ORIGINAL PAPERS

RECALAD. Patient care at National Health System Digestive Care Units - A pilot study, 2015

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ABSTRACT

Objectives: To reach a situation diagnosis on the status of patient management at digestive care units (DCUs) in Spain.

Material and methods: A cross-sectional descriptive study across DCUs in general acute care hospitals within the Spanish National Health System (data referred to 2015). The study variables were collected with a questionnaire including items on structure, services portfolio, activity, education, research, and good practice. Hospital discharge rates for digestive diseases were also assessed using the minimum basic data set (2005-2014).

Results: Two hundred and nine hospitals invited, 55 responders (26.3%). Average discharges from hospital were 1,139 ± 653 per DCU/year, and 100 ± 66 per year per dedicated gastroenterologist. In 2014, admission rate to DCUs per 1,000 population and year was 280, with a mean stay of 7.4 days. The analysis of the MBDS for 2005-2014 reveals a progressive increase in the number of discharges (37% more in 2014 *versus* 2005), with a 28% decrease in hospital gross mortality rate (3.7% in 2014) and a slightly reduced (14%) mean stay (7.6 days in 2014). Considerable variability may be seen in structure, activity, and results indicators. Mortality and readmission rates, as well as mean stay, vary more than 100% amongst DCUs, and major dispersions also exist in frequentation and results amongst autonomous communities.

Conclusions: The RECALAD 2015 survey unveiled relevant aspects related to DCUs organization, structure, and management. The notable variability encountered likely reflects relevant differences in efficiency and productivity, and thus points out there is ample room for improvement.

INTRODUCTION

In most Western countries, a tendency towards self-assessment and professionalism has lately emerged in the health care sector, particularly regarding results and patient safety (1,2). In relation to digestive system units and services (digestive care units or DCUs) within the National Health System (NHS), there is a dearth of information about their structure, activities, and results. In 2011, the *Sociedad Española de Patología Digestiva* (SEPD), *Asociación Española para el Estudio del Hígado* (AEEH) and *Asociación Española de Gastroenterología* (AEG), amongst other scientific societies, worked jointly with the Spanish Ministry of Health, Social Services and Equality (MSSSI) to develop standards and recommendations for NHS DCUs (3). Some of these recommendations included developing a systematic analysis of DCU indicators, and collecting information on their structure and operation. Recently, the *Federación de Asociaciones Científico-Médicas* (FACME), with the help of the *Instituto para la Mejora de la Asistencia Sanitaria* (IMAS), is driving the development of RECAL (resources and quality) projects together with a number of scientific societies. The RECALAD (resources and quality in diges-

tive care) project, developed by the SEPD in collaboration with the IMAS, has the following goals: a) to develop a DCU registry to record the specialty's care resources within the NHS (RECALAD survey); b) to facilitate a comparative assessment (benchmarking) system to facilitate ongoing improvement in DCUs; c) to analyze the relationship between structure data and performance in NHS DCUs with health outcomes (as measured by exploiting the NHS minimum basic data set [MBDS]), as well as their use as a tool for healthcare management and planning; and d) to identify needs according to the evolution of epidemiologic data as provided by the MBDS and RECALAD survey.

The goal of this paper is to present the data collected by the RECALAD 2015 survey, the pilot experience for the implementation of the RECALAD survey, and the initial analyses of the MBDS database as related to digestive diseases.

MATERIAL AND METHODS

RECALAD survey

The SEPD set up a task force to adapt the survey on care unit resources and quality used by other scientific societies for online completion in the area of NHS DCUs. A pilot sample was established with a total of 103 items requesting data for 2015. A total of 209 heads of NHS DCUs, including general acute hospitals with over 99 beds, were invited. The goal of this survey, which was designed to be regularly completed, is to understand aspects such as structure, human and technological resources, target population, services portfolio, cooperation with Primary Care, research and education, and good practices implementation.

