
BRIEF REPORT

Evaluation of appropriate hospital admissions from a tertiary level hospital emergency department

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The authors declare no conflict of interest in relation with the present article.

Objectives: To estimate the percentage of inappropriate hospital admissions ordered by the emergency department of a tertiary care hospital and to assess the association between appropriateness and patient and care factors.

Methods: Cross-sectional study of 631 randomly selected admissions in 2011. The Spanish version of the Appropriateness Evaluation Protocol was used. We recorded patient characteristics (age, sex) and care factors (referred consultation or not, shift, day of the week, and level of demand for services). The unit of statistical analysis was an admission episode. Associations were explored by multivariable regression analysis.

Results: We detected a rate of inappropriate admission of 15.2% (95% CI, 12.62%–18.23%). The most common reason for inappropriate admission was to perform diagnostic tests and/or procedures that could have been ordered through outpatient clinics (59.4%). Patients who were appropriately admitted were significantly older, by a mean of 5.4 years ($P=.005$). Multivariable analysis found a positive association between appropriateness of admission and 2 variables: age (odds ratio [OR], 1.021; 95% CI, 1.008–1.035) and number of admissions daily (OR, 1.027; 95% CI, 1.001–1.053).

Conclusions: The rate of inappropriate admissions by our department is similar to the rates published for other Spanish hospitals. Organizational variables that our hospital can potentially improve are the main reasons behind inappropriate admissions. Age and the number of admissions daily were positively associated with appropriate admission. [Emergencias 2014;26:464-467]

Keywords: Emergency service, hospital. Admissions. Appropriateness of admissions. Hospital wards.

Introduction

Assessing the appropriateness of hospital admissions is key to improving efficiency in health-care. Improper hospitalization has been defined as that ordered in order to receive certain care that could have been provided at other levels of care: primary care, day hospital, home care, programmed outpatient clinic visit etc.)¹. For the patient, avoiding unnecessary hospitalization results in safer care, since it avoids exposure to hospital-associated risks such as infections, medication errors and unnecessary tests which may be harmful. From the point of view of the health system, it optimizes health resources^{2,3} and improves the organization and operation of services⁴.

The emergency department (ED) of the General Hospital of the University Hospital La Paz (HULP) represents the main gateway to local hospitalization; in 2011 it generated 13,972 hospital admissions, most of them assigned to their General Hospital (GH) and Cantoblanco (CB). Given the growing importance of making efficient use of resources and ensuring quality healthcare, we conducted the present study, with the following objectives: 1) to estimate the proportion of inappropriate hospitalization from clinical departments of HULP; 2) describe the main causes of inappropriateness; and 3) evaluate whether there was an association between appropriateness and patient characteristics (age, gender) and healthcare variables (type of consultation, day of consultation, shift, workload).

Method

We performed a cross-sectional study of a simple randomized sample of patients, selected using an Excel random sequence from the list of ED patients referred for admission during 2011 to the following HG clinical departments: Cardiology, Gastroenterology, Geriatrics, Internal Medicine, Pulmonology, Neurology and Oncology. The sample size was calculated based on the maximum degree of inappropriateness reported in studies conducted in Spain (20%)^{5,6}. A confidence level of 95% and an accuracy of $\pm 3\%$ was considered. Based on a finite population of 8,284 (admissions recorded in 2011 in the above departments), a sample size of 631 admissions was considered necessary.

The assessment tool used to determine the appropriateness of hospitalization was the Spanish version of the Appropriateness Evaluation Protocol (AEP)^{1,7}, consisting of a questionnaire with 16 explicit, objective and independent diagnostic criteria to assess the clinical need for hospitalization from information recorded in the medical record. The fulfillment of one criterion is sufficient to consider hospitalization as appropriate. The questionnaire also includes the causes of inappropriate admissions.

Information on patient characteristics (age, gender) was also collected; and on issues related to healthcare: consultation type (referral / non referral), shift (morning / afternoon / evening), day (holiday / weekday), and workload (number of ED visits / day; hospitalizations / day).

The information was obtained from two sources: 1) the HULP information and management system, HP-HIS (Hewlett Packard-Hospital Information System), where the list of hospitalizations in 2011 was obtained; 2) the clinical station, a HULP medical histories viewer showing ED discharge reports, department discharge reports, results of clinical laboratory and radiological studies.

The questionnaire was initially administered on ED discharge. Compliance or non-compliance with each of the appropriateness criteria was recorded. Meeting at least one criterion of appropriateness was sufficient to categorize hospitalization as appropriate and the corresponding information was recorded. Hospitalizations initially not meeting any criteria of appropriateness were revised in a more comprehensive manner, through the information available at the clinical station on the episode. For each case, the criteria of appropriateness or the reasons for inappropriateness were recorded.

