Appropriateness Of Hospital Use By Family Physicians

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Background: **Reducing inappropriate hospital admissions could lead to lower total health care costs without compromising the quality of care. Research suggests that a sizeable portion of hospital admissions are inappropriate. Other studies indicate that family physicians use health care resources, including hospitalizations, less often than other primary care physicians. To gain additional insight into family physicians' decisions to admit patients, we performed an exploratory study using the Appropriateness Evaluation Protocol, a validated, clinically based utilization review instrument.**

Methods: **We assessed admissions by community-based and residency-based family physicians to a single university-affiliated hospital during calendar year 1988. A total of 905 patients were admitted to the hospital by family physicians during the study period. Of these, 889 records had complete data. Each was reviewed for appropriateness of admission. We calculated percentages of inappropriate admissions and used logistic regression to ascertain variables that were significant predictors of inappropriateness.**

Results: **Overall, 5.4 percent of admissions were categorized as inappropriate. Omitting obstetric cases, the rate was 10.5 percent. Inappropriate admissions did not cluster around a small number of diagnoses or diagnosis-related groups. Using logistic regression, we found that urgency of admission, patient insurance status, and residency-based physician admission versus community-based physician admission were significant predictors of inappropriate hospital use. Of the inappropriate admissions, 70 percent were so rated because diagnostic procedures or treatments could have been performed on an outpatient basis.**

Conclusions: **In contrast with other studies for which physician specialty was not controlled, family physicians less frequently admitted patients inappropriately. Predictors of inappropriateness differed from those found in other studies. Changes in hospital systems, in addition to educational efforts directed toward individual physicians, hold promise as a strategy for reducing inappropriate hospital use. (J Am Board Fam Pract 1994; 7:229-35.)**

Reducing inappropriate hospital use is one promising means of controlling health costs without jeopardizing the quality of care.[1] The Appropriateness Evaluation Protocol (AEP)[2] is a validated instrument that categorizes unnecessary hospital admissions and hospital days. The AEP categorization scheme is based on the clinical state of the patient, independent of the diagnosis or diagnosis-related group. The criteria for inappropriateness are explicitly stated. They do not depend on complex mathematical models.

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By AEP criteria, a substantial fraction of hospital care is inappropriate. Siu and colleagues,[3] for example, concluded that 23 percent of a national sample of 1132 nonelderly admissions were inappropriate and that another 17 percent were for surgical procedures that could have been done in an ambulatory setting. Restuccia, et al.[4] found that 28.1 percent of hospital days were inappropriate in a sample of more than 8000 admissions to 41 Massachusetts hospitals. Studies of Veterans Administration hospitalizations have revealed an inappropriate admission rate of 43 percent[5] and an inappropriate day rate of 48 percent,[6] probably reflecting nonclinical factors, such as the lack of ambulatory surgery facilities. In a study of 25 hospitals in four geographical regions of the United States, Restuccia, Gertman, et al.[7] found 19.1 percent of admissions and 20 percent of hospital days to be inappropriate.

If predictors of inappropriate hospital use were better understood, interventions could be developed and tested, and health care costs might be reduced. Physicians are responsible for the decision to admit patients to and retain patients in the hospital. Physician characteristics are plausible predictors of inappropriate utilization. Yet there has been little reported research on this question using the AEP. One study involving a pediatric population reported AEP-derived inappropriate use by pediatric medical and surgical specialty.[8] The rate of inappropriate use varied from 10 percent for pediatric pulmonary medicine to 70 percent for pediatric neurology. In a study of six sites across the United States that examined physician characteristics and their relation to appropriateness of hospital use, Siu, Manning, et al.[9] found that physicians in practice for more than 15 years had a slightly higher proportion of inappropriate admissions when compared with younger physicians.

Third-party payers increasingly rely on primary care physicians to be gatekeepers whose decisions presumably limit the extent of inappropriate hospital use. The evidence suggests, however, that different primary care disciplines have different practice styles. In a study in which adult patients were randomly assigned to family medicine or internal medicine clinics staffed by residents at one hospital, family physicians in training used the hospital less often and incurred lower costs per hospitalization than residents in internal medicine.[10] This lower intensity of service also has been seen in non-risk-adjusted comparisons in the ambulatory setting,[11-15] and it persists even when variation in patient mix is controlled.[16]

We wanted to study in more detail decision making about hospitalization by one primary care specialty. In particular, we wanted to determine the extent to which family physicians admitted patients to an acute-care hospital appropriately, as categorized by the AEP, and to discern what variables predict inappropriate hospital utilization. In an exploratory study, we analyzed hospital use by community-based and university-based family physicians admitting patients to a university-affiliated community hospital.

