Assessment of Inappropriate Hospital Stays in a Cardiology Department

José A. San Román,[a] Francisco J. Luquero,[b] Luis de la Fuente,[a] Alberto Pérez-Rubio,[b] Sonia Tamames,[b] Francisco Fernández-Avilés,[c] and Javier Castrodeza[b]

[a]Servicio de Cardiología, Hospital Clínico Universitario de Valladolid, Valladolid, Spain
[b]Servicio de Medicina Preventiva, Hospital Clínico Universitario de Valladolid, Valladolid, Spain
[c]Servicio de Cardiología, Hospital Universitario Gregorio Marañón, Madrid, Spain

One of the fundamental ways of increasing hospital efficiency is to ensure that unnecessary hospital stays are avoided. To date, no study on this topic has been published by any cardiology department in Spain. We performed a retrospective, observational, analytical study to determine the rate of unnecessary hospital stays. Data were collected in accordance with the Appropriateness Evaluation Protocol (AEP). The rate of inappropriate stays was 27 per 100 patient-days. Multivariate analysis showed that the factors associated with inappropriate stays were older age-group, stays longer than 7 days, and days during the last third of the stay. The most frequent causes of inappropriate stays were delays in performing diagnostic and therapeutic procedures and stays for procedures that could have been performed without hospital admission.

Key words: *Inappropriateness. Hospital stays. Cardiology department. Appropriateness Evaluation Protocol. Health management.*

Evaluación de las estancias inadecuadas en un servicio de cardiología

Una medida esencial en la búsqueda de la eficiencia hospitalaria es evitar estancias inadecuadas. No se ha publicado ningún estudio en este sentido realizado en un servicio de cardiología de nuestro país. Para conocer la tasa de inadecuación de estancias hospitalarias, hemos realizado un estudio observacional, analítico, retrospectivo. La recogida de datos se realizó conforme al Appropriateness Evaluation Protocol (AEP). La tasa de inadecuación fue de 27 estancias cada 100 pacientes-día. En el análisis multivariable, los factores relacionados con estancias inadecuadas fueron los grupos de mayor edad, las estancias mayores de 7 días y los días correspondientes a los últimos tercios de estancia. Las causas más frecuentes de estancias inadecuadas estuvieron relacionadas con el retraso en procedimientos diagnósticos o terapéuticos y con que estos procedimientos podrían haberse hecho sin ingreso.

Palabras clave: *Inadecuación. Estancias hospitalarias. Servicio de cardiología. Appropriateness Evaluation Protocol. Gestión sanitaria.*

INTRODUCTION

The increasing demand for hospital care and concern regarding the quality of the services provided justify improving hospital efficiency by determining what constitutes inappropriate use of hospitalization and its possible correction.[1] To make this assessment, methods have been developed to measure the appropriateness of hospital stays, the best known of which is the Appropriateness Evaluation Protocol (AEP).[2,3] The model is valid and reliable,[4] and is useful for identifying inappropriate stays in acute hospitals and the causes.[5,6]

Inappropriate stays in Spain represent between 15% and 44% of all hospital stays.[7] Among the factors that determine appropriateness of stay is the type of department providing the care.[8] For this reason, analysis of the factors that cause inappropriate stays for each specialty can provide valuable information for implementing specific corrective measures. This analysis has not been carried out previously in any cardiology department in Spain.

The objective of the present study was to determine the rate of inappropriate stays and associated factors in patients hospitalized in our cardiology department, with the goal of establishing and developing a strategy for decreasing their frequency.

TABLE 1. Appropriateness of Hospital Stay Criteria Included in the Appropriateness Evaluation Protocol

Medical care	Same-day surgical intervention (within 24 h of admission)
	Intervention within 24 h requiring in-hospital preoperative consultation or evaluation
	Same-day cardiac catheterization
	Same-day angiography
	Same-day internal organ biopsy
	Same-day thoracocentesis or paracentesis
	Same-day invasive procedures of the central nervous system
	Any medical examination requiring strict dietary control
	New or experimental treatment requiring frequent dosing adjustments with direct medical supervision
	Medical supervision at least 3 times per day (documented in the medical history)
	Invasive procedure in the past 24 h (from 1 to 7, inclusive)
Nursing care	Respiratory therapy and/or mechanical ventilation by inhalation at least 3 times per day
	Parenteral therapy: intravenous administration of liquids, intermittent or continuous
	Monitoring of vital signs, at least every 30 min, during a minimum of 4 h
	Intramuscular or subcutaneous injections, at least 2 times per day
	Measurement of water balance
	Treatment of major surgical wounds and drainages (excluding feeding tube and Foley urinary catheter)
Clinical condition of patient	On the day of examination or in the previous 24 h
	Inability to urinate/defecate in the last 24 h not attributable to neurological problems
	Within the last 48 h before the day of examination
	Transfusion due to blood loss
	Ventricular fibrillation or electrocardiographic evidence of acute ischemia
	Fever >38ºC
	Coma
	Acute confusional state, excluding that due to alcohol abstinence syndrome
	Symptoms or signs due to acute hematological alterations
	Acute progressive neurological alterations

