

Appropriateness of hospital use

Report from an Italian study

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The objective was to assess the extent of inappropriate hospital admission and stay in an adult patient population and identify potential correlates of such inappropriateness. Design: a cross-sectional survey on a sample of 1,082 in-patients using a modified version of the appropriateness evaluation protocol (AEP). Setting: adult acute departments in a 950 bed teaching hospital in the greater Milan area. The patient sample consisted of patients cared for at 1 of the participating departments on any of 3 index days between October 1989 and June 1990. The results show that overall 27% of the admissions and 40% of the hospital days were inappropriate. The rate of inappropriate admissions was higher for patients admitted during week days and was also significantly associated with the admitting ward and the age of the patient. Inappropriate hospital-day stays were related to the type of ward and to the location during the stay, with those sampled in the later part of their stay having the highest rate of inappropriateness. Most of the hospital days rated as not appropriate did not require any further stay (75%). Conclusions: a substantial proportion of hospital use was found to be medically unnecessary and, for the most part, due to hospital functioning or the behaviour of the doctors. Some properties of the AEP (high inter-rater reliability, predictivity of expected associations) were also confirmed. The basic features of this revised version of the AEP make it a good candidate for becoming of great importance in monitoring the effect of the changes the Italian National Health Service is currently undergoing.

Key words: appropriateness of admission, appropriateness of stay, hospital utilization

Concerns about health care costs seem to have spread both in the US and Europe¹ together with increasing critical attention to the effectiveness of medical care. The assessment of hospital utilization finds its justification in the awareness that part of such utilization may be inappropriate either from the medical and economic viewpoints, i.e. patients receive either services that provide no significant benefits or services that could be rendered, at lower cost, elsewhere. Although several methods have been proposed to assess the medical necessity of hospitalization, all suffer from high subjectivity, low reliability, cost and complexity of implementation.²⁻⁴ The appropriateness evaluation protocol (AEP) has been shown to overcome most of these drawbacks while still retaining good validity and reliability.⁵⁻⁷ The AEP is a utilization review tool that has certain features that make it especially attractive. First, it is diagnosis independent and based on a set of explicit criteria whose compliance leads to the classification of a hospital day as appropriate. Secondly, estimates of the level of inappropriateness can be based on a cross-sectional analysis of a single day of

patient care making it vastly simpler and cheaper than the longitudinal or concurrent assessment on which most approaches are based. After a pilot investigation carried out in 1988 to test the feasibility and acceptability of the AEP in Italy,⁸ a larger study was undertaken to confirm the potential of the modified Italian version as a screening tool for subsequent quality assurance activities. This study had 3 objectives:

- to assess the reliability of the Italian version of the AEP,
- to measure the extent of inappropriate hospital admissions and days of care and
- to identify potential factors associated with inappropriate hospital utilization.

Based on the findings from the pilot study, we expected a relatively large amount of inappropriate hospital days. Moreover, we also predicted significant differences across admitting wards, according to the overall length of stay (LOS) and location within the stay of the day reviewed.

THE ITALIAN HEALTH CARE DELIVERY SYSTEM

Since approval of the 'National Health Service' (NHS) bill in 1978, health care has been provided largely free of charge at the point of consumption with no restrictions on eligibility, duration or level of care. Only a limited co-payment has been requested since the early 1980s for drugs, specialists' visits and tests for out-patient care. No co-payment was required for hospital care. Health care for a population of over 60 million inhabitants is provided through public facilities (public hospitals accounting for 82% of the total number of beds in 1991) or by contract-

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ing with private health care facilities or providers. Nationwide there are 5.7 hospital beds per 1,000 inhabitants, with an overall mean length of stay of 9.7 days (1991 data). At the time this study was carried out, the NHS had 3 tiers: the Central Government, the region and the local health unit (LHU). The latter was responsible for the delivery of health care and it was run by administrators appointed by political parties in charge of the local government. Financing came from employee and employers' contributions (about 40%), from Central Government (another 40%) and the rest from the LHU's own sources revenues. Most hospitals were owned and administered by the LHUs and no direct financial accountability was posed on administrators or doctors. From 1995 major changes in financing and organization have been taking place. While the 3 tiers still remain in operation, the main emphasis will be on introducing a form of 'managed competition' by separating 'purchasers' (the LHUs) from 'providers' (public and private health care facilities). All LHUs (whose number has been reduced from over 600 to less than 300) and a few large hospitals (approximately up to 40 in 1995) have become 'independent', being run by general managers (appointed by the regional government) who are supported by medical and administrative directors. Each LHU will receive a capitated fee (set equal to a 1.5 million Italian lira per inhabitant in 1995) from which it has to provide every resident citizen with a 'basic package of services' (called 'livelli uniformi di assistenza'). Hospitals' financing will shift from a global budget largely based on 'historical expenditures' to a prospective payment based on a 'resources-based' classification system.