Methods

The AEP criteria for appropriateness of an admission are clinically based. A trained reviewer audits a hospital record, looking for evidence that the admission has met at least one appropriateness criterion. Separate criteria have been developed for adult medical-surgical, pediatric, and obstetric admissions (see Appendix for adult medical-surgical admission criteria). The elective surgery criteria rate the appropriateness of the location (inpatient versus outpatient) and timing (need for preoperative hospital days) of surgery. The reviewer can override a criterion-based judgment concerning appropriateness or inappropriateness if the patient's unique situation merits. AEP criteria evaluate whether an admission is appropriate given the patient's severity of illness and the intensity of service; the instrument does not assess whether a particular service was appropriate for the patient.

We applied AEP criteria to admissions by family physicians to a 425-bed university-affiliated community hospital in the Rocky Mountain West. The hospital had more than 100 community-based family physicians on its staff and served as the clinical base for a 24-resident family medicine residency program. Community physicians admitted patients directly to the hospital from their offices or from the emergency department. Residents made decisions about admission of the residency program's patients while seeing patients in the outpatient family practice unit or after hours in the hospital's emergency department. All residency admissions were supervised and approved by an on-call family physician faculty member.

We reviewed all admissions to the hospital by family physicians during calendar year 1988, the last year for which complete records were available. Admissions solely for rehabilitation and of children 6 months old or younger were excluded because AEP criteria do not apply. A search of the hospital data base revealed 879 applicable admissions, which we reviewed for appropriateness. During the data-collection phase, we found 26 additional admissions by family physicians during the study year not detected by the hospital data base, so our initial study sample included 905 admissions. Appropriateness of admission data were missing for 7 cases, and 9 admissions were for elective surgery, for which the AEP categorizes the appropriateness of the choice of location but not the appropriateness of the surgery itself. Because all 9 cases were rated appropriate for loca-

tion, they were dropped from the analysis. Subtracting these 16 cases yielded a final sample size of 889 admissions.

After undergoing training using materials provided by Utilization Management Associates, a firm specializing in the development and application of appropriateness criteria, a single board-certified family physician reviewed all records and rated them for appropriateness of admission according to AEP criteria. Because the review necessitated reading portions of the hospital record, it was not possible to blind the reviewer to the identities of the admitting physicians. The reviewer was not at the time and never had been a member of the medical staff of the study hospital. To validate the reviewer's use of the protocols, Utilization Management Associates performed its own ratings on a sample of 30 records previously assessed by our reviewer. The agreement rate was 96.6 percent with a kappa of 0.656 (LL Tarr, Utilization Management Associates, personal communication, 11 December 1989). This level of agreement is comparable with that reported by others.[17,18]

We calculated the overall percentage of inappropriate admissions for all physicians and for community physicians and the residency program separately. Because admissions of pregnant women were virtually all rated as appropriate, we also analyzed the data omitting obstetric admissions.

To help explain inappropriate hospital use, we used stepwise logistic regression to determine important predictors of whether an admission was appropriate or inappropriate. Variables tested as predictors included patient demographics (age, sex); date, time, and day of the week of admission; insurance status; residency or community practice; length of stay; and admission status (routine, urgent, emergent), and source. There were too few inappropriate cases in any individual diagnosis or procedure, diagnosis-related group, or major diagnostic category for these variables to be examined as predictors of inappropriate admission. Likewise, there were too few inappropriate admissions for any individual physician. We also determined the most common reasons for inappropriate admissions, analyzing the results with Pareto diagrams. These graphical data displays are histograms with the bars arranged in descending order of size and a superimposed line graph showing cumulative frequencies. Pareto diagrams are used in industry to ascertain the most promising areas — the so-called "vital few" — in which to concentrate quality improvement efforts.[19]

Results

Of 889 admissions with complete data, 406 were adult medical-surgical admissions, 41 were pediatric, and 442 were obstetric. Women constituted 81.9 percent of all patients and 64 percent of the nonobstetrical patients. The average patient age, excluding pediatric admissions, was 40.4 years.