METHODS

Study Population

A retrospective observational analytical study was carried out in our hospital,[8] which is a public entity and comprises 716 beds. The current work is a substudy within the global analysis of the hospital. The study period covered the year 2004, during which time 23 183 admissions were registered, 12% of these corresponding to the cardiology department, which had 35 beds during the year of the study.

Assessment Tool

A stratified random sampling was performed with proportionate allocation to the number of admissions in each department. Assuming an alpha error of .05, a statistical power of 80% and 30% expected inappropriate stays in the reference group (quotient =2), the necessary size of 800 stays to detect risks >1.25 per stratum was obtained. After taking into account 15% possible losses, a sample size needed of 920 stays corresponding to the cardiology department was estimated. The definition of a case (inappropriate stay) and the data collection model were adjusted to the AEP hospital stay protocol.[2] The appropriateness criteria used in the AEP are listed in Table 1.

Inappropriate stays are defined as those for which none of the criteria for appropriateness are met, in which case the causes of inappropriateness are recorded. Data collection was carried out by 6 researchers, among whom a kappa concordance index was obtained. Explanatory variables considered were: sex, type of admission (emergency or elective), and duration of hospital stay. Quantitative variables were recoded prior to their inclusion in the regression model. The duration of each admission was divided into three thirds and this variable was included in the analysis. Each patient's time at risk was calculated as well as inappropriate stays for each one of them. From this data the inappropriateness rate (IR) was calculated, which was the outcome variable of interest.

Statistical Analysis

A gross analysis was carried out where the null hypothesis of no association between different explanatory variables and the inappropriateness rate was contrasted, with a confidence level of $\alpha=.05$. Finally, a multivariate analysis was performed using a generalized linear model assuming a Poisson distribution, obtaining adjusted estimates of the odds ratio for each of the variables and 95% confidence intervals (CI) with an over-dispersion correction factor.

TABLE 2. Rates of Inappropriateness Based on the Different Study Variables and 95% Confidence Intervals (CI). Gross Analysis and Analysis Adjusted for the Remainder of the Variables of the Odds Ratio, 95% CI, and Statistical Significance. Cardiology Service of the Clinical University Hospital of Valladolid, 2004

Group	IR (95% CI)	OR (95% CI)	AOR (95% CI)	P
Sex				
Women	23 (17.7-29.3)			
Men	29.2 (24.8-34.1)	1.27 (0.95-1.7)	1.24 (0.79-1.95)	.349
Age, y				
<45	10 (2.7-25.6)			
45-65	24.5 (18.6-31.6)	2.45 (0.89-6.74)	2.84 (0.62-13.1)	.185
>65	29.4 (25-34.3)	2.94 (1.09-7.93)	2.85 (0.64-12.8)	.174
Type				
Elective	24.8 (19.7-30.8)			
Emergency	28.5 (24-33.7)	1.15 (0.88-1.51)	0.86 (0.56-1.33)	.500
Hospital stay				
Less than 7 days	15.4 (11.7-20.3)			
More than 7 days	34.7 (29.9-40.3)	2.55 (1.65-3.09)	1.91 (1.15-3.17)	.015
Thirds				
First	15.6 (11.8-20.2)			
Second	31.6 (24.9-39.4)	2.03 (1.42-2.9)	1.81 (1.08-3.06)	.028
Third	40.2 (31.9-50)	2.57 (1.81-3.68)	2.21 (1.31-3.74)	.004
Total	27 (23.6-30.8)			

AOR indicates adjusted odds ratio; IR, inappropriateness rate each 100 patient-days; OR, odds ratio.

