic data set of hospital discharge (MBDSHD) from 2005 to 2012 in Catalonia, Spain. The Annex describes the ICD-9-CM codes used to identify patients aged over 18 years who were surgically intervened during the study period for the following cancers: esophagus, pancreas, liver, stomach and rectum. Minors and those not funded by CatSalut were excluded from the database.

The information regarding age, gender, main and secondary diagnoses, main surgical procedure and status at discharge (alive/dead) was gathered from the MBDSHD. A Charlson index was constructed (21) to calculate the risk of death attributable to patient comorbidity one year after hospitalization. This was based on the ICD-9-CM codes and allocated a weight to certain comorbidity diagnoses (approximately the same as the relative risk of death one year from referral). This index has been employed in numerous studies and has shown to be valid for both stratifying patients according to their risk of mortality and as an adjusted variable in predictive and explicative models (21).

Statistical analysis

In order to calculate the mean of annual interventions and type of cancer for each center, the number of surgical interventions carried out during the study period was divided by the number of years analyzed. The centers were classified into three groups: low, medium, and high volume (≤ 5, 6-10, and > 10 interventions/year, respectively). The cut-offs are the same as those used in the 2004 study (13).

Results are presented according to tumor location. Surgical activity is shown by periods (2005-2008 and 2009-2012) and analyzed by the number of centers, annual mean of interventions, percentage of patients attended in high volume centers, percentage of gross hospital mortality rate and main surgical procedure. The activity from the period 1996-2000 was obtained from the 2004 study (17). A Chi-squared test was performed in order to evaluate the trend of centralization of patients in centers with greater volumes and the evolution of hospital mortality during the three periods. This statistical test is habitually used to analyze trends over time, dose-response effects and other ordinal independent variables. The null hypothesis is the lack of a tendency or proportions in the same horizontal line and the test statistic is reflected by its distance from the horizontal axis.

In a similar manner to the 2004 study, hospital mortality (at discharge) was selected as a dependent variable in order to study the relationship between volume and result. A two-level logistic regression model was calculated in order to take into consideration the hierarchical structure of the data and the fact that patients are assigned to a particular center. The coefficient of intra-class correlation (CIC) was calculated to represent the proportion of variance in the dependent variable attributed to the differences among hospitals. Models were adjusted at an individual level for age, gender, Charlson comorbidity index and surgical technique (main procedure). A separate model was calculated for each type of cancer.

To study variability among centers with respect to the main surgical technique (with the exception of hepatic surgery, where there is only one), dot plots were constructed showing the percentage of interventions for each hospital according to low, medium and high categories of activity. The analysis only considered those centers with a mean of more than one surgical intervention per year. In order to improve comparability and reduce the number of graphs, the low and medium volume categories have been pooled. Statistical significance was set at 0.05 and the STATA v11.0 software was used for analysis.

RESULTS

Table 1 shows the age, gender, Charlson index and days of hospitalization (mean) of the patients intervened for each kind of digestive cancer. The percentage of males with digestive tumors is always higher than in females. In this study, the largest difference was observed in esophageal cancer with 84.3% of male patients. Most of the patients intervened due to digestive cancer were aged 65 to 70 years with the exception of esophagus cancer, with 57% of patients aged 45 to 64 years. The percentage of interventions for individuals aged less than 45 never passed 7% for any type of cancer. With regard to the Charlson index, the majority of patients had a score of two or less with the exception of liver cancer, where a greater number of patients scored six points or more. The same patterns were observed irrespective of the volume of the hospital. The average length of stay was between eight days for liver cancer surgery (25% of the patients more than 12 days) and 21 days for pancreatic cancer surgery (25% more than 34 days).

Table 2 describes the activity and outcome for cancer surgery during the periods analyzed. A reduction was observed from 2009-2012 with respect to the initial period from 1996-2000 for all cancers in the centers that performed between 10% (liver surgery) and 46% (esophagus cancer) of interventions. An increase in the percentage of patients attended in high volume centers was observed for all cancer surgeries, with pancreas, liver, stomach and rectum reaching statistical significance ($p < 0.0001$ for trend). With regard to hospital mortality, a reduction was observed for all cancers, although this only reached statistical significance for esophagus oncologic surgery ($p = 0.003$ for trend), with the exception of rectum cancer, which remained stable at 3%. Over time (during 2005-08 and 2009-12), there was an increase in the percentage of total esophagectomies, total rectum resections, ileostomies and colostomies with the percentage of total pancreaticoduodenectomies/pancreatectomies and gastrectomies remaining stable.