METHODS

The instrument

The AEP is a standardized explicit tool specifically targeted at an audit of hospital care whose characteristics have been exhaustively described by Gertman and Restuccia,⁵ Restuccia et al.,^{6,9} Strumwasser et al.⁷ and Apolone et al.⁸ Briefly, the original AEP is a criteria-based decision support tool for determining the medical necessity of hospital admissions and days of care. It consists of sets of generic (i.e. applicable to all patients independently from diagnosis and severity of illness) and explicit (i.e. each criterion represents a pre-set distinct indication for in-patient care that alone justifies the episode of care) criteria for adult medical-surgical, paediatric and elective surgery cases. The standard medical-surgical form – the version adopted in this study as the source instrument – contains 2 separate sets of criteria for admission and stay, further divided in 2 and 3 subsets respectively. The admission section pertains to the patient conditions (n=11 criteria) and clinical services (n=7), while the day of care consists of medical services (n=11), nursing/life support services (n=7) and patient condition (n=9) criteria. Once a day has been identified as medically unnecessary (i.e. no information has been traced in the medical record matching at least 1 of the 28 explicit criteria), the AEP also allows the description of factors potentially responsible for such medically unnecessary episodes of care using a

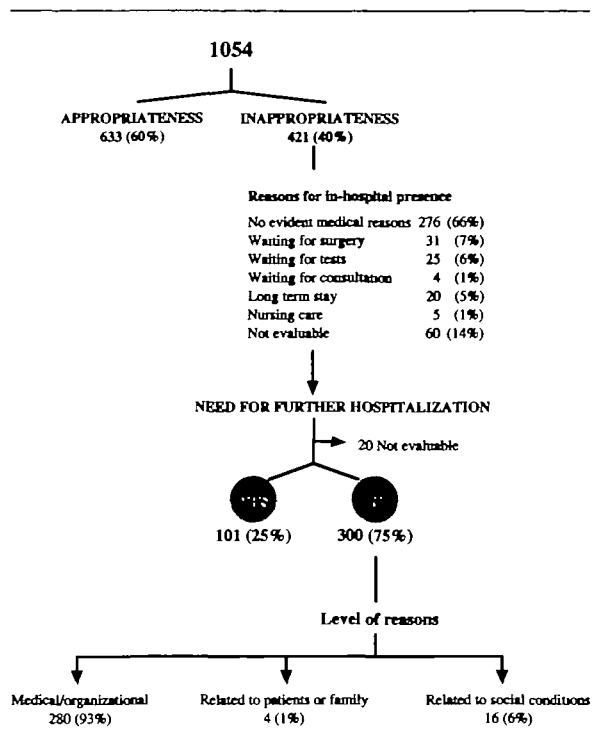


Figure 1 Main results of the study

complementary list of reasons and alternatives. If the hospital day did not meet any criteria, reviewers are also asked to judge implicitly the need for further hospitalization and indicate tentative reasons (see figure 1 for a decision tree scheme).

In the present study, the appropriateness of admission and length of stay was rated using a revised version of the adult medical-surgical AEP where a few changes were made in order to make it more suitable for the Italian setting (this modified version has been previously described and piloted in a study⁸ carried out at the same hospital). A short description of the Italian version of the AEP is displayed in figure 2. The full protocol is available from the authors upon request.

Study design and patient sample

The study was carried out at the S. Gerardo Hospital (Monza, Italy), a 950 bed teaching hospital. In the hospital wards that took part in the study on a voluntary basis (internal medicine, neurology, cardiology, pulmonary disease, gynaecology and general surgery), all patients present in the wards on 3 pre-selected index days (October 1989 and March and June 1990) were considered eligible for the retrospective application of the AEP list of criteria. Medical record reviews were carried out by 6 medically qualified investigators specifically trained in the use of the questionnaire. Reviewers were instructed to base their admission assessment only on the basis of the medical information relative to the day of admission and the following 24 h. Assessment of appropriateness of hospital stay was made only for the index day and not for the entire hospitalization. Each patient's chart was examined, independently, by a pair of reviewers allowing a formal test of inter-rater reliability. The final analysis is

Admission (Set A–B, 19 criteria)**A : Severity of illness (10 criteria)**

1– Pulse rate:

a: less than 50 beats per minute

b: greater than 140 per minutes

5– Acute bleeding

11– Acute loss of sight and hearing

B : Intensity of service (9 criteria)