MBDS database

The MBDS is a registry of all discharge reports from NHS hospitals. It includes sex, age, reason for admission (primary diagnosis), risk factors, comorbidities, complications (secondary diagnoses), and procedures performed. The registry also includes admission date, discharge date, admission status (urgent or scheduled), and discharge status (home, demise, transfer to another facility). The MBDS uses International Classification of Diseases (ICD) codes: ICD-9 up to 2015, then ICD-9-CM, and ICD-10 from 2016 onwards (4).

The MBDS-DS includes all admission events with a coded primary diagnosis of "diseases of digestive system" (DDS) occurred in NHS hospitals (3) (Table 1), as well as discharges from DCUs even in the absence of a primary DDS diagnosis.

Hospital classification (characterization)

The MSSSI cluster classification was used. This classification gathers NHS hospitals into five groups according to size, complexity, case mix or DRGs, and services portfolio (5).

Statistical analysis

Qualitative variables are summarized with frequency distribution, and their associations were assessed using a Chi-

Table 1. *ICD-9-CM. International classification of "diseases of digestive system"*

Chapter and diagnosis	ICD-9-CM Code
II Neoplasms	140-239
II.1 Malignant neoplasms	140-208
Malignant neoplasm of esophagus	150
Malignant neoplasm of stomach	151
Malignant neoplasm of colon and rectum	153-154
IX.2 Diseases of esophagus, stomach, and duodenum	530-538
Diseases of esophagus	530
Ulcers	531-534
Gastritis and other diseases of stomach and duodenum	535-538
IX.5 Noninfective enteritis and colitis, and other diseases of intestine and peritoneum	555-569
Regional enteritis and ulcerative enterocolitis	555-556
Other and unspecified noninfectious gastroenteritis and colitis	558
Intestinal obstruction without mention of hernia	560
Diverticula of intestine	562
Other diseases of intestine and peritoneum	Rest (555-569)
IX.6 Other diseases of digestive system	570-579
Chronic liver disease and cirrhosis	571
Cholelithiasis	574
Other disorders of gallbladder and biliary tract	575-576
Diseases of pancreas	577
Other diseases of digestive system	Rest (570-579)

squared test. Quantitative variables are expressed as mean and standard deviation (SD). Correlation among quantitative variables was studied using Pearson's coefficient (r) and determination coefficient (r^2).

DCU-related mortality and readmissions were risk-adjusted using MBDS-DS data and considering sex, age, admission type, comorbidity load according to the Charlson index, and episode duration in stays as independent variables. Risk adjustment for overall DCU activity was performed with a multilevel logistic regression model using the Charlson index (6,7) (Table 2). The probability of patient dying or being readmitted is considered to be a composite of individual risk factors (casuistics) and quality of care (performance) (8). In addition to demographic and clinical patient variables, multilevel risk-adjusted models take into consideration a specific hospital effect (9-11). Hospital mortality and readmission rates were estimated from multilevel models as the ratio of foreseen outcome (which considers the performance of the specific hospital where the patient is cared for) over expected outcome (which considers a standard performance according to the mean value for all hospitals) multiplied by gross mortality rate (GMR) or readmission rate (8,10). Thus, should a hospital's ratio be

Table 2. *Multilevel risk adjustment model for DDS-related mortality (RSMR) and readmission (RSRR) rates*

Mortality	Odds ratio	p	95% confidence interval	
Sex	0.90	< 0.001	0.87	0.93
Age	1.03	< 0.001	1.03	1.03
Admission type	0.39	< 0.001	0.38	0.41
Charlson group				
1	2.16	< 0.001	2.03	2.29
2	6.11	< 0.001	5.80	6.43
Group stay				
3	0.56	< 0.001	0.53	0.59
4	0.75	< 0.001	0.71	0.80
5	1.18	< 0.001	1.10	1.27
6	2.22	< 0.001	2.08	2.36
Consolidated	0.01	< 0.001	0.01	0.01

Median OR: 1.85; area under ROC curve: 0.81; p < 0.001; confidence interval: 0.81-0.81.

