Original Article

Prolonged length of stay in hospitalized internal medicine patients

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ABSTRACT

Background: Targeting patients with prolonged hospitalizations may represent an effective strategy for reducing average hospital length of stay (LOS). Objective: We sought to characterize predictors of prolonged hospitalization among internal medicine patients in an effort to guide future improvement efforts.

Design: We conducted a retrospective cohort study using administrative data of internal medicine patients from all hospitals of the Spanish Public Health Service between January 1st, 2005 and December 31st, 2013. Multivariable logistic regression was performed to assess the association between sociodemographic and clinical variables and prolonged LOS, defined as >30 days.

Key results: Of 5,275,139 discharges, 166,470 (3.2%) had a prolonged LOS. Prolonged hospitalizations accounted for 17.4% of total inpatient days and contributed 0.5 days to an average LOS of 9.8 days during the study period. Prolonged hospitalizations were associated with younger age (odds ratio [OR]: 0.97 per 10-year increase in age, 95% confidence interval [CI]: 0.96–0.98) and male gender (OR 0.88 IC95% 0.87–0.89). Compared to patients without prolonged LOS, prolonged LOS patients were more likely to require a palliative care consult (OR: 2.48, 95% CI: 2.39–2.58), surgery (OR: 6.9 95% CI: 6.8–7.0); and be discharged to a post-acute-care facility (OR: 2.91, 95% CI: 2.86–2.95).

Conclusions: Prolonged hospitalizations in a small proportion of patients were an important contributor to overall LOS and particularly affected complex hospital stays who were not discharged home.

1. Introduction

Hospital length of stay (LOS) has been an essential indicator of hospital efficiency and quality of care [1]. Prolonged LOS in acute care wards has been associated with greater risk of adverse events, in-hospital morbidity and mortality and readmission after discharge [2] as well as with a marked increase in health expenditures [3].

The reasons for prolonged LOS have not been widely studied. The progressive aging of the western population along with declining support of in-hospital beds and post-acute care facilities might account for the congestion of most acute medical wards. [4,5]. Few studies have analyzed patient's characteristics that predicted prolonged LOS, specifically in general medicine patients.

Bo et al. [4] showed that the elderly account for a high proportion of prolonged LOS mainly as a result of poor health condition, multi-morbidity and functional dependence. In the mid-1980s Selker et al. [6] found that 15% of hospital days were medically unnecessary, mainly for non-medical reasons. More recently Carey et al. [7] note that 63% of unnecessary days were for non-medical reasons, mostly due to difficulty finding skilled beds in a nursing facility.

We analyzed patients with very long LOS (over 30 days) in internal medicine wards in Spain during nine years (2005 through 2013), using an administrative database (Basic Minimum Data Set (BMDS)) assigned by the Ministry of Health of our country to quantify and characterize this group of patients. Our objective is to characterize predictors of prolonged hospitalizations to guide future improvements efforts.

2. Material and methods

We identified every patient discharged in Internal Medicine Department from hospitals of the Spanish Public Health Service between January 1st, 2005 to December 31st, 2013. Hospital discharge data were obtained from the BMDS (Basic Minimum Data Set). This BMDS registry is compulsory for every patient admitted to a hospital of the Spanish

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National Health Service, a system that cares for more than 90% of the country's population. All centers submit this information to the Spanish Health Ministry. BMDS contains sociodemographic and clinical data for each documented hospital stay including: gender and age, primary and secondary diagnoses (according to the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code); primary and secondary procedures; admission and discharge status (discharge home, death, post-acute facility, other hospital, or voluntary discharge); length of stay; and hospital characteristics (less than 200 beds; 200 to 500 beds; 500 to 1000 beds; more than 1000 beds). For every patient, a diagnosis-related group (DRG) was identified. DRGs are a way of classifying patient hospitalizations by diagnosis and procedure on the assumption that similar costs are expended on patients by using similar resources. Each DRG has a relative weight that reflects the intensity of resources consumed. Patients were considered surgical if they had a procedure performed requiring the use of an operating room. Since the patient data generally available does not indicate precisely whether a patient was taken to the operating room, surgical patients were identified based on the surgical procedure performed.

Prolonged length of stay: Cases were selected if they were discharged with a length of stay longer than 30 days.

The Charlson Co-morbidity Index (CCI) [8,9] was computed for each patient. This index reflects the number and importance of co-morbid diseases, relies on ICD categories, and was used to adequately adjust for the severity of illnesses. The index, which has been adapted for use with administrative databases, values the presence of 19 medical conditions, with a scale of 1–6, and a total grade between 0 and 37. An index higher than 2 is related to a mortality rate greater than 50% per year.