4– Vital sign monitoring need during the day

5– Intravenous medications and/or fluid replacement

9– Treatments that require continous observations for reactions

Day of care (Set C–D–E, 23 criteria)**C : Medical services (11 criteria)**

1– Procedure in operating room that day

5– Biopsy of internal organ that day

9– Close medical monitoring by physicians

D : Nursing/life support (6 criteria)

1– Respiratory care

2– Parenteral therapy

4– Intake and output measurement

E : Patient condition (6 criteria)

4– Central nervous system failure within 48 hours

5– New acute myocardial infarction or stroke within 14 days before the index day

Figure 2 Italian version of the appropriateness evaluation protocol: structure and examples

based on data in which discrepancies were solved through discussion among reviewers. Information abstracted from each chart included the patient's name, age, sex, ward attended on the day reviewed, discharge diagnoses (principal and secondary, whenever reported) and overall and pre-index day LOS.

Statistical analysis

Three different models were built where proportions of agreement among pairs, rates of inappropriate hospital admission and stays were the dependent variables. The total LOS was used as a stratifying factor when appropriate, to account for the fact that the patient probability of being sampled and reviewed with a cross-sectional approach is proportional to his/her length of stay in hospital^{7,9}. The kappa statistic (k), a measure that corrects for agreement that may occur by chance, was used to assess the inter-rater reliability.^{10,11} The Pearson χ^2 test was used to test the significance of differences in the rates

of appropriateness between groups. The significance of the linear trend (i.e. the association between inappropriate hospital days and part of stay, operationally broken down into three thirds) was assessed using the Mantel–Haenszel test.¹²

RESULTS

A total of 1,082 patient days were identified in the 3 index days (348 in October, 363 in March and 371 in June) and complete data were available for 1,054 (97%). Fifty per cent were males and 57% were younger than 65 years (table 1). The largest number of patients were from 3 general medical ($n=345$, 32%) and 3 surgical ($n=356$, 34%) wards: 147 (14%) from neurology, 73 (7%) from cardiology, 71 (7%) from pulmonary medicine and 62 (6%) from gynaecology. The mean LOS was 29 days (median 19), with one-quarter longer than 30 days.

Reliability

The overall agreement and k statistic regarding the appropriateness of admission in hospital stay were computed for each pair. Overall, agreement was good in each pair (table 2).

Appropriateness of admission

Twenty-seven per cent (289/1054) were inappropriate admissions. Inappropriateness was significantly associated with the day of the week on which the patient was admitted, being highest on Monday and Friday (33%), and lowest on Saturday (12%) and Sunday (18%) ($p<0.001$). Younger patients were more often inappropri-

Table 1 Characteristics of the study population

Variables	Number	%
Sex		
Male	530	50
Female	524	50
Age (years)		
0–24	66	6
25–44	128	12
45–64	411	39
65–74	243	23
>74	203	20
NE	3	–
Ward		
Medicine	345	32
Surgery	356	34
Cardiology	73	7
Neurology	147	14
Pulmonary	71	7
Gynaecology	62	6
Length of stay (days)		
1–3	39	4
4–10	230	22
11–17	206	20
18–24	162	15
25–31	129	12
>31	288	27

NE: non-evaluable

Table 2 Results of the analysis of inter-rater agreement according to the 3 pairs of chart reviewers

	Pair 1 n=334	Pair 2 n=318	Pair 3 n=402
	% agreement -k (95% CI)	% agreement -k (95% CI)	% agreement -k (95% CI)
Type of assessment			
Admission	96 -0.91 (0.8-1.0)	96 -0.86 (0.75-0.97)	97 -0.93 (0.83-1.0)
Stay	94 -0.88 (0.77-0.98)	92 -0.83 (0.72-0.94)	99 -0.97 (0.87-1.0)

CI: confidence intervals at the 95% level of the k statistic

ately admitted (31 versus 25% among those younger and older than 65 years respectively) ($p=0.02$). Inappropriate admission rates varied also according to the wards where patients were sampled ($p<0.001$). Neurology (11%), cardiology (15%) and pulmonary medicine (15%) had the lowest rates compared to, in increasing order, internal medicine, surgery and gynaecology wards (25, 39 and 42% respectively). The appropriateness of admission did not vary according to the patients' gender and was quite consistent across the 3 index days reviewed (32% in October, 26% in March and 25% in June).