Readmission	Odds ratio	p	95% confidence interval	
Sex	0.90	< 0.001	0.88	0.93
Age	1	< 0.001	1	1
Charlson group				
1	1.2	< 0.001	1.16	1.25
2	1.86	< 0.001	1.80	1.92
Group stay				
3	1.06	0.03	1	1.12
4	1.26	< 0.001	1.19	1.34
5	1.36	< 0.001	27	1.46
6	1.56	< 0.001	1.46	1.67
Consolidated	0.16	< 0.001	0.11	0.13

Median OR: 1.19; area under ROC curve: 0.61 (95% IC: 0.61-0.61).

higher than its GMR or readmission rate, the site's fatality or readmission odds would be higher than the mean value for the considered hospitals. Risk-adjusted model calibration was analyzed using the Hosmer-Lemeshow test, and discrimination was assessed using the area under the ROC (receiver operating characteristic) curve (AROC).

For all comparisons the null hypothesis was rejected with p < 0.05. Statistical analyses were performed using the STATA 13 software.

RESULTS

RECALAD survey

Out of 209 hospitals, 55 (26.3%) DCUs completed the survey. Response rate varied considerably among autonomous communities, and was very low among less complex institutions.

According to DCU type, 32 of 55 (58%) responders were services, 24% were sections, and 14.5% were institutes or clinical management areas. There is considerable dispersion regarding the hospital types where responding DCUs were located. Average number of beds was 635 ± 388, with a range of 100 to 1,671. As regards the hospital influence area population, dispersion was found to be similar, with an average 315,000 ± 180,000 inhabitants, range from 70,000 to 1,200,000 population. Thirteen (24%) units were in the "large hospitals" group (cluster 5), 31% were in high structural and activity load sites (cluster 4), 27% were in area hospitals (cluster 3), 11% were in basic general hospitals (cluster 2), and 7% were in cluster 1 facilities.

Most responding DCUs (86%) have a system set up for contacts between Primary Care teams (PCTs) and gastroenterologists, with e-mail and phone contacts being most common (72% and 77%, respectively), and 21% of DCUs regularly meet with PCTs (one meeting monthly on average).

Beds assigned to gastroenterology were present in 91% of responding hospitals, and monitoring beds were present in 18%. On-duty physicians were available in 34.5% (51.9% in DCUs with ≥ 24 beds), and on-call practitioners were available in 78.8% of facilities without on-duty services.

The average number of discharges from the DCUs was 1,139 ± 653/year, 100 ± 66 per year for each dedicated gastroenterologist. DCUs frequentation rate in 2014 (discharges per 100,000 population/year) was, according to the survey, 280/100,000 population/year, with a mean stay (MS) of 7.4 days.

Regarding endoscopy units, there was one room/75,000 ± 25,000 inhabitants. Average use time was 55 ± 19 hours/room. The rate of upper digestive endoscopies was 12 ± 7/1,000 population/year, and that of lower digestive endoscopies was 16 ± 6 per 1,000 population per year. In 35% of lower digestive endoscopies some intervention was carried out, albeit with relevant variations amongst units. The rate of endoscopic retrograde cholangiopancreatography procedures estimated from the survey data was 790 ± 405 per million population on average, whereas the rate of endoscopic ultrasounds was 941 ± 527 per million population.

Digestive endoscopy room performance, determined according to number of rooms and working hours as estimated by the survey, and applying the estimated times provided by the standards document (3), was 33 ± 12%.

A total of 23.6% of DCUs had a structured ultrasound unit, with a reference population similar to that in the hospital's influence area. Ultrasound unit working time was 34 ± 15 hours on average; 9% of specialists were dedicated to ultrasound units. The average rate of ultrasonograms per 1,000 population, as estimated by our survey, was 10 ± 6. However, this estimate has to be taken with caution given the low response rate obtained on this topic.

Of all responding DCUs, 74% were accredited to train residents in gastroenterology, and 96% were involved in under-graduate education; 66% of DCUs had associated professors, and 23% had research professors.

In all, 26% of responding DCUs were part of a RETIC or CIBER, 65% developed research projects (three projects on average), and 89% had papers published in indexed journals (a median of four papers). In four units their staff had got a patent registered.

Forty-nine percent of DCUs responded they had a procedure in place for the most relevant conditions they saw; 4% were part of a regional DCU network (for 600,000 or more population).