The unit of statistical analysis unit was the episode leading to hospitalization. The percentage of overall inappropriateness and that for each depart-

ment concerned was estimated. A descriptive analysis of the appropriateness criteria and causes of inappropriateness was performed. A subgroup analysis of the characteristics of patients and healthcare was performed using Chi-square test (for categorical variables) and Student's t test (for continuous variables). The association between hospitalization appropriateness and characteristics of patients and healthcare was performed using backward stepwise multivariable logistic regression analysis. A p-value less than 0.05 for inclusion and less than 0.10 for exclusion was established. The analysis was performed using PASW Statistics 18 for Windows.

Results

Of 631 hospitalizations analyzed, 535 were considered appropriate (84.8%) and 96 inappropriate (15.2%). The departments with the lowest percentage of inappropriateness were geriatrics and oncology, and the highest were neurology and cardiology (Table 1). The average number of appropriateness criteria for admission was 1.8, ranging from 1 (43.4%) to 5 (0.2%). The distribution of appropriateness criteria and causes of inappropriateness are shown in Table 2.

The average age of patients whose hospitalization was considered appropriate was 5.4 years higher than that of patients with inappropriate hospitalization ($p = 0.005$). In the group of inappropriate hospitalizations, we observed a lower average number of admissions / day, a higher percentage of hospitalization on holidays, and a higher percentage of CB hospitalization, although not statistically significant (Table 3). Multivariate analysis showed a positive association between appropriate hospitalization and age (patient characteristics) and between appropriate hospitalization and the number of admissions / day (healthcare characteristic). Thus, older age and more admissions / day were associated with higher hospitalization appropriateness.

Table 1. Inappropriate admissions by hospital departments

Departments	Admissions included	Inappropriate admissions	% of inappropriate admissions (95% CI)
Cardiology	64	15	23.4 (14.7-35.1)
Digestive tract	46	5	10.9 (4.7-23.0)
Geriatrics	70	4	5.7 (2.2-13.8)
Internal medicine	247	39	15.8 (11.8-20.9)
Pneumology	96	17	17.7 (11.4-26.5)
Neurology	46	11	23.9 (13.9-37.9)
Oncology	62	5	8.1 (3.5-17.5)
TOTAL	631	96	15.2 (12.6-18.2)

CI: Confidence Interval.

Table 2. Distribution of appropriateness criteria and causes of inappropriate admission according to the Appropriateness Evaluation Protocol (AEP)

	n (%)
Appropriateness criteria (n = 631)	
Care needs	
1. Surgery or special technique in 24 h that requires: General or local anesthesia Equipment available only on admission	16 (2.5)
2. Telemetry or monitoring of vital signs every 2 hours	74 (11.7)
3. Medicación iv and / or fluid replacement (not including tube feeding)	437 (69.3)
4. Observación of undesirable reactions to medication	12 (1.9)
5. Intramuscular antibiotics 3 or more times daily	0 (0.0)
6. Continuous or intermittent assisted ventilation (at least every 8 h)	2 (0.3)
Clinical condition	
7. Alterations of electrolytes/acid-base: Na <123 mEq / l or > 156 mEq / l K + <2.5 mEq / l or > 6 mEq / l HCO ₃ <20 mEq / l or > 36 mEq / l Arterial pH <7.3 or > 7.45	159 (25.2)
8. Persistent fever > 38°C for more than 5 days	20 (3.2)
9. Sudden loss of body mobility (motor deficit)	3 (0.5)
10. Sudden loss of vision or hearing	2 (0.3)
11. Active bleeding	21 (3.3)
12. Surgical wound dehiscence or evisceration	0 (0.0)
13. Heart rate <50 or >140 beats / min	31 (4.9)
14. Blood pressure: Systolic <90 or > 200 mmHg Diastolic <60 or > 120 mmHg	167 (26.5)
15. Acute confusional state, coma or unresponsiveness	25 (4.0)
16. Electrocardiogram compatible with acute ischemia	9 (1.4)
Causes of inappropriateness (n = 96)	
The diagnostic tests and / or procedures may be performed in outpatient clinics	57 (59.4)
The patient was admitted for diagnostic or therapeutic procedures that were programmable	27 (28.1)
The patient requires institutionalization but at a lower level, not in an acute care hospital	5 (5.2)
The patient requires a nursing home	5 (5.2)
The patient needs a chronic care hospital	2 (2.1)
Surgical procedure that should be performed in an ambulatory setting	1 (1.0)
The patient needs terminal care	1 (1.0)

Discussion

The proportion of inappropriate hospitalization found in this study is similar to that of other studies in Spain that used the same evaluation tool and applied it to clinical departments^{4-6,8}, ranging between 10 and 20%. Our main cause of inappropriate admissions was diagnostic tests and / or procedures which could have been performed on an outpatient basis, which coincides with that reported in other studies^{4,5,9}. In this regard it has been noted that the use of hospitalization in response to organizational deficit of specialized care, especially during the diagnostic process, is a fact in Spanish hospitals as evidenced in these studies¹⁰. We believe, therefore, that this is an aspect which needs improvement in our institution, through measures such as rapid access to consultation for certain complementary tests; increased high resolution and day hospital consultations; and above all, to improve coordination with primary care to ensure true continuity of care. The improvement process must also avoid the discharge of ED patients who really need to be admitted.