The data analysis was performed using the R 2.5.0® program. The percentages of the principal causes of inappropriateness were calculated in each of the thirds of the hospital stay.
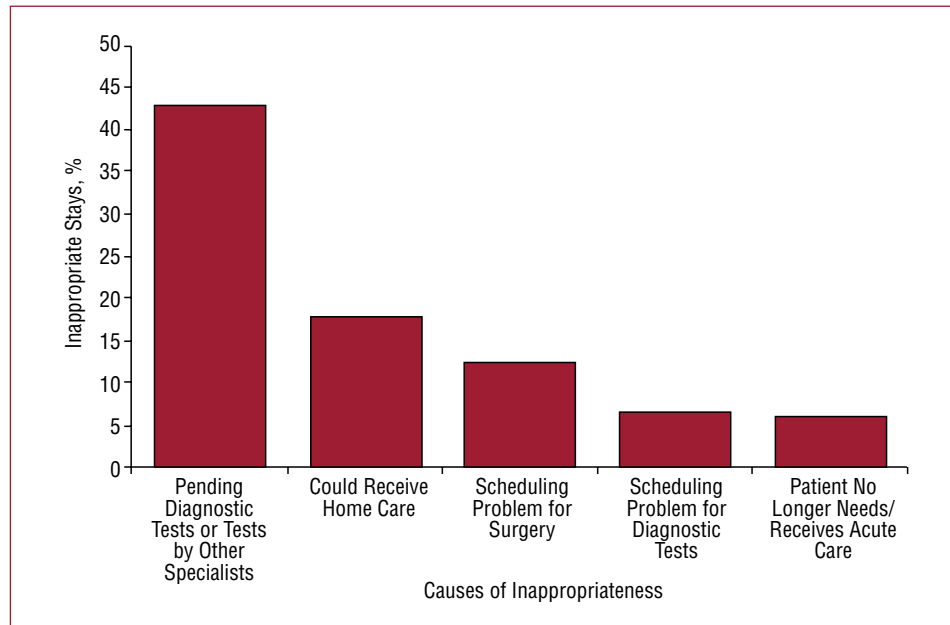
RESULTS

During the study period 202 admissions to the cardiology department were assessed, which corresponded to a total of 818 days of stay. The mean (standard deviation) age of the patients was 65 (10.5) years and 127 (63%) were men. Seventy percent of the admissions were elective (n=142). The mean admission stay was 4.5 (5.4) (median, 2) days and 1.1 (3) (median, 0) days were inappropriate. The mean general kappa concordance index was 0.71, with a maximum agreement level of 0.76 (0.23) and a minimum agreement level of 0.67 (0.15).

The general inappropriateness rate in the study period was 27 (95% CI, 23.6-30.8) inappropriate stays each 100 patient-days (Table 2). Multivariate analysis (Table 2) shows that the main risk factors of inappropriate stays were older age-groups, stays of more than 7 days and days during the last third of the hospital stay. Sex and type of admission (emergency or elective) did not influence inappropriateness of stay. The main causes of inappropriateness are shown in Figure.

DISCUSSION

Our study highlights a 27% rate of inappropriateness in our cardiology department. Although a priori this may seem high, it is within the range published by other authors in other hospital contexts.[9-13] In fact, this rate is low compared with other departments at our center (general rate, 34% [95% CI, 33-35]).[8] This is the first study utilizing the AEP for a cardiology department in Spain. Despite its limitations, this is an objective tool that is useful for comparisons between departments and, above all, for comparing a single department against itself at different points in time. We must point out that when cataloguing a stay as inappropriate, neither the appropriateness nor the quality of care given is assessed, but only that this care could have been provided at a lower level of care or in a shorter period of time.

Various aspects of the results obtained are worthy of discussion. First, the inappropriateness rates were higher for older age-groups. This may be due to delays in discharging elderly patients for social reasons not specified in the clinical history or also to the higher incidence of comorbidities in this patient group, not reflected in the AEP criteria. Second, the likelihood that a day of stay may be inappropriate increases with prolonged stays. It could be argued that prolonged stays are due, in many cases, to

Figure. Frequency of the main causes of inappropriateness in the Cardiology Service of the Clinical University Hospital of Valladolid 2004 (220 inappropriate stays).

waiting for results of tests that have already been performed. It is also possible that the patient's daily progress report does not reliably reflect the reason for continued hospitalization. This is more frequent in prolonged stays, where daily progress notes refer to previous days' progress notes. As we have already demonstrated, the absence of an ongoing record of patient progress increases the risk of inappropriate stay by 36%.[14] In a strict sense, those stays are not truly inappropriate, but by not specifying the reason for continued hospitalization they are catalogued as such.

Our results indicate that inappropriate stays are more frequent in the final third of the stay, independently of total stay duration. Again, this may be related to daily progress reports that initially reflect appropriateness criteria but fail to do so in later reports. Furthermore, it is more probable that social reasons as much as comorbidities in the elderly cause inappropriate stays in the final days of hospitalization, and that in the first days severity criteria that deem the stay appropriate predominate.