MBDS-DS

The MBDS-DS database includes 3,741,074 DDS-related discharge events during the 2005-2014 period. Of these events, 25% correspond to discharges from a DCU. In all, 46% of DDS-related discharges derived from General Surgery services and 17%, from Internal Medicine units. Table 3 shows the evolution of admissions for DDS, and highlights the ten most common diagnoses on discharge. In 2014 admissions for DDS increased by 17% over 2005; all common primary diagnoses increased except for "chronic liver disease and cirrhosis", which decreased to a considerable extent (24%). The number of admissions for upper digestive bleeding remained stable.

From 2005 (first year the MBDS reliably records discharge reports) to 2014, HNS DCUs reported 1,175,201 discharge events (Table 4). During this period this number increased gradually (by 37% in 2014 vs 2005), which was associated with

Table 3. *Evolution of discharges for DDS by primary diagnosis, 2005-2014*

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Δ % 2014/2005
Cholelithiasis	66,455	68,583	70,403	74,170	77,372	79,260	80,809	79,595	82,064	83,138	25%
Diseases of pancreas	22,724	23,212	23,874	24,669	25,645	26,392	27,143	27,152	27,626	28,516	25%
Malignant neoplasms of colon	19,319	20,180	21,503	21,923	23,435	23,337	24,832	25,072	25,255	25,831	34%
Intestinal obstruction without hernia	17,930	19,329	19,256	19,415	19,584	20,222	20,449	20,502	21,142	21,587	20%
Intestinal diverticula	12,811	13,649	14,059	14,370	15,464	15,736	16,348	16,806	17,792	18,579	45%
Chronic liver disease and cirrhosis	20,030	19,819	18,975	19,644	19,063	18,177	17,290	16,223	15,556	15,269	-24%
Other noninfective and nonspecified gastroenteritis and colitis	13,256	15,229	15,037	14,938	15,178	15,428	15,159	14,986	14,686	14,976	13%
Other intestinal disorders	10,030	10,690	11,710	12,008	12,393	12,422	13,232	13,044	13,406	13,742	37%
Malignant neoplasm of rectum, rectosigmoid junction and anus	12,483	12,541	13,146	13,465	14,142	13,651	14,044	13,358	13,914	13,412	7%
Gastrointestinal bleeding	11,595	11,332	11,904	12,159	11,462	11,723	11,789	11,816	11,776	11,969	3%
Rest	132,220	137,081	139,012	142,648	144,866	145,358	147,016	145,785	148,801	150,491	14%
Total	338,853	351,645	358,879	369,409	378,604	381,706	388,111	384,339	392,018	397,510	17%

DDS: Diseases of digestive system.

Table 4. *Evolution of case numbers, mortality and mean stay in NHS DCUs 2005-2014*

Year	Cases	GMR	MS
2005	96,113	4.3%	8.76
2006	108,243	4.0%	8.51
2007	111,668	4.2%	8.57
2008	107,920	3.9%	8.38
2009	121,222	3.8%	8.24
2010	122,742	3.6%	8.08
2011	124,855	3.6%	7.81
2012	124,149	3.4%	7.67
2013	126,520	3.2%	7.70
2014	131,769	3.1%	7.56
Total 2005-2014	1,175,201	3.7%	8.10
D % 2014/2005	37%	-28%	-14%

DCU: Digestive Care Unit; GMR: Gross mortality rate; MS: Mean stay.

a decrease in GMR (3.7% in 2014, -28% *vs* 2005) and a slight reduction of MS (7.6 days in 2014, -14% *vs* 2005) (Table 4).

Mortality (multilevel) adjustment using the Charlson index is good (AROC: 0.81; 95% CI: 0.81-0.81; p < 0.001) and low for readmissions (AROC: 0.61; 95% CI: 0.61-0.61; p < 0.001) (Table 2). Adjustment is deemed excellent when the AROC (test discrimination) is above 0.97, and poor when it is below 0.6. As with other RECAL projects, a finding to be highlighted is the notable dispersion seen in outcome indicators such as mortality and readmission rates (both gross and adjusted), both amongst DCUs (Table 5) and autonomous communities (Table 6), with regard to DDS. Mortality adjusted rates may vary up to 3-fold amongst DCUs, and notable dispersions also exist in DDS-related frequentation and the other indicators amongst autonomous communities, including the proportion of DCU-reported discharge events for DDS.