Our results agree with those previously published: older people are justifiably hospitalized more than younger people^{3,5,6,11}. In our study, the largest number of admissions / day, included as an indicator of workload and not seen in other studies, was associated with increased likelihood of appropriate hospitalization. One possible explanation is better selection of patients for hospitalization when there is more demand.

The limitations of our study include those corresponding to any study based on records, in this case ED discharge reports, which did not contain sufficient information to assess the appropriateness of hospitalization in all cases. To minimize this we also reviewed clinical station data on the corresponding episode in cases not reported at least one

Table 3. Characteristics of patients and health care, according to appropriateness of admission

	Appropriate admission (n = 535)	Inappropriate admission (n = 96)	Valor p	Multivariate analysis OR (95% CI)
Patient characteristics				
Gender (female)	49.3%	49.0%	0,944	-
Mean age (years)	73.6	68.2	0,005	1,021 (1,008-1,035)
Characteristics of healthcare				
Type of consultation (not referral)	87.5%	89.6%	0,561	-
Public holiday	20.0%	31.2%	0,202	-
Shift: morning	22.1%	16.7%	0,477	-
afternoon	68.0%	71.9%	-	-
night	9.9%	11.5%	-	-
Mean no. emergencies / day	283.6	284.7	0,742	-
Mean no. admissions / day	40.3	38.6	0,080	1,027 (1,001-1,053)
Hospital (Cantoblanco)	25.8%	29.2%	0,490	-
Hospital (Cantoblanco)*	39.1%	46.7%	0,269	-

OR: Odds ratio; CI: Confidence Interval. *Comparing only the departments of geriatrics, internal medicine and pulmonology.

criterion of appropriateness. However, it is possible that the number of appropriateness criteria for admission is greater, since it is not possible to ensure identification of all AEP criteria in reports that met at least one criterion. However, we believe that AEP is a simple and very useful tool for the detection of areas for improvement in ED, which may also be used to assess the impact of measures to correct organizational deficiencies identified¹²⁻¹⁴. It is therefore a useful tool to assess quality of care, which promotes the efficient use of resources and the process of continuous improvement of an institution.

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Adecuación de los ingresos hospitalarios procedentes del servicio de urgencias de un hospital de tercer nivel

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Objetivos: Estimar el porcentaje de ingresos inadecuados realizados desde un servicio de urgencias a servicios clínicos de un hospital de tercer nivel, describir las causas de inadecuación, y evaluar la asociación entre adecuación del ingreso y características del paciente y de la asistencia sanitaria.

Método: Mediante estudio transversal, se evaluaron 631 ingresos realizados durante el año 2011, seleccionados aleatoriamente. El instrumento de evaluación fue la versión española del *Appropriateness Evaluation Protocol*. Se recogió información sobre el paciente (edad, sexo) y la asistencia sanitaria (tipo de consulta, turno, día de la semana y presión asistencial). La unidad de análisis estadístico fue el episodio de ingreso. Se evaluó la asociación mediante modelo de regresión logística multivariable.

Resultados: El porcentaje de ingresos inadecuados fue 15,2% (IC 95%: 12,6-18,2). La principal causa de inadecuación fue las pruebas diagnósticas y/o los procedimientos que pueden realizarse en consultas externas (59,4%). La edad media fue 5,4 años mayor en los ingresos adecuados ($p = 0,005$). El análisis multivariable encontró asociación positiva entre la adecuación del ingreso y la edad (OR: 1,021; IC 95%: 1,008-1,035) y el número de ingresos/día (OR: 1,027; IC 95%: 1,001-1,053).

Conclusiones: El porcentaje de ingresos inadecuados estimado es similar al de otros hospitales españoles. Las principales causas de inadecuación tienen que ver con aspectos organizativos susceptibles de mejora. La edad y el número de ingreso/día se asociaron positivamente a la adecuación del ingreso. [Emergencias 2014;26:464-467]

Palabras clave: Servicio de urgencia hospitalario. Ingresos. Adecuación. Servicios médicos.