Appropriateness of days of care

The overall proportion of inappropriate admissions in hospital days was 40% (421/1054). Inappropriateness was significantly associated with the type of attending ward ($p<0.001$); for patients seen in gynaecology (16%) and cardiology (21%) wards, the rates were significantly lower than for others. Those sampled in the last third of their stay were more often deemed inappropriate than others (33 versus 37 versus 50%, for days sampled in the first, second and last third respectively, $p<0.001$). Patients inappropriately admitted were also more likely to be classified as inappropriate with respect to the hospital stay (58 versus 33% for inappropriate and appropriate respectively, $p<0.001$). Neither age, gender or other variables were significantly associated with the occurrence of appropriateness (table 3). In approximately 66% of the inappropriate days of stay, no medical reasons could be traced in the records that could explain the stay in hospital during the index day (figure 1). Moreover, 75% ($n=300$) of the days rated as inappropriate were also judged by reviewers as not needing further hospital care. Finally, the distribution of responsibilities in the inappropriate decision to keep patients in hospital is of some interest. Medical (delayed) decisions or hospital (poor) functioning were the justifications claimed by reviewers most of the time for inappropriate stay (93%), while in only 7% cases was the responsibility attributed to the lack of appropriate social or community-based alternatives.

Factors associated with appropriateness of day of care

The appropriateness of admission, type of ward and location for the stay of the day reviewed were all significantly associated with appropriateness. Although these findings were consistent with our⁸ and other^{5,9,13} studies, we further assessed the nature of such putative associations. As is shown in table 4 (left-hand side), in each of the 6 LOS

strata there was a higher rate of inappropriate stay among patients inappropriately admitted. When proper analysis of the association between the location within the stay and the appropriateness of stay was performed (table 4, right-hand side), in all but one stratum, cases sampled in the third

part of their stay were rated more frequently inappropriate than either the first and second thirds. The overall association and linear trend held significant even when cases with inappropriate admission were excluded from the analysis in order to minimize the potential bias due to the inappropriate admission evaluation (table 4, bottom 2 rows). Finally, when medical and surgical services were compared (still stratifying by LOS) we found that patients admitted in medical wards were more likely to be rated inappropriate compared to those in surgical ones (49 versus 35%) (table 5).

Table 3 Proportions of inappropriate hospital stays according to potential predictors

Variable	Inappropriate/total	%	p value
Admission appropriateness			
Yes	252/765	33	0.001
No	169/289	58	
Sex			
Male	210/530	40	0.8
Female	211/524	40	
Age (years)			
≤65	236/605	39	0.3
>65	187/446	42	
NE	3		
Ward			
Medicine	168/345	49	0.001
Surgery	123/356	35	
Cardiology	15/73	21	
Neurology	76/147	52	
Pulmonary	29/71	41	
Gynaecology	10/62	16	
Length of stay (days)			
1-3	13/39	33	0.5
4-10	85/230	37	
11-17	92/206	45	
18-24	68/162	42	
25-31	48/129	37	
>31	115/288	40	
Location within stay of the day reviewed ^a			
First third	102/306	33	0.001
Second third	129/353	37	
Third third	177/356	50	

NE: non-evaluable

a: Stays of 3 days or less not included ($n=39$)

Table 4 Proportions of inappropriate hospital stay according to overall length of stay, type of admission and location of the day reviewed within the stay

	Number of patients	Admission (%)		Location within stay (%) ^a		
		Appropriate n=765	Inappropriate n=289	1st/3rd n=306	2nd/3rd n=353	3rd/3rd n=356
Overall length of stay (days)						
1-3	39	4	100	—	—	—
4-10	230	29	59	19	35	57
11-17	206	36	59	43	37	56
18-24	162	35	57	37	35	55
25-31	129	32	49	40	39	32
>31	288	36	56	38	36	45
Total	1,054	33	58 ^b	34	37	49 ^b
Total ^c	765	—	—	19	31	47 ^b

a: Stays of 3 days or less not included

b: $p < 0.001$

c: Inappropriate admissions were excluded (n=289)

The entries in the right-hand side of the table represent the percentages of inappropriate stay in each length of stay stratum.

DISCUSSION

The AEP is a utilization review tool used to assess whether medical instability, severity of illness or type of clinical services justify in-hospital care for a given patient.⁵ The strengths and limitations of the instrument are well known in the United States where it was developed, tested and used several times.^{5,6,9,13-16}

In Italy, the revised version which has been adopted has kept its excellent reliability, well comparable with the data reported by Restuccia et al.⁶ and other independent authors such as Kemper,¹³ Siu et al.,¹⁴ Rishpon et al.,¹⁷ and was able to detect expected phenomena and also identify correlations between inappropriateness and potential predictors.

