

Understanding inappropriate hospital admissions of patients presenting to the Emergency Department

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Abstract

Objectives. To identify 1) the characteristics of patients receiving non acute (inappropriate) care and 2) the variables associated to inappropriate hospital use, in order to 3) estimate the relevance of the problem and to 4) focus future concurrent reviews and efforts to allocate patients to alternative health care settings.

Design. A prospective review of a random sample of adult patients who presented to the Emergency Department of the Molinette Hospital. Patients were assessed at admission and on day 3, 5 and 8 using the Appropriateness Evaluation Protocol (Italian validated version). Patients: 490 overall; 312 (64 %) medical and 178 (36 %) surgical.

Outcome measures. Acute (appropriate) and non acute (inappropriate) admissions, Major Disease Category, costs, mean weights of Diagnosis Related Groups, and length of stay (days).

Results. The proportion of patients requiring acute care declined rapidly from presentation (84.5%) to the fifth day of admission (60.9%). Patients admitted during weekends showed a higher rate of inappropriate stay on day 5 ($P=0.04$). The proportion of inappropriate admissions was higher for medical rather than surgical patients ($P=0.07$) at presentation and at day 5 ($P < 0.01$). Traditional social-demographic variables were not significant risk indicators for inappropriate admissions. The likelihood ratio for inappropriate admission at presentation was significantly higher for minor illnesses and disturbances ($P=0.03$). Inappropriate stay on day 5 was significantly associated with lower cost ($P < 0.01$), lower mean DRG weight ($P < 0.01$) and shorter length of stay ($P=0.05$) for medical but not for surgical admissions.

Conclusions. Traditional epidemiological indicators are inadequate to target prospective concurrent reviews. Qualitative studies focusing on patient physician dialogue in different situations and contexts could widen our understanding of the problem and suggest new theoretical frameworks and theories to provide us with more detailed explanations.

Key words: *appropriateness of care, concurrent review, indicators of inappropriate use, Emergency Departments, costs*

Introduction

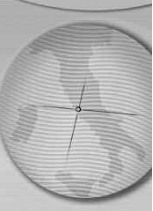
Internationally, reviews relating to the inappropriateness of hospital care, defined as an admission which results and benefit could have been obtained at a lower level of care [1], show that variable proportions of patients admitted to hospitals do not require the services of acute care institutions. There is, therefore, room for increasing the efficiency of health care systems by

improving the allocation of patients to appropriate intensity of care settings [2-6].

The payment system based upon Diagnosis Related Groups (DRG's), using the third payer model, recently introduced in Italy, has made the problem of optimising the usage Hospitals and Emergency Departments a target of increasing concern [7,8].

Of the many studies undertaken, only a few of them have focused specifically on admissions

(*RS was responsible for the design of the study and for drafting the article. NR made substantial contribution to the design and conducted the study. GR conducted the data analysis, made substantial contributions to the data discussion and participated in writing the paper. DM assisted in the conduction of the study and reviewed the literature. MMG made contribution to the data discussion. GR was responsible for revising the paper. The Collaborating Group was responsible for data collection.



from Emergency Departments [6,7,9,10], even though their role is crucial in the efficient allocation of bed resources. In this context the evaluation of the patient in relation to the possible admission differs markedly from the elective referral of non-acute conditions and presentations. Patients needs, demands, and expectations are much more influential in an Emergency Department setting, where physicians often face unfiltered acute presentations and have to mediate with both the patients' perceived urgency and the best decision in relation to the optimal use of available resources.

Utilization reviews have often been applied to estimate inappropriate hospital usage by retrospectively assessing hospital records. This approach has the advantage of being inexpensive, consuming few resources, but it is often biased by the quality of the clinical records. Concurrent review of every patient admitted by specifically trained personnel is a more reliable source of estimate but it is very resource intensive and expensive. As a consequence, it is neither easy nor convenient to introduce a routine policy of concurrent prospective review for each presenting patient [2]. In order to focus future monitoring processes, it could be very useful to identify patient or institutional characteristics that predict the increased risk of inappropriate admission.

We therefore conducted a prospective concurrent review in a random sample of patients presenting to the Emergency Department of Molinette Hospital in Torino in order to estimate the proportion of patients needing acute inpatient care and to identify patient characteristics associated with inappropriate admissions, in order to focus the problem and to plan monitoring policies for the future.