Survey comparisons - MBDS

DCU frequentation in 2014 (discharges per 100,000 population/year), according to data from the MBDS, was

Table 5. *Indicator variations among DCUs 2014*

	No. episodes	MS	GMR	RSMR	% Readmissions	RSRR
Average	732	7.68	3.52	3.19	10.76	10.82
Median	690	7.60	3.33	3.08	10.48	10.53
Standard deviation	428	1.69	1.56	0.72	3.36	1.47
Min	116	2.81	0.00	1.87	4.17	6.78
Max	2,044	13.08	12.44	5.54	23.73	15.82

DCU: Digestive care unit; MS: Mean stay; GMR: Gross mortality rate; RSMR: Risk-standardized mortality rate (multilevel adjustment); RSRR: Risk-standardized readmission rate (multilevel adjustment). DCUs with 100 or more discharges for DDS in 2014.

280/100,000/year, with a MS of 7.6 days. Estimates for these indicators based on the survey results yielded 352/100,000/year and a MS of 7.4 days.

No correlation was seen between risk-standardized mortality rate (RSMR) and frequentation ($r^2 = 0.08$; p = 0.37), or between RSMR and MS ($r^2 = 0.08$; p = 0.3), or in comparison with the risk-standardized readmission rate (RSRR) ($r^2 = 0.17$; p = 0.1). However, a significant inverse correlation was found between RSRR and MS (r = -0.68; p < 0.01).

DISCUSSION

The results of this first RECALAD survey, a pilot experience with data from 2015, provide relevant information on the structure and operation of NHS DCUs. The MBDS analysis shows a steady decrease in MS and mortality over time for most conditions, which suggests higher hospital care quality regarding digestive diseases. Interestingly, hospital frequentation increased for most conditions except chronic liver disease and cirrhosis, and remained stable for digestive bleeding. These results are similar for some conditions to the admission rates seen in the USA until 2012, inasmuch as admission rates for GI bleeding (the first most common admission cause among digestive conditions [12]) became stable whereas admissions for acute pancreatitis, intestinal obstruction, and diverticulitis increased. In contrast, admissions for chronic liver disease have increased while those for cholelithiasis decreased by 5% (12). The reason for such an increase in admissions for chronic liver disease, by 21%, may be hepatitis C, with an admission rate that grew by 225% (12). The introduction of direct-acting antivirals (DAAs) in 2014 may well radically change this scenario in upcoming years.

Furthermore, in this same period from 2005 to 2014 there was an increase in readmission rates. The inverse correlation between MS and RSRR defies interpretation, and it may be speculated that early discharge for some complex conditions would be associated with higher readmission rates.

Upper and lower digestive endoscopy rates per 1,000 population/year are similar to those found in other developed countries such as the United Kingdom (13), where also a significant increase in the demand for and performance of such procedures was witnessed in the past decade. Since screening with colonoscopy reduces the incidence of colorectal cancer and its related mortality by almost 90% (14), it is highly likely that screening policies might be increasing colonoscopy rates in all autonomous communities, particularly among the population over 55 years of age. However, screening strategies in our setting should be improved in order to enhance program adherence (15).

The differences found in frequentation and MS between our survey and MBDS-based estimations may be explained by the limited number of respondents we had, by the fact that higher-volume hospitals responded more often, and by the fact that the RECALAD survey collects DCU discharge events whereas the MBDS includes discharges to other hospital departments.