A total of 48 (5.4 percent) admissions were categorized as inappropriate by AEP criteria. For the 397 admissions attributable to the residency practice, 11 (2.8 percent) were classified as inappropriate. Of all 889 admissions, only 1.2 percent (11 of 889) were inappropriate and attributable to the residency. For the 492 admissions attributable to the community physicians, 37 (7.5 percent) were considered inappropriate by AEP criteria. This constituted 4.2 percent (37 of 889) of all admissions.

Obstetric problems accounted for one-half of the admissions. Because only 1 of the 442 admissions in this category was rated as inappropriate, we concentrated the remaining analysis on the 447 nonobstetric admissions, summarized in Table 1. Community and residency admissions had similar age and sex distributions and average length of stay. Overall, 47 (10.5 percent) of 447 nonobstetric admissions were inappropriate (11 of 179 [6.1 percent] residency, 36 of 268 [13.4 percent] community). Table 2 summarizes the degree of inappropriate admissions by AEP group.

Table 1. Admissions Characteristics (Excluding Obstetrical and Elective Surgical) by Residency and Community Family Physicians.

Characteristics	Residency (n=181) No. (%)	Community Admissions (n=269) No. (%)	Total Admissions (n=450*) No. (%)
Rated admissions*	179 (40)	268 (60)	447 (100)
Inappropriate	11 (6.1)	36 (13.4)	47 (10.5)
Male	56 (31.3)	105 (39.2)	161 (36.0)
Female	123 (68.7)	163 (60.8)	286 (64.0)
Average age in years (SD)	54.5 (26.8)	49.2 (22.9)	51.3 (24.6)
Average length of stay in days (SD)	5.4 (5.3)	4.4 (4.2)	4.8 (4.7)

*Three cases were missing ratings for appropriateness of admission and were dropped from subsequent analyses.
SD=standard deviation.

Table 2. Appropriateness of Admissions by Residency and Community Family Physicians.

Hospital Service	Residency Admissions	Community Admissions	Combined Admissions
Adult medical-surgical			
Number of admissions	158	247	405
Percentage inappropriate	7.0	14.2	11.7
Pediatric			
Number of admissions	21	20	41
Percentage inappropriate	0	5.0	2.4
Obstetric			
Number of admissions	218	224	442
Percentage inappropriate	0	0.4	0.2

Inappropriate admissions did not cluster around any single diagnosis. By diagnosis-related groups, the largest proportions of inappropriate admissions were for patients with back problems (18.8 percent) and patients with diabetes who were older than 35 years (8.3 percent). A variety of other diagnosis-related groups each accounted for a single inappropriate admission. There also was no significant clustering around any major diagnostic category.

Applying a stepwise logistic regression model, we found three significant predictors of whether an admission was appropriate: community-based versus residency-based attending physician, insurance type, and admission status. Thirty-six (77 percent) of 47 inappropriate admissions were by community-based physicians, though community-based physicians accounted for only 55 percent of all admissions. Patients insured through health maintenance organizations (HMOs) accounted for 24.8 percent of the total admissions but 46.8 percent of the inappropriate admissions. The HMOs admitting to our study hospital were all open-panel, individual practice association plans with typical utilization control mechanisms in place. In contrast, Medicare admissions constituted 37.2 percent of the total admissions, but only 17.0 percent were categorized as inappropriate. Likewise, commercial insurance admissions made up 22.9 percent of the total but only 3.5 percent of the inappropriate admissions. Admission status also was a significant predictor. Patients admitted on an emergency basis accounted for almost one-half of all admissions (49.7 percent) but only 19.1 percent of inappropriate admissions. Urgent admissions were 42.5 percent of the total admissions but 57.4 percent were inappropriate. Routine admissions, only 7.8 percent of the total, accounted for 23.4 percent of inappropriate admissions. Logistic regression results, along with odds ratios of significant predictors of inappropriate admission, are presented in Table 3.