Methods

Target and study population

The target population consisted of consecutive medical and surgical patients who presented to the Emergency Department of Molinette Hospital in Torino during a one year period (1999).

Molinette Hospital is a teaching hospital with 1800 beds, with an average of 90.000 presentations to the Emergency Department (30 beds) and 50.000 ordinary admissions per year. Psychiatry, dermatology and intensive care patients were excluded as not covered by the assessment instrument (PRUO).

Sampling design

The study design was a prospective concurrent assessment of appropriateness during two different seasonal periods (February and June

1999). Based on the 1998 data which showed 1400 admissions during these months and an inappropriateness rate of 35% for our Region (unpublished data), 490 patients were sampled (244 in February and 246 in June).

The sampling method involved three stages: sampling from medical and surgical admissions, then sampling for the two index months, and finally sampling two different week days per week for each month in order to have all week days represented.

Assessment

We used the Appropriateness Evaluation Protocol criteria [11] to assess whether the patient required acute care. These criteria are based on clinical patient characteristics and some specific procedures or services received. The criteria are independent of diagnosis and have been broadly accepted [6-10,12-16] and applied by physicians, allowing data comparisons between different studies. An Italian translation is available and has been externally validated (PRUO) [11,17].

The assessment was performed prospectively and concurrently by 2 medical student who were involved for their final thesis prior to qualifying as medical doctors, and 6 postgraduate students from the Specialist School of Public Health at the Turin University.

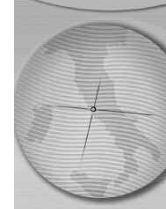
They all received training which comprised of formal teaching and practical experience by abstracting a random sample of patient records prior to the study commencing.

Inter-rater reliability (kappa) was statistically significant, with a level greater than 70% being used as the criterion for adequate agreement in order to start the prospective data collection process [13].

Patients were assessed by the eight medical investigators upon presentation (first 24 hours) in the Emergency Department, and then again during their stay on days 3, 5 and in the medical or surgical wards. Each day of stay was assessed independently, irrespective of the findings for any other day, using data from clinical records and active interviews with personnel and patients (when applicable).

Data from PRUO were linked with the Discharge Record Data Base, a valid source of hospital information. This database includes many of the patients characteristics, ICD-9-CM diagnosis, Diagnosis Related Groups and the corresponding cost, major disease category and duration of hospitalisation.

In the database patients' social and demographic characteristics are coded following the Italian



Census coding system. Codes for occupation are employed, unemployed, in search of their first job, housewife, student, retired, not declared and other. Education is coded as university degree, high school, secondary school, primary school, no title and not declared. Marital status was coded as single, married, separated, divorced, widow and not declared.

Statistical methods

Inter-rater reliability (kappa) was evaluated during the training phase before the concurrent data collection process.

Upon data collection being completed, we tested our sample to verify that it was representative of the target total admission population of the Molinette Hospital for 1999 with respect to age, sex, town of residence, school, marital status and occupational status. We used the analysis of variance for age and the chi squared test, adjusting for multiple significance testing for the other variables. The sample was found representative at the 5% significance level and allowed us to generalize the findings from the study population to the target population of the Molinette Hospital.

To identify characteristics of patients receiving non acute (inappropriate) care and variables associated to inappropriate hospital use, we applied as outcome indicators both the presentation and the 5th day (peak of inappropriateness) classification of the patients into acute (appropriate) versus non acute (inappropriate) status. Chi squared tests and analysis of variance were applied for the comparison of appropriateness amongst the subgroups identified by the candidate variables.

We applied the Bonferroni method of adjustment for multiple significance testing when indicated.

Results

Inter-rater reliability

The agreement among medical investigators improved with the training process, and before starting the data collection phase, all investigators were in agreement statistically significant level of greater than 70%.

Need for acute care by length of stay

We identified the proportion of patients in need for acute care at presentation and on the third, fifth and eighth day of stay and as well as the duration of hospitalisation.

The proportion of patients requiring acute care declined rapidly from presentation to the fifth day of admission. The values were 84.5% for the first day (95% confidence interval [CI] 77.1% to

91.9%), 71.1% (95% CI 64.8 to 77.4) for the third day, 60.9% (95% CI 55.5 to 66.3) for the fifth day, and 65.5% (95% CI 59.7 to 71.3) for the eighth day.

The 5th day of stay was the peak for inappropriate hospital stay and was used as an outcome indicator together with appropriateness at presentation in the statistical analysis.