The percentage variability in the use of each surgical technique with respect to center volume is shown in figure 1. For esophagus, pancreas and stomach oncologic surgery, percentages were observed between 0% and 83% for total esophagectomies, 0-80% for surgical techniques for pancreatic cancer, and 0-74% for total gastrectomies, in the 5 and 95 percentiles. The variability of percentage use with respect to total rectum resection was lower, with a minimum of 6% and a maximum 49%.

Table 3 presents the relationship between center volume and hospital mortality for each of the digestive oncology surgeries studied. In all cases an inverse relationship between a greater number of interventions and hospital mortality was observed, although this did not reach statistical significance. In fact, the high volume centers had a lower rate of hospital mortality for each of the digestive oncology surgeries than the low volume centers, with pancreatic cancer surgery having the lowest rate (odds ratio [OR] = 0.62; confidence interval [CI] 95%: 0.31-1.25). The exception was rectal cancer, where a greater volume resulted in a higher mortality rate although the association was not statistically significant (continuous OR: 1.01; CI 95%: 1.00-1.02).

DISCUSSION

Our results show that in recent years there has been a progressive centralization of complex digestive oncology surgery in Catalonia. The number of hospitals that carry out this kind of intervention has been reduced. On the other hand, the percentage of patients operated in high volume centers (> 10 interventions/year) has increased significantly. A significant decrease in mortality has also been observed, particularly with respect to cancers of the esophagus and pancreas. There have not been any clear relevant changes in other digestive cancers. Essentially, this means that more than 140 patients have survived to the point of hospital discharge during the period from 1996 to 2000, particularly in the case of pancreatic cancer, where the number of intervened patients has increased.

Care centralization in high volume hospitals hinders the evaluation of the association between volume and result, mainly in interventions for liver and rectum cancer, which reached more than 90%. Variability with regard to the main surgical technique has been found among the centers irrespective of volume (medium/low and high). However, there is a possibility that a lower volume itself might lead to a greater variation. The percentage of one technique or another is not so relevant, but rather the decrease in variability among the centers during the study period (data not shown).

In oncology surgery, an increased centralization of complex procedures has been repeatedly associated with a better therapeutic outcome and not only with respect to hospital mortality (1,22,23). This could be due to the fact that performing more interventions leads to a wider experience, which in turn gives rise to better results (24). Measuring this experience at the level of the principal surgeon and the surgical equipment, as well as other services and technological resources available at the hospital, is a major challenge. In addition, there exists the possibility that changes in the surgical equipment (during the seven-year study period) could imply a centralization of patients in recent years.

It is surprising that volume itself has little effect on variation in hospital mortality among centers, even though the study was undertaken during a period of centralized oncology surgery. The center factor explains 7-9% of the variation in mortality in stomach and rectum surgery. Variability remained stable for these procedures during the study periods with a marked increase in the number of annual interventions in the case of the rectum. The organizational culture of each center has been proposed as a key factor in results together with intervention volume, the clinician's qualifications and available equipment in each hospital. Such a culture fosters objectives that seek a continuous improvement in quality, greater involvement of the senior professionals, active participation of the nursing staff, better communication and coordination among groups and investigation of errors (25). Unfortunately, it is difficult to measure these factors objectively, and systematic information is not available as there are no studies evaluating them. Standardization of processes and adhesion to quality care measures are also elements that can explain this observation rather than the simple annual volume of interventions, although more at the level of efficiency than effectiveness (26).

The centralization of complex surgical procedures presents some drawbacks for professionals, centers and patients. The former see their portfolio of services diminished and undermined when attracting patients and specialists, whilst patients may have to travel a large distance to reference hospitals which may lead to inequality of access. Such disadvantages should be balanced against improvements in the patients' health. Without a doubt, all these factors should be examined within each geographical context and strategies could be implemented where the surgical team goes to the patient and not vice versa, without losing the proposed benefits (8,10).

Some factors are more qualitative than quantitative and, consequently, harder to gather and measure. Even though they might have a greater influence. For instance, the correct selection of candidate patients for surgery and/or the need for neoadjuvant treatment by a multi-disciplinary team, and the prevention and effective management of complications are all issues that should be taken into account (27). Any possible Hawthorne effects during the audits should be considered as well as constant examination of processes carried out and the results obtained (23,28).

Finally, there may be some confusion with regard to the university status of some hospitals and their accreditation for specialized training. Whilst some reviews did not observe any effect due to the limitation of the study (29), others have reported favorable outcomes that were greater than the referred volume of interventions (30).