The Pareto diagram (Figure 1) graphically shows that 70 percent of the 46 inappropriate nonobstetric admissions were rated as inappropriate because diagnostic procedures or treatment could have been done on an outpatient basis.

Discussion

Because physicians' decisions control as much as 80 percent of all health care expenditures,[20,21] physician characteristics might predict inappropriate hospital use. As noted above, previous research suggests that "primary care physician" is not a homogeneous category and that medical specialty might influence the decision to use the hospital.

The family physicians in our sample admitted patients inappropriately less often than physicians as a whole in previous studies — which, as in the present work, were not controlled for severity.

Table 3. Results of Logistic Regression Analyses Predicting Likelihood of Inappropriate Hospital Admission.

Variable	Logistic Regression B	OR	95% CI
Type of physician			
Residency-based (reference group)			
Community-based	0.68	1.97*	1.25–3.13
Admission status			
Emergency (reference group)			
Urgent	2.76	15.80*	5.33–46.83
Insurance type			
HMO (reference group)			
Workers' compensation	–0.38	0.68	0.13–3.65
Self-paying	0.21	1.23	0.20–7.44
Commercial	–1.13	0.32*	0.12–0.86
Medicaid	0.15	1.16	0.35–3.86
Medicare	–1.65	0.19*	0.07–0.49

*Significant odds ratios.
B=standardized beta coefficienct, OR=odds ratio, CI=confidence interval.

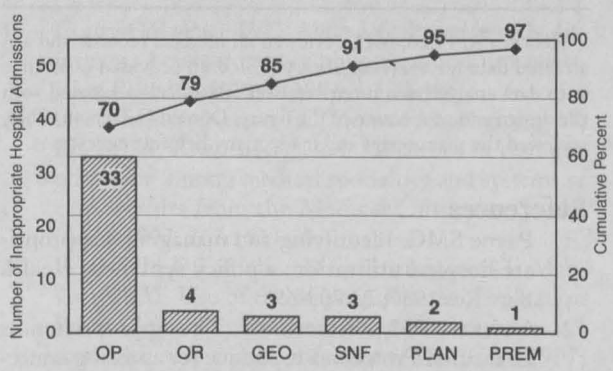

Figure 1. Pareto diagram of reasons for inappropriate admission. Key: OP = diagnostic procedures or treatment can be done as outpatient, OR = reviewer override although admission appropriate by criteria, GEO = patient lives too far away from hospital to permit diagnostic procedures or treatment to be scheduled expeditiously, SNF = patient needs skilled nursing facility care, PLAN = no documented plan for diagnostic procedures or treatment, PREM = patient admitted 1 or more days before previously scheduled inpatient procedure. The number at the top of each bar is the total number of admissions rated as inappropriate for that reason.

There were several surprising findings. First, in AEP terms, most inappropriate admissions were accounted for by a single parameter — procedures that could have been done in the outpatient setting. It is tempting to conclude that these admissions are a consequence solely of physicians' choices. It also is possible that hospital characteristics played a role. Hospital regulations, the nonavailability of ambulatory facilities, or other factors could have contributed to this component of inappropriate use. Our study hints at an important but often unappreciated aspect of inpatient care — while patients are nominally under the control of their admitting physicians, their admitting physicians are not in complete control of the processes of care. Similar conditions have been observed in other complex systems.[22]

The residency-based physicians in our study had fewer inappropriate admissions than the community-based physicians (6.1 percent versus 13.4 percent). There is no *a priori* reason to assume that the residency's patients were more or less severely ill than those admitted by community physicians. It could be that close faculty supervision of residents' admission decisions accounts for the low rate. Our data cannot support or refute the hypothesis. If confirmed in other settings, this finding would suggest that training programs can keep costs down through judicious use of the hospital, provided that hospital systems do not inadvertently cause increases in inappropriate utilization.

Finally, while differences in urgency might be expected to predict the appropriateness of the decision to admit, our finding about the importance of insurance status was surprising. Patients insured through HMOs were admitted inappropriately more often than expected. Other larger studies have reached different conclusions, but they have not been limited to admissions by a single primary care medical specialty. It is possible that existing utilization review methods, based on diagnosis or nationally derived norms, do not detect some inappropriate hospitalizations. A method based on the patient's clinical condition at admission, such as the AEP, might assist HMOs wishing to exert tighter control over hospital use. At the same time, our finding concerning Medicare's relatively low rate of inappropriate admissions appears to confirm that prospective payment has altered physician behavior.