Inappropriateness estimates are high and not completely surprising for the Italian hospital system where provision

of in-patient care is free of charge and hospital doctors are not required to justify their decisions about prolonging or shortening the stay of patients. Furthermore, the excess of doctors and the lack of nurses and social workers has led to a primary care dominated by general practitioners to whom hospital care is an easy to use surrogate for a lower level of care, in particular for specific categories of patients (i.e. in the case of the elderly a 'premature' hospital admission is sometimes a way to bypass an otherwise long waiting list to obtain access to diagnostic tests). Differences in the rate of inappropriateness among departments are also not surprising and must be investigated with a deeper understanding of the different potential determinants involved. Unanticipated, interesting findings were the low frequency of the so-called 'social factors' responsibilities and the large amount of those generically labelled as 'medical/organizational'. A systematic underestimation of the social factors cannot be ruled out. Recording in a medical record is the doctors' prerogative in Italy and in this sense this may not be an appropriate source of information as social factors may be more easily picked up by nurses. Nevertheless, in a concurrent sample of patients admitted to geriatric wards in the same hospital where the same evaluative approach was adopted (data not shown in this report) the rate of reasons attributed to 'social factors' was somewhat higher (20%).

Two main reservations have been raised relative to the use of the AEP in Italy:

- the criteria could be too strict and
- the assessment could be negatively affected by the poor quality of the medical record.

The claim of strictness deserves some comments. Although each criterion might be judged to be arbitrary to a given extent, we have already seen through Apolone's et al.⁸ pilot investigation that, with few exceptions, the AEP criteria could be applied to an average Italian hospital. When we scrutinized the frequencies of the 3 sets of criteria related to the hospital stay, the clinical conditions and/or the need for medical services were met less often. The criterion 'fluid infusion without balance monitoring' turned out to be the criterion most frequently used. This suggests that hospital days are often justified by the AEP criteria related to the intensity service needed, suggesting that an overestimate of appropriateness is more likely to have occurred. Moreover, the limited use of override options (7% of the total sample) indicates that the reviewers felt rather comfortable with the set of explicit

Table 5 Proportion of inappropriate hospital stays, according to overall length of stay and admitting ward specialty

	Number of patients	Department (%)	
		Medicine n=345	Surgery n=356
Overall length of stay (days)			
1-3	28	75	25
4-10	136	57	36
11-17	118	58	41
18-24	119	52	34
25-31	101	41	40
>31	199	45	24
Total	701	49	35 ^a
Total ^b	476	39	28 ^a

a: $p < 0.001$

b: Inappropriate admissions were excluded (n=225)

The entries in the right-hand side of the table represent the percentages of inappropriate stay in each length of stay stratum.

criteria included in the questionnaire. As for the source of the data (i.e. the medical record), all the items used to assess appropriateness belong to the medical care domain and it is customary to record them in the charts, even when they refer to minor procedures like, for instance, the 'fluid infusion' practice. For all these reasons we do believe that incompleteness of the medical record should not therefore represent a major threat to the applicability of the AEP and to the validity of our conclusions.

It must be noted, on the other hand, that the sections of the AEP exploring reasons or responsibilities for inappropriate stay do not seem adequately suited to the Italian system. The most obvious reason is a lack of pertinent reporting in the patient's charts (see the large amount of inappropriate days labelled with 'no evident medical reasons' or 'not evaluable at all'), possibly aggravated by the retrospective approach adopted. It is somewhat puzzling, however, that even in another study carried out more recently using a prospective data collection approach, the frequency of inappropriateness attributable to 'social factors' appeared to be very low. The issue should probably be investigated more closely and it is likely to vary quite substantially in different types of departments.

CONCLUSIONS

The attention that is increasingly paid in Europe to the promotion of quality of care and assurance activities seems to require simple, reliable and inexpensive systems for regularly reviewing the appropriateness of the care provided. The basic features of the AEP and its good properties when tested outside the US context make it a good candidate to be, in its original form or properly modified, a widely usable screening tool for hospital utilization reviews. It is certainly worth noting that despite the profound differences between the Italian and US health care systems our results do not differ substantially from those that emerged in the USA, in particular when compared to studies carried out before the implementation of the prospective payment system.⁶ Whether this indicates that an 'unavoidable inefficiency' affects hospitals' functioning regardless of the specific features of the health care systems might be the result of international comparative surveys worth being planned for the future. For now a European project aimed at assessing the comparability of results obtained in different countries has been launched within the framework of the Biomed Programme.¹⁸ By the end of the project (1996) a formal comparative international study will have been carried out using a common 'European' version of the

AEP together with a standardized list of reasons for inappropriate admission and days of stay.

The protocol, operative materials and preliminary results are available from the authors upon request.

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