The following risk factors were identified using ICD-9-MC codes in any primary or secondary diagnosis field: Decubitus ulcer ICD-9-CM: 707*, Urinary tract infection ICD-9-CM: 599.00, 590*, 646.60–49, 601, Sepsis ICD-9-CM:038*, 995.91, 995.92 Congestive heart failure: ICD-9-CM: 398.91, 404*, 402.11, 402.91, 428–428.9, Peripheral arterial disease: ICD-9-CM 440–448, Dementia: ICD-9-CM: 290–290.9, Neoplasia ICD-9-CM:140.0–172.9, 174.0–195.8, 200–208.9 Metastasic cancer: ICD-9-MC:196.0–199.99, Cerebrovascular disease ICD-9-MC: 430–438, Malnutrition: ICD-9-CM: 260–263.9, *Clostridium difficile* infection -9-MC 008.45, Upper digestive hemorrhage: ICD-9-CM 530.2, 530.82, 531, 532*, 533* 534*, 535.10–60, 537.83, Liver disease: ICD-9-CM 571.0–571.99; 572.2–572.8, AIDS: ICD-9-CM: 042.00, V08, Methicillin-sensitive *Staphylococcus aureus* septicaemia ICD-9-CM 038.11, Methicillin-resistant *S. aureus* septicaemia ICD-9-CM 038.12, Urinary catheter: ICD-9-CM 57.94, Nasogastric tube ICD-9-CM 96.35, Enteral nutrition: ICD-9-CM 96.6, Parenteral nutrition: ICD-9-CM 99.15, Gastrostomy: ICD-9-CM: 44.11, 44.19, 44.32, Palliative Consultant: ICD-9-CM V66.7.

2.1. Statistical analysis

A descriptive analysis of these patients was carried out, and the demographic variables among the patients with or without prolonged LOS were compared. We used the chi-square test for categorical variables with the Yates correction, the Fisher's exact test for dichotomous variables when the expected value of a cell was less than 5, and Student's *t*-test or ANOVA for quantitative variables. All the univariate analyses were carried out after adjusting for age and gender. The odds-ratios (OR) and 95% confidence intervals (CI) were estimated from the regression coefficients.

All statistical analyses were carried out with the use of a SPSS Software version 16 (Chicago, Illinois, SPSS Inc).

Table 1
Baseline characteristics for patients with and without prolonged hospitalizations.

	LOS < 30 days N = 5.108.647 (96.8%)	LOS > 30 days N = 166.470 (3.2%)	OR	95% C.I.
Age (years, mean)	72.27 (16.87)	71.66 (15.43)	0.97[a]	0.96–0.97
Male	2.676.270 (52.4%)	92.510 (55.6%)	0.88	0.87–0.89
Length of stay (days, SD)	8.13 (5.88)	49.54 (33.91)		
GRDs relative weight (SD)	1.66 (1.13)	3.75 (5.93)	1.52	1.51–1.53
Death during admission	495.290 (9.7%)	34.604 (20.8%)	2.44	2.41–2.47
Nursing home	152.110 (3%)	2526 (1.5%)	0.50	0.48–0.52
Discharge post-acute facility or nursing home	201.227 (3.9%)	17.755 (10.7%)	2.91	2.86–2.95
Charlson > 2	1.098.190 (21.5%)	48.310 (29%)	1.49	1.47–1.50
Acute myocardial infarction	189.572 (3.7%)	4968 (3.0%)	0.79	0.77–0.82
Congestive heart failure	631.435 (12.4%)	26.307 (15.8%)	1.33	1.31–1.35
Peripherial artery disease	103.759 (2%)	3.967 (2.4%)	1.17	1.14–1.21
Cerebrovascular disease	381.383 (7.5%)	17.235 (10.4%)	1.43	1.40–1.45
Hemiplegia	8.199 (0.2%)	912 (0.5%)	3.4	3.1–3.6
Dementia	217.025 (4.2%)	7.810 (4.7%)	1.10	1.08–1.13
COPD	1.116.351 (22.8%)	31.828 (19.1%)	0.80	0.79–0.81
Upper digestive hemorrhage	53.708 (1.1%)	2.444 (1.5%)	1.40	1.34–1.46
Liver disease	122.304 (2.4%)	6.121 (3.7%)	1.55	1.51–1.59
Diabetes	1.148.419 (22.5%)	33.170 (19.9%)	0.85	0.84–0.86
Chronic renal disease	603.336 (11.8%)	19.046 (11.4%)	0.96	0.95–0.97
Neoplasia	314.611 (6.2%)	12.900 (7.7%)	1.28	1.25–1.30
Metastasis	215.735 (4.2%)	12.613 (7.6%)	1.85	1.82–1.89
AIDS	64.858 (1.3%)	6.089 (3.7%)	2.95	2.8–3.0
Malnutrition	91.604 (1.8%)	12.212 (7.3%)	4.33	4.25–4.42
Urinary tract infection (not present on admission)	111.275 (2.2%)	14.503 (8.7%)	4.28	4.20–4.36
Urinary catheter	335.456 (6.6%)	28.720 (17.3%)	2.96	2.92–3.00
Nasogastric tube	105.328 (2.1%)	9.685 (5.8%)	2.93	2.87–2.99
Gastrostomy	17.265 (0.3%)	3.369 (2.0%)	6.09	5.86–6.32
Enteral nutrition	8.513 (0.2%)	3.165 (1.9%)	11.61	11.14–12.09
Parenteral nutrition	50.644 (1.0%)	12.420 (7.5%)	8.05	7.88–8.21
Surgical procedure	21.121 (0.4%)	6.954 (4.2%)	10.49	10.21–10.79
SAMS	146.977 (2.9%)	27.220 (17.3%)	6.90	6.80–7.00
SAMR	3322 (0.1%)	1281 (0.8%)	11.91	11.17–12.71
Infection *Clostridium difficile*	5.302 (0.1%)	1.912 (1.1%)	11.18	10.61–11.78
Pressure ulcer	852 (0.01%)	247 (0.1%)	8.9	7.73–10.26
Palliative care	36.323 (0.7%)	2.911 (1.7%)	2.48	2.39–2.581

[a] Every 10 years.