We identified 73 (14.9%) inappropriate admissions at presentation. On the 5th day of stay (peak of inappropriateness) 102 (39.1%) patients were classified as inappropriate.

Need for acute care by age

The mean age was 63 years, with a median of 68 and a range of 15-94 years.

Age was not significantly associated with inappropriate (non acute) admissions at presentation ($P = 0.93$) or 5th day of stay ($P=0.86$).

The significance of age was evaluated separately for medical and surgical presentations ($P=0.92$ and $P=0.45$) and 5th day of stay in a medical or surgical ward ($P=0.15$ and $P=0.50$).

Given the asymmetry of the age distribution, with more patients in the older age range, the median was used to split the sample into two subgroups. The results of this comparison for appropriateness between the two subgroups at presentation and at the 5th day of stay are reported in Table 1 and Table 3. Patients older than 68 years were more frequent, but age was not a significant predictor for inappropriate admission or 5th day stay.

Need for acute care by day of presentation

In order to evaluate the effect of unavailability of general physicians on weekends, as their offices are closed, we compared the proportion of inappropriate admissions during weekends and weekdays.

The comparison for appropriateness between the two subgroups was not statistically significant ($P=0.87$) at presentation but at 5th day of stay the percentage of inappropriate admissions was significantly higher for patients admitted during the weekend (51.8 versus 48.2, $P=0.04$) as shown in Tables 1 and 3.

Need for acute care by season

The percentage of inappropriate admissions at presentation was not significantly different in February compared to June (Table 1). In February, on the 5th day of stay, 59.8% of admissions were inappropriate as compared to 40.2% in June, this comparison for appropriateness between the two seasonal subgroups was statistically significant ($P = 0.05$).

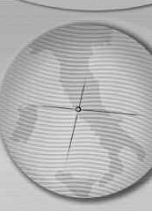


Table 1. Appropriateness data at presentation

Variable	Subgroups	Appropriate		Inappropriate		P
		%	95 % CL	%	95 % CL	
Age	Less than 68 years	47.1	43.0 – 51.2	46.6	42.5 – 50.7	0.93
	Older than 68 years	52.9	48.3 – 57.5	53.4	48.7 – 58.1	
Day of week	Weekend	42.8	39.1 – 46.5	43.8	40.0 – 47.6	0.87
	Weekday	57.2	52.2 – 62.2	56.2	51.3 – 61.1	
Season	February	52.0	47.4 – 56.6	48.0	43.8 – 52.2	0.54
	June	48.0	43.8 – 52.2	52.0	47.4 – 56.6	
Ward	Medical	65.7	59.9 – 71.5	54.8	50.0 – 59.6	0.07
	Surgical	34.3	31.3 – 37.3	45.2	31.3 – 37.3	
Gender	Male	59.5	54.3 – 64.7	49.3	45.0 – 53.6	0.11
	Female	40.5	37.0 – 44.0	50.7	46.3 – 55.1	
Residence	Turin	72.7	66.3 – 79.1	67.1	61.2 – 73.0	0.32
	Other area	27.2	24.8 – 29.6	32.9	30.0 – 35.8	
Occupation	Retired from work	33.6	30.7 – 36.5	40.3	36.8 – 43.8	0.27
	All others	66.4	60.6 – 72.2	59.7	54.5 – 64.9	
	Employed	19.2	17.5 – 20.9	22.2	20.3 – 24.1	
School	All others	80.8	73.7 – 87.9	77.8	71.0 – 84.6	0.56
	Higher then secondary	21.7	19.8 – 23.6	29.4	26.8 – 32.0	
	All Others	78.3	71.4 – 85.2	70.6	64.4 – 76.8	
Marital status	Higher then primary	42.5	38.8 – 46.2	44.1	40.2 – 48.0	0.81
	All Others	57.5	52.5 – 62.5	55.9	51.0 – 60.8	
	Married	59.2	54.0 – 64.4	61.6	56.2 – 67.0	
All Others	All Others	40.8	37.2 – 44.4	38.4	35.0 – 41.8	0.70
	Widow	21.4	19.5 – 23.3	23.3	21.3 – 25.3	
	All Others	78.6	71.7 – 85.5	76.7	70.0 – 83.4	