Limitations

The use of clinical-administrative databases for research in healthcare services, especially with the lack of population registers or alternative sources of reliable information has the following advantages: thoroughness, low cost and descriptive potential. Nevertheless, there are issues related to quality and homogeneity in the coding of the diagnoses and procedures as well as shortcomings in the number of included diagnoses and associated procedures. In addition, the lack of a variable to evaluate the state or seriousness of the illness, the restricted availability of information regarding the quality of the surgery (such as the number of resected nodes, affected edges and the consumption of blood products), and the inability to discern complications/morbidity present at or after hospitalization continue to be limiting factors (9). A previous study noted that health workers rarely gathered data on the clinical and functional state of the patient, information that is clearly prognostic (18). Nevertheless, it has become increasingly possible to integrate all the data collected in the healthcare service and incorporate part of these variables, which are of a huge clinical relevance, into the clinical-administrative databases. On the other hand, the use of hospital mortality as a measure of outcome instead of mortality at 30 days hinders the comparison among centers. This approach favors those with an efficient referral policy to health and welfare centers or to long-stay centers for a relatively early convalescence period. Hospital mortality does permit the evaluation of results immediately following surgery as it provides information about post-surgical complications such as relapses, re-interventions and re-hospitalizations, which add to the evaluation. Finally, the database used did not allow the assessment of the impact of the surgeon or specific equipment.

CONCLUSIONS

In conclusion, our findings show that in Catalonia and other regions (23) a centralization of digestive oncology surgery in high volume centers has been introduced which is accompanied by a clear reduction in hospital mortality for pancreatic and esophageal cancers. An inverse relationship between the volume of annual interventions and hospital mortality was observed, although it was not statistically significant and there were other factors that were not taken into account. The progressive centralization and the limitations related to the evaluation of the outcome could have hindered our observations. Nevertheless, we believe that this progressive centralization should be maintained in oncologic surgical techniques, especially those that are more complex and less frequently performed, such as esophageal and pancreatic surgery, as this can provide a better outcome including a reduction in mortality.

ACKNOWLEDGEMENTS

This project was funded by the Quality Plan for the National Health System (2013-2014) from the Ministry for Health, Social Services and Equality.

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Table 1. Characteristics of patients intervened for digestive neoplasms from 2005 to 2012

	Esophagus		*Pancreas*		*Liver*		*Stomach*		*Rectum*	
	n	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*
Total	560		2,004		5,581		3,456		10,247	
Gender										
Male	472	(84.3)	1,101	(54.9)	3,638	(65.2)	2,050	(59.3)	6,581	(64.2)
Female	88	(15.7)	903	(45.1)	1,943	(34.8)	1,406	(40.7)	3,666	(35.8)
Age										
< 45	32	(5.7)	138	(6.9)	244	(4.4)	145	(4.2)	330	(3.2)
45-64	319	(57.0)	744	(37.1)	2,330	(41.7)	934	(27.0)	3,278	(32.0)
65-79	198	(35.3)	979	(48.9)	2,626	(47.1)	1,678	(48.5)	4,876	(47.6)
≥ 80	11	(2.0)	143	(7.1)	381	(6.8)	699	(20.3)	1,763	(17.2)
Charlson Index										
≤ 2	303	(54.1)	1,035	(51.6)	520	(9.3)	1,640	(47.4)	5,510	(53.7)
3-5	151	(26.9)	477	(23.8)	1,501	(26.9)	919	(26.6)	2,590	(25.3)
≥ 6	106	(19.0)	492	(24.6)	3,560	(63.8)	897	(26.0)	2,147	(21.0)
Mean stay (days (P25-P75)	19 (13-33)		21 (12-33)		8 (4-12)		14 (9-24)		11 (8-18)	

P25: Percentile 25; P75: Percentile 75.

Table 2. Surgical activity for each cancer studied and study period

	Esophagus cancer			*Pancreatic cancer*			*Liver cancer*		
	1996/2000	2005/2008	2009/2012	1996/2000	2005/2008	2009/2012	1996/2000	2005/2008	2009/2012
No. interventions	475	287	273	596	915	1,089	627	2,256	3,325
No. hospitals	28	18	15	40	23	27	30	23	27
No. interventions/year (mean)	95	72	68	119	229	272	125	564	831
Patients treated in high volume centers n (%)	171 (36%)	100 (35%)	116 (42%)	302 (51%)	706 (78%)	870 (80%)	406 (65%)	2,201 (98%)	3,185 (96%)
Gross hospital mortality (%)	72 (15%)	39 (14%)	20 (7%)	38 (12%)	60 (6%)	65 (6%)	20 (3%)	88 (4%)	76 (2%)

Total esophagectomies n (%)	NA	121 (14%)	129 (47%)	-	-	-	-	-	-
Total pancreatectomies n (%)	-	-	-	NA	60 (7%)	73 (7%)	-	-	-
Radical duodenopancreatectomies n (%)	-	-	-	NA	192 (21%)	236 (21%)	-	-	-

NA: Not available.