To accurately assess the effect of other potential confounders on appropriateness of stays, such as care pressure, psychosocial factors, clinical and comorbidity aspects, would require additional research. This is not a simultaneous review, and inappropriateness may therefore be slightly overestimated, since the AEP can lead to such overestimation when the stay is not sufficiently justified. Other inherent limitations in the use of the AEP as the measuring instrument have been extensively described. It is unlikely that seasonal variations in the inappropriateness rates are a limitation in this study, since random sampling was performed over one year. One limitation that could have affected the results is the loss of statistical power derived from the fact that the number of stays analyzed was lower than expected and gave excessively broad CI results. Nonetheless, the magnitude of the risk and the CI range indicate that the results were not affected.

Finally, with regard to causes of inappropriateness, two of the most frequent causes (Figure) are closely related (pending tests and scheduling problems), and would be resolved by performing diagnostic tests more quickly once ordered, fundamentally catheterization and echocardiograms. Identifying measures for improvement with this objective and putting them into practice would most likely reduce the rate of inappropriate stays. Another frequent cause of inappropriate stays is that the diagnostic or therapeutic process could be carried out in an outpatient setting. In this respect, performing invasive procedures without hospital admission and starting up short-term care units should improve the rate of inappropriate stays.

REFERENCES

1. Peiró MS, Portella E. Identificación del uso inapropiado de la hospitalización: la búsqueda de la eficiencia. Med Clin (Barc). 1994;103:65-71.
2. Pérez-Rubio A, Santos S, Luquero FJ, Tamames S, Cantón B, Castrodeza JJ. Evaluación de la adecuación de las estancias en un hospital de tercer nivel. An Sist Sanit Navar. 2007;30:29-36.

3. McDonagh MS, Smith DH, Goddard M. Measuring appropriate use of acute beds. A systematic review of methods and results. Health Policy. 2000;53:157-84.

4. Peiró S, Meneu R, Roselló ML, Portella E, Carbonell-Sanchís R, Fernández C, et al. Validez del protocolo de evaluación del uso inapropiado de la hospitalización. Med Clin (Barc). 1996;107:124-9.

5. Fuente D, Peiró S, Portella E, Marchan C, Aymerich S. Utilización innecesaria de la hospitalización: Importancia de la gestión a nivel de Servicio. Rev Calidad Asistencial. 1994;1:8-16.

6. Strumwasser I, Paranjpe NV, Ronis DL, Share D, Sell LJ. Reliability and validity of utilization review criteria. Appropriateness Evaluation Protocol, standardized medreview instrument, and intensity-severity-discharge criteria. Med Care. 1990;28:95-111.

7. Lorenzo S, Sunol R. An overview of Spanish studies on appropriateness of hospital use. Int J Qual Health Care. 1995;7:213-8.

8. Pérez-Rubio A, Santos S, Luquero FJ, Tamames S, Canton B, Castrodeza JJ. Evaluación de la adecuación de las estancias en un hospital de tercer nivel. An Sist Sanit Navar. 2007;30:29-36.

9. Moya-Ruiz C, Peiró S, Meneu R. Effectiveness of feedback to physicians in reducing inappropriate use of hospitalization: a study in a Spanish hospital. Int J Qual Health Care. 2002;14:305-12.

10. Villalta J, Siso A, Cereijo AC, Sequeira E, de La SA. Adecuación de la hospitalización en una unidad de estancia corta de un hospital universitario. Un estudio controlado. Med Clin (Barc). 2004;122:454-6.

11. Velasco DL, García RS, Oterino de la FD, Suárez GF, Diego RS, Fernández AR. Impacto de los ingresos urgentes innecesarios sobre las estancias hospitalarias en un hospital de Asturias. Rev Esp Salud Pública. 2005;79:541-9.

12. Luis Zambrana GJ, Delgado FM, Cruz CG, Díez GF, Dolores Martín EM, Salas CJ. Factores asociados a ingresos inadecuados en un servicio de medicina interna. Med Clin (Barc). 2001;116:652-4.

13. Perea García J, Lago Oliver J, Quijada García B, Garrido G, Muñoz-Calero A. Evaluación del uso hospitalario según el AEP (protocolo de evaluación de la adecuación) en un servicio de cirugía general. Cir Esp. 2000;68:52.

14. Luquero Alcalde FJ, Santos Sanz S, Pérez Rubio A, Tamames Gómez S, Cantón M, Castrodeza Sanz J. Factores determinantes de la estancia inadecuada en un hospital de tercer nivel. Gac Sanit. 2008;22:48-51.