Table 2. Major Disease Category at presentation

MDC	Appropriate %	Inappropriate %	Lik *	P
Nervous system	9.3	5.5	0.59	
Eyes	0.5	0.0	0.0	
Ear Nose Throat	5.5	13.7	2.5	
Respiratory	13.1	8.2	0.6	
Cardiovascular	25.2	23.3	0.9	
Gastrointestinal	19.1	6.9	0.4	
Liver and pancreas	8.1	11.0	1.4	
Musculoskeletal	3.5	6.9	1.9	
Skin	2.7	5.9	2.2	
Endocrinology and metab.	1.3	2.7	2.0	
Kidney and urinary	4.5	12.3	2.7	
Reproductive (male)	0.8	1.4	1.7	
Blood and immunity	2.0	0.0	0.0	
Neoplasia	0.8	0.0	0.0	
Infective	1.5	0.0	0.0	
Mental	1.0	1.4	1.4	
Alcohol and drugs	0.3	0.0	0.0	
Trauma and poisoning	0.3	1.4	4.6	
Various Factors	0.3	0.0	0.0	
Multiple trauma	0.3	0.0	0.0	0.03

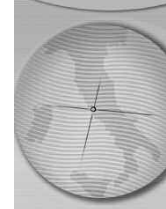
* Likelihood ratio for inappropriate admission = percentage inappropriate admissions / percentage appropriate admissions.

Need for medical versus surgical acute care

The random sample of 490 patients was represented by 178 (36%) surgical and 312 (63.7%) medical admissions. The proportion of inappropriate

admissions was higher for medical than surgical patients (P=0.07) at presentation (Table 1).

The difference reached statistical significance when analysed on the 5th day of stay (P < 0.01)


Table 3. Appropriateness data 5th Day of stay

Variable	Subgroups	Appropriate		Inappropriate		P
		%	95 % CL	%	95 % CL	
Age	Less than 68 years	43.1	39.3 – 46.9	44.1	40.2 – 48.0	0.86
	Older than 68 years	56.9	51.9 – 61.9	55.9	51.0 – 60.8	
Day of week	Weekend	40.2	36.6 – 43.8	51.8	47.2 – 56.4	0.04
	Weekday	59.8	54.5 – 65.1	48.2	43.9 – 52.5	
Season	February	49.3	44.9 – 53.7	59.8	54.5 – 65.1	0.05
	June	50.7	46.2 – 55.2	40.2	36.6 – 43.8	
Ward	Medical	60.3	55.0 – 65.6	77.5	70.6 – 84.4	< 0.01
	Surgical	39.7	36.2 – 43.2	22.5	20.5 – 24.5	
Gender	Male	56.7	51.7 – 61.7	52.7	48.0 – 57.4	0.47
	Female	43.2	39.4 – 47.0	47.3	43.1 – 51.5	
Residence	Same area	70.4	64.1 – 76.7	71.4	65.1 – 77.7	0.99
	Other area	29.6	27.0 – 32.2	28.6	26.1 – 31.1	
Occupation	Retired from work	67.3	61.3 – 73.3	69.7	63.5 – 75.9	0.65
	All others	32.7	29.8 – 35.6	30.3	27.6 – 33.0	
School	Higher then secondary	21.0	19.2 – 22.8	20.6	18.8 – 22.4	0.99
	All Others	79.0	72.0 – 86.0	79.4	72.3 – 86.5	
	Higher then primary	37.4	34.1 – 40.7	41.2	37.6 – 44.8	
	All Others	62.6	57.0 – 68.2	58.8	53.6 – 64.0	
Marital status	Married	58.3	53.1 – 63.5	67.0	61.1 – 72.9	0.51
	All Others	41.7	38.0 – 45.4	33.0	30.1 – 35.9	
	Widow	22.6	20.6 – 24.6	20.5	18.7 – 22.3	
	All Others	77.4	70.5 – 84.3	79.5	72.4 – 86.6	

with a non acute rate of 77.5% for medical and 22.5% for surgical patients ($P < 0.01$) (Table 3).

Need for acute care by socio-economic and other patient characteristics

The sex distribution of patients was 280 (57%) males and 210 (43%) females.

The percentages of inappropriateness at admission were 49.3% (95% CI 45,0 to 53,6) for males and 50.7% (95% CI 46,3 to 55.1) for females. The comparison for appropriateness was not statistically significant ($P=0.11$) (Table 1).

On the 5th day of stay the percentages were 52.7% for males and 47.3% for females. The comparison for appropriateness remained non-significant ($P=0.47$).