	Stomach cancer			*Rectum cancer*		
	1996/2000	2005/2008	2009/2012	1996/2000	2005/2008	2009/2012
No. interventions	2,490	1,824	1,632	4,443	5,138	5,11

											0	
No. hospitals	69		49		47		73		53		54	
No. interventions/year (mean)	498		456		408		889		1,285		1,278	
Patients treated in high volume centers n (%)	1,021	(59%)	1,303	(71%)	1,284	(79%)	3,272	(74%)	4,767	(93%)	4,756	(93%)
Gross hospital mortality n (%)	209	(8%)	140	(8%)	112	(7%)	147	(3%)	209	(4%)	148	(3%)
Total gastrectomies n (%)	NA		608	(37%)	617	(38%)	-		-		-	
Ileostomies n (%)	-		-		-		NA		972	(19%)	1,389	(27%)
Colostomies n (%)	-		-		-		NA		1,982	(38%)	2,275	(45%)
Total resections n (%)	-		-		-		NA		892	(17%)	1,142	(22%)

NA: Not available.

Table 3. Association between center volume and hospital mortality for each cancer surgery studied among patients with a programmed intervention between 2005 and 2012 using multilevel logistic regression models

	Low volume		*Medium volume*		*High volume*		*CIC*
	OR	CI (95%)	OR	CI (95%)	OR	CI (95%)	
Esophagus	1.00	-	1.27	(0.57-2.83)	0.95	(0.46-1.98)	2%
Pancreas	1.00	-	0.75	(0.32-1.75)	0.62	(0.31-1.25)	4%
Stomach	1.00	-	0.72	(0.30-1.70)	0.84	(0.44-1.62)	7%
Liver*	1.00	-	-	-	0.99	(0.99-1.00)	4%
Rectum*	1.00	-	-	-	1.01	(1.00-1.02)	9%

Low volume: ≤ 5 interventions/year; Medium volume: 6-10 interventions/year; High volume: > 10 interventions/year; OR: Odds ratio, 1.00 indicates the reference category; CI: Confidence interval; CIC: Coefficient of intra-class correlation. All models were adjusted by age, gender and Charlson index. For esophagus, stomach and rectum cancer surgeries, the model was also adjusted for total esophagectomy (yes/no), total gastrectomy (yes/no), and total rectum resection (yes/no), respectively. *Not possible to use the categorized volume variable as all the centers performed more than ten interventions per year; volume was used in a continuous form.

Annex 1. Type of cancer and selected surgical procedures according to the ICD-9 codes of the MBDSHD

Principal diagnosis	*CIE-9*	*Main procedure*	*CIE-9*
Malignant esophageal neoplasm	150 (150.0-150.9)	Excision of the esophagus	42.4
		Non-specified esophagectomy	42.40
		Partial esophagectomy	42.41
		Total esophagectomy	42.42
Malignant stomach neoplasm	151 (151.0-151.9)	Partial gastrectomy with anastomosis in the esophagus Proximal gastrectomy	43.5
		Partial gastrectomy with anastomosis in the duodenum Distal gastrectomy Gastro-pilorectomy Billroth I intervention	43.6

Principal diagnosis	*CIE-9*	*Main procedure*	*CIE-9*
		Partial gastrectomy with anastomosis in jejunum Billroth II intervention	43.7
		Other partial gastrectomies	43.8
		Partial gastrectomy with jejunal transposition Henley jejunal transposition intervention	43.81
		Others Partial gastrectomy with gastro-gastrostomy bypass Segmental resection of the stomach	43.89
		Total gastrectomy	43.9
		Total gastrectomy with intestinal insertion	43.91
		Other total gastrectomies Esophago-duodenostomy with total gastrectomy	43.99

Principal diagnosis	*CIE-9*	*Main procedure*	*CIE-9*
		Esophago-gastrectomy NOS Esophago-jejunostomy with total gastrectomy Radical gastrectomy Total gastro-duodenoctomy	
Malignant rectum, rectosigmoid junction and anal neoplasm	154 (154.0-154.8)	Resection and/or colostomy	45.76 46.1 48.5 48.62
		Resection without colostomy	45.8 48.6