Our study has several important limitations. It does not permit direct comparisons between different medical specialties, because by choice we limited our sample to patients admitted by family physicians. Certain additional characteristics of our study sample could have combined to reduce inappropriate hospitalization. The hospital we studied had a close affiliation with a medical school, and many of its community-based family physicians were young and residency trained. As noted above,[9] greater physician age is associated with inappropriate utilization as measured by the AEP. Our study hospital's data base reliably recorded the admitting physician, not the referring physician. Thus patients referred by a family physician to, say, a surgeon and admitted by that surgeon did not appear in our sample. If inappropriate admissions in this setting were assigned to the referring family physicians, rates of inappropriateness would rise. Because referring physicians arguably have only partial control over their consultants' decisions, on the other hand, it might or might not be proper to assign a consultant's AEP-derived inappropriate admission to the referring physician. One way to

examine this question would be to replicate our study in a managed care environment in which referrals and their outcomes can be tracked.

It is also possible that the true proportion of inappropriate admissions attributed to family physicians was even lower then we detected. As is the case in most private hospitals, full-time emergency physicians occasionally admit patients of community-based family physicians to the hospital after hours. If inappropriate, these admissions would be credited to the family physician, not to the physician who actually made the decision to admit. Our data also do not permit us to sort out patients who might have been inappropriately *not* admitted, and who, if admitted, would have caused the proportion rated as inappropriate to fall.

No utilization review instrument, of course, is perfectly reliable or valid. The AEP reliability and validity are within acceptable limits.[23] It is possible, however, that a more valid and reliable instrument would have categorized more admissions as inappropriate.

Nevertheless, our results are consistent with other studies showing that family physicians use fewer health care resources than other specialists and use the hospital less frequently.[10,15,16] If confirmed in other settings and with other patient populations, these findings suggest that a medical care system based on generalists might be more cost effective than our current arrangement.[24] Other AEP-based strategies to reduce inappropriate utilization include targeted utilization review[25] and feedback to attending physicians.[26] The Pareto analysis suggests additional strategies to reduce inappropriate utilization that are consistent with the principles and methods of continuous quality improvement.[22,27] By focusing on the most common reasons for inappropriateness, and analyzing both the systematic and extrasystematic causes of those reasons,[28] our study hospital potentially could achieve an important reduction in nonacute utilization. Such techniques have already been applied successfully to a variety of issues in different types of health care organizations.[29]

We conclude that more research is needed to define further the contributions of physician specialty, patient insurance status, and hospital process characteristics to the analysis and improvement of inappropriate hospital use.

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Appendix

Adult Appropriateness Evaluation Protocol Admission Criteria

Patient Condition

1. Sudden onset of unconsciousness or disorientation (coma or unresponsiveness)
2. Pulse rate <50 or >140 beats per minute
3. Systolic blood pressure <90 or >200 mmHg, or diastolic blood pressure <60 or >120 mmHg
4. Acute loss of sight or hearing
5. Acute loss of ability to move body part
6. Persistent fever equal to or greater than 100°F oral or greater than 101°F rectal for more than 5 days
7. Active bleeding
8. Severe electrolyte or blood gas abnormality (any of the following): serum sodium <123 or >156 mEq/L; serum potassium <2.5 or >6.0 mEq/L; carbon dioxide combining power <20 or >36 mEq/L (unless chronically abnormal); arterial pH <7.30 or >7.45
9. Electrocardiographic evidence of acute ischemia; must be suspicion of a new myocardial infarction
10. Wound dehiscence or evisceration

Clinical Services

11. Intravenous medications or fluid replacement (does not include tube feedings)
12. Surgery or procedure scheduled that day requiring general or regional anesthesia, or equipment or facilities available only for inpatients
13. Vital sign monitoring every 2 hours or more often (can include telemetry or bedside cardiac monitor)
14. Chemotherapeutic agents that require continuous observation for life-threatening toxic reaction
15. Intramuscular antibiotics at least every 8 hours
16. Intermittent or continuous respirator use at least every 8 hours

Adapted from Gertman and Restuccia[2]