Most patients (348, 71%) were resident in Torino, the remaining (142, 29%) had to travel in order to reach the Emergency Department. The percentages of inappropriateness at admission were 67.1% for residents and 32.9% for patients from other areas. This comparison for appropriateness was not significant ($P=0.32$) (Table 1).

On the 5th day of stay the percentages were 71.4% for residents and 28.6% for patients from other areas. The comparison for appropriateness remained non-significant ($P=0.99$) (Table 3).

Occupational status was analysed following the Italian Census Coding System. In the study

population 319 (65%) patients were retired, 98 (20%) were still working and the remaining were students, housewives or unemployed.

At first a comparison was made between those retired and all those in the other categories.

The percentages of inappropriate admissions were 40.3% for those who were retired and 59.7% for the other group. The comparison for appropriateness was not significant ($P=0.27$) (Table 1).

On the 5th day of stay the percentages were 69.7% for those who were retired and 30.3% for the other group. The comparison for appropriateness was not significant ($P=0.65$) (Table 3).

A second comparison involved workers versus all other subgroups.

The percentages of non-acute admissions were 22.2% for workers and 77.8% for the others. The comparison for appropriateness was not significant ($P=0.56$) (Table 1).

On the 5th day of stay the percentages were 14.7% for workers and 85.3% for the others. The comparison for appropriateness was not significant ($P=0.51$) (Table 3).

Education

First a comparison was done between higher versus lower than secondary school education level. At presentation the percentages of non-acute patients in these categories were 29.4% and

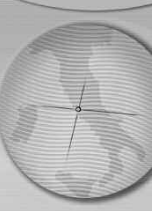


Table 4. Major Disease Category at 5th day of stay

MDC	Appropriate %	Inappropriate %	Lik *	P
Nervous system	7.9	12.5	1.6	
Eyes	0.4	0.0	0	
Ear Nose Throat	4.9	3.6	0.7	
Respiratory	13.1	11.6	0.9	
Cardiovascular	20.7	25.9	1.3	
Gastrointestinal	22.2	10.7	0.5	
Liver and pancreas	11.7	8.0	0.7	
Musculoskeletal	4.5	6.3	1.4	
Skin	3.8	2.7	0.7	
Endocrinology and metab.	1.5	1.8	1.2	
Kidney and urinary	4.5	7.1	1.6	
Reproductive (male)	0.8	1.8	2.3	
Blood and immunity	0.7	3.6	5.1	
Neoplasia	0.7	0.9	1.3	
Infective	0.8	1.8	2.3	
Mental	1.1	0.9	0.8	
Alcohol and drugs	0.0	0.9	0.0	
Trauma and poisoning	0.4	0.0	0.0	
Various Factors	0.4	0.0	0.0	
Multiple trauma	0.0	0.0	0.0	0.29

* Likelihood ratio for inappropriate admission = percentage inappropriate admissions / percentage appropriate admissions.

70.6% respectively. The comparison for appropriateness was not significant (P=0.17) (Table 1).

On the 5th day of stay the percentages were 20.6% and 79.4% with no significant difference (P=0.99) for appropriateness (Table 3).

The comparison for appropriateness was also not significant when higher versus lower than primary school education levels were compared (Table 1 and Table 3).

Marital status

The comparison for appropriateness for those either married or widow when compared to all of the other categories was not significant (Table 1 and Table 3).

Medical versus surgical admissions

All of the previous statistical analyses were repeated after stratification for either medical and surgical presentation, with no change in the conclusions.

Need for acute care by diagnosis

For each of the Major Disease Categories reported in the discharge record the likelihood ratio for inappropriate admission was calculated as the percentage of inappropriate admissions/percentage of appropriate admissions for each category. The results for presentation and 5th day of stay are reported in Table 2 and 4. The Major Disease Categories associated with non-acute

admission were significantly different at presentation (P=0.03) but not on the 5th day of stay (P=0.29).

The likelihood of non-acute admissions were less than 1 for the most clinically important disease categories such as the nervous, respiratory, cardiovascular and gastrointestinal systems as well as cancer. The likelihood was often higher for minor illnesses and disturbances like trauma (Molinet Hospital is not the referral Hospital for major trauma) and poisoning, ear nose and throat, musculoskeletal, skin and mental health categories.

Admission costs in million Euros, Disease Related Group (DRG) mean weight and days in hospital for acute versus non-acute admissions were compared and the result are reported in Table 5.

No significant difference was found for appropriateness at presentation.