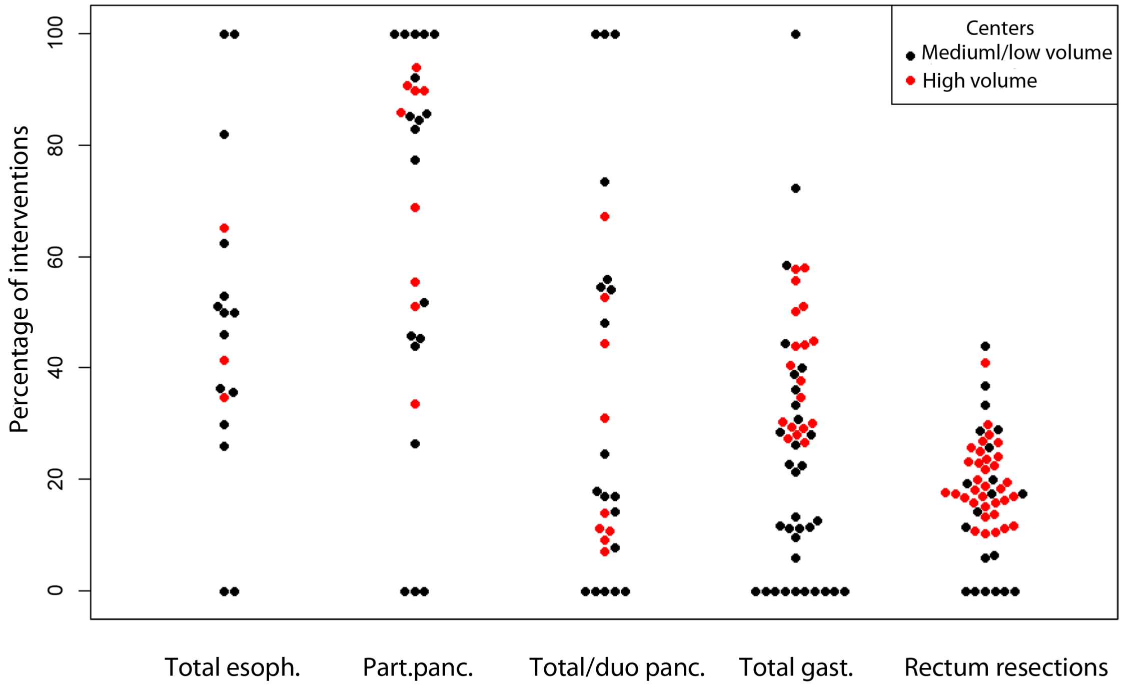
Principal diagnosis	*CIE-9*	*Main procedure*	*CIE-9*
Malignant pancreatic neoplasm	157 (157.0-157.9, except 157.4*)	Partial pancreatectomy	52.5
		Proximal pancreatectomy Excision of the pancreas head (with part of the body) Proximal pancreatectomy with simultaneous duodenectomy	52.51
		Distal pancreatectomy Excision of pancreas tail (with part of the body)	52.52
		Radical subtotal pancreatectomy	52.53
		Other partial pancreatectomies	52.59

		Total pancreatectomy Pancreatectomy with simultaneous duodenectomy	52.6
		Radical pancreato-duodenectomy Whipple procedure Pancreato-duodenal resection in two stages (first) (second) Pancreato-duodenal resection in one stage with biliary-jejunal anastomosis, pancreatic-jejunal anastomosis, and gastro-jejunostomy Radical pancreatic resection	52.7
Malignant ampulla of Vater neoplasm	156.2	Excision of the ampulla of Water (with bile duct reimplantation)	51.62
Secondary malignant liver neoplasm (hepatic	197.7	Partial hepatectomy Cuneiform liver resection	50.22

metastasis)		
	Liver lobectomy Total liver lobectomy with partial excision of other lobes	50.3
	Total hepatectomy	50.4

*Islets of Langerhans. ICD-9: International Classification of Diseases 9th revision. MBDSHD: Minimum Basic Data Set at Hospital Discharge.

Figure 1. Percentage of patients intervened by type of procedure in the period 2005-2012.



Total esophagectomies; partial pancreatomies; total pancreatomies + radical duodenopancreatomies; total gastrectomies; total rectum resections

Fig. 1. Percentage of patients intervened by procedure type in the period 2005-2012. Total esoph.: Total esophagectomies; Part. panc.: Partial pancreatomies; Total/duo panc.: total pancreatomies + radical duodenopancreatomies; Total gast.: total gastrectomies.