A notable finding is the significant variability of outcome indicators between hospitals and Autonomous Community

Table 6. *Indicator comparison among autonomous communities. DDS 2014*

	Frequentation	MS	GMR	RSMR	% Readmissions	RSRR	%DIG/Total
Andalucía	684	8.95	7.29	7.11	10.96	11.37	30.58
Aragón	976	8.83	6.32	5.81	11.30	11.47	32.52
Asturias	1,067	9.85	6.68	5.54	11.11	11.55	27.98
Baleares	670	8.12	5.53	5.58	11.85	12.27	30.91
Canarias	544	11.64	7.91	6.91	9.33	9.60	30.66
Cantabria	893	8.08	5.94	5.52	11.09	11.13	26.20
Castilla y León	1,133	8.91	6.78	5.61	12.88	12.79	28.31
Castilla-La Mancha	926	8.72	6.44	5.70	11.82	12.00	25.23
Cataluña	861	7.47	5.67	5.83	12.26	12.63	16.89
Comunidad Valenciana	943	7.54	6.06	6.38	12.78	13.14	27.00
Extremadura	1,001	8.36	7.66	6.94	13.00	13.15	19.42
Galicia	1,008	9.96	7.36	6.02	11.49	11.62	24.40
Madrid	786	9.04	6.09	5.33	12.91	12.64	24.13
Murcia	814	8.45	5.79	5.73	12.49	12.66	21.96
Navarra	1,024	7.15	6.47	6.38	11.48	11.58	28.82
País Vasco	1,028	7.97	6.37	5.85	12.59	12.91	34.13
Rioja	1,111	7.52	4.30	4.45	12.53	13.38	33.30
Average	910	8.62	6.39	5.92	11.87	12.11	8.62
Median	943	8.45	6.37	5.81	11.85	12.27	8.45
SD	165	1.11	0.88	0.66	0.96	0.96	1.11
Min	544	7.15	4.30	4.45	9.33	9.60	7.15
Max	1,133	11.64	7.91	7.11	13.00	13.38	11.64

Frequentation: Discharges per 100,000 population; DDS: Diseases of digestive system; MS: Mean stay; GMR: Gross mortality rate; RSMR: Risk-standardized mortality rate (multilevel adjustment); Readmission: Within 30 days of discharge (all causes); RSRR: Risk-standardized readmission rate (multilevel adjustment); % DIG/Total: Percentage of discharges by GI units over total.

health services, the latter also exhibiting a strong variability both in DDS-related frequentation and clinical management (percentage of DDS-related discharges from DCUs). Although higher volume is associated with lower mortality for some conditions (16), no correlation was observed between hospital volume and adjusted mortality (RSMR) or readmission rate (RSRR) regarding DDS.

The variability found in risk-adjusted indicators may be hardly accounted for by epidemiological conditions or random variation, hence reaching a relevant number of responding DCUs to the next RECALAD survey would be important to provide consistency for the statistical analyses of associations between DCU structure and operation and health outcomes. Health outcome research as provided by the RECAL projects is collecting relevant information on the policy-enabling workings of the various specialties within the NHS (17,18), hence DCUs are dared to provide adequate response rates.

Limitations

The main limitation of this RECALAD pilot experience is the low proportion of responding DCUs (26%), inferior to the minimum 50% required by the MSSSI to gain NHS interest status, which is the goal pursued by the SEPD.

Despite this limitation, which does not apply to the results obtained from the MBDS, the information collected from all 55 responding DCUs may be considered to faithfully reflect the organization and functioning of these units, particularly as it is mostly derived from high-volume hospitals. Similar response rates were obtained in similar surveys (19), but RECAL projects aim at reaching a far greater number of responses (18,19). The low number of responses obtained also conditions the analysis of associations between DCU structure and functioning and health outcomes. Circulating the findings of this pilot, as well as promoting a campaign amongst SEPD members and DDS-related scientific societies on the significance of reliable data on DCU performance, are components of the SEPD strategy devised to increase response rates.

CONCLUSIONS

DDS represent a significant cause of hospital-related morbidity and mortality. The number of hospital admissions considerably grew (17%) during the period 2005-2014, in association with decreases in GMR and MS, and increases in readmissions. DCUs are responsible for 25% of DDS-related discharges. The RECALAD survey provides relevant information on the structure and organization of these units. Both the RECALAD survey and MBDS analysis show

important variations amongst hospitals, DCUs and Autonomous Community health services. In order to gain a deeper insight into the causes of these variations it is important that higher numbers of RECALAD participating DCUs be recruited for the upcoming editions, among other factors.

ACKNOWLEDGEMENTS

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