For patients found to be inappropriate on the 5th day, the cost of admission (obtained from the separation record) was significantly lower than for appropriate admissions (P < 0.01). DRG mean weight was also significantly lower (P < 0.01) and days in hospital were significantly less than those for acute admissions (P=0.05).

When medical and surgical admissions were analysed separately, no significant difference was found for appropriateness at presentation.

For patients inappropriate on the 5th day, the cost of admission (obtained from the separation

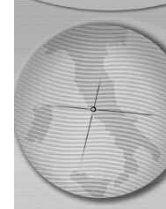


Table 5 Costs, Disease Related Group mean weight and days of stay for appropriate versus inappropriate admissions.

		Appropriate Means +/- SD	Inappropriate Means +/- SD	P *
Presentation	Cost	3.3 +/- 1.7	3.2 +/- 0.8	0.10
	DRG weight	1.6 +/- 0.9	1.4 +/- 0.3	0.12
	Days in Hospital	14.4 +/- 9.1	16.1 +/- 11.3	0.84
5 th Day	Cost	3.8 +/- 2.5	2.7 +/- 0.6	< 0.01
	DRG weight	1.8 +/- 0.9	1.2 +/- 0.6	< 0.01
	Days in Hospital	18.3 +/- 12.1	14.7 +/- 9.3	0.05

* Given the marked skew to the right in the distributions of raw data, a logarithmic transformation was performed for statistical analysis.

record) was significantly lower than for appropriate admissions ($P < 0.01$) for medical but not for surgical patients ($P=0.21$).

DRG mean weight was significantly lower ($P < 0.01$) for medical but not for surgical patients ($P=0.24$) and days in hospital were significantly less for acute medical admissions ($P < 0.01$) but not surgical admissions ($P=0.80$).

As the study sample was representative of the target total admission population of the Molinette Hospital and considering an average of 50,000 admissions per year, we can estimate 7,750 patient admissions (95% CI 4550 to 11450) were non acute at presentation at a cost of 25 million Euro (95% CI 12.11 to 48.71) and resulting in 124 775 days in hospital (95% CI 73255 to 184345).

We can also estimate that 19 950 (95% CI 16850 to 22250) patients who were non-acute on the 5th day of stay cost 57 million Euro (95% CI 36.72 to 89.16) for a total of 293 265 days in hospital (95% CI 247695 to 327025).

Discussion

The major aim of the study was to identify patient and organisational characteristics more often associated with inappropriate admissions. To this end a reliable assessment of appropriateness was a prerequisite. Although the Italian version of the Appropriateness Evaluation Protocol (AEP, Italian version PRUO) is one of the most widely used and validated instruments, it still has some limitations such as a certain degree of subjectivity in its assessment, the inadequacy to account for the specific characteristics of routine clinical practice in different hospitals, [18] and the dependency of results on the documentation available in the wards.

In order to reduce the subjective component, the physicians involved in data collection had to be trained specifically to the use of the instrument and inter observer agreement was obtained by practising repeatedly with both real and simulated cases with different degrees of complexity.

As for the incomplete coherence of the instrument to the clinical routine of different

hospitals [5], we had to take into account that the monitoring of vital signs and the physician's visit in a teaching hospital like the Molinette, are routine and are usually performed more than once a day, irrespective of the patient's severity, therefore, when considered separately, they cannot be considered sufficient indicators of acuteness.

In order to avoid the limitations associated with the retrospective assessment of clinical records, we decided to choose the more expensive protocol of a concurrent review of every patient admitted in order to get reliable results by paying due attention to personnel training and to the collaboration of nurses and patients [19], hoping to identify high risk patients and conditions.

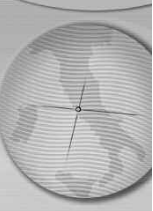
International studies utilizing AEP gave extremely heterogeneous inappropriateness rates for emergency admissions [20-22].

The most recent Italian study by Angelillo et al. [3], reported an inappropriateness rate at admission of 9.8% with a 39.6% peak during the hospital stay. In light of this how do we explain our inappropriate admissions rate of 15.5%? In reality there will probably always be a small percentage of inappropriate admissions, as it is difficult to imagine a system for answering medical problems that is able to perfectly match medical and patient's perceptions of acuteness with the perfect use of resources.

Part of the inefficiency is certainly related to the high turnover and workload of a teaching hospital's Emergency Department, where there is generally less time for careful evaluation on some weekdays and during some seasons.

There is the perverse effect of feed forward, whereby because a system uses resources inefficiently, the same resources will be used less efficiently, amplifying the effect of the initial decision, so the decision to admit a patient inappropriately will consume resources and stress diagnostic facilities and operating rooms already under the market strain.

The percentage of non-acute patients increased from presentation to the 5th day of stay, then started to decrease progressively, as reported in the literature [2,23]. Two possible explanations



are 1) the presentation was acute, but hospital care was effective in rapidly improving the patient's condition to a non acute state (as defined by PRUO); 2) patients presented to the emergency department with a more-acute-than-usual condition that rapidly improved spontaneously, giving the impression of successful treatment. Both explanations do not tell us why the patient were not discharged from the hospital or moved to an alternative care setting.

Some patient characteristic were reported in the literature as being predictive of inappropriateness. Advanced age has often been reported as associated to inappropriate admission and prolonged hospital stay [2,23], while in others it was low social class. The traditional social and demographic explanations for inappropriate admissions were not confirmed as significant in our study. Most of the characteristics of patients receiving inappropriate care were not statistically different from those who were appropriately admitted. Both appropriate and inappropriate admissions reflected the composition of the population presenting to the Emergency Department. Therefore it is not possible to focus future concurrent reviews on subgroups of patients at high risk of inappropriate admissions via emergency departments using these characteristics.

Minor illnesses and trauma were significantly associated to the increased likelihood of inappropriate admissions [2] during weekends [1,3] and the winter season. This suggests that the response by Emergency Medical Physicians is less than adequate when the preliminary filter of the general practitioner is not working, resulting in a tendency to overestimate minor illnesses and problems.

The acuteness of these patients conditions generally resolved rapidly however as a consequence of being admitted, the patient often spent further days in hospital waiting for tests to discount the possibility of a more severe diagnosis. In our study, on the 3rd day of stay, 50% of the non-acute patients were waiting for the tests to be carried out or the test results and 27% of surgical admissions were waiting to have the surgical intervention (data not shown).

The hypothesis that in our sample, inappropriate admissions were less severe, was confirmed by the lower mean weight of the Disease Related Groups, the lower cost and number of days these patients spent in hospital compared to those who were admitted appropriately.

The likely explanations are different for medical and surgical admissions. Inappropriate surgical admissions were associated with more days in

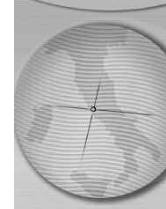
hospital and mean DRG weights not significantly different from those of appropriate admissions. The reason being that inappropriate surgical admissions were not scheduled for the operating theatre, so they had to wait a few days before the indicated (but non acute) intervention was performed. On discharge, the costs and mean DRG weights are similar to the appropriate surgical admissions because the intended surgical intervention had been performed in most cases irrespective of the appropriateness of the emergency admission.

The situation is different for inappropriate medical admissions. The inappropriate decision to admit patients was more common for minor illnesses and disturbances, during weekends when the primary care is not working as a gatekeeper, as well as during the winter season, which is characterised by various inconsequential infective disorders. However, as a consequence of being admitted, another physician had to discount the emergency department's physicians reason for admitting the patient. "Defensive medicine" probably plays a large role in these cases, as it takes a few days and many tests to discount the referral for more acute care.

The reduced cost of inappropriate admissions might suggest that inappropriateness is less of a problem in economic terms [1]. But focusing on costs alone does not take into consideration the perverse effects on the rational use of resources, considering that these patients are often examined as a priority by the attending physician, in order to exclude a severe condition and to be able to discharge the patient as soon as possible. Furthermore the admission is associated with risks [4,8,24,25] and it is highly improbable that the experience of being admitted would improve the patients quality of life [1].

Descriptive studies of the patient-physician relationship in the Emergency Department, paying particular attention to values, expectations and patterns of interactions could lead to better models of inappropriate use and focus interventions to allocate non acute illnesses to alternative care settings. Even though AEP is probably the best tool available at present for assessing hospital utilization and the related internal organisational problems [7], the real challenge is to identify and understand the interaction patterns that more often than not lead to inappropriate admissions.

The detailed, continuous, routine audit of hospital admission data, as required in the recent *legge finanziaria* [26], is not a simple process. New interpretive models have to be developed to



understand and influence the allocation of patients by physicians in the Emergency Department to different levels and contexts of care, taking into consideration the patient's values, preferences and the availability of alternative care.

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