Morbidity, Mortality, and Charges for Hospital Care of the Elderly: A Comparison of Internists' and Family Physicians' Admissions

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Background. In an atmosphere of cost containment, an important question is whether there are differences in quality or cost of medical care provided by physicians with different specialty training.

Methods. This study is an analysis of Pennsylvania hospital admissions from the 1989 MedisGroups Comparative Database, consisting of 31,321 hospital admissions by internists and family physicians. It encompasses the top 10 admission diagnostic-related groups in patients 65 years and older. Outcome measures of morbidity, mortality, length of stay, and hospital charges were compared between patients of internists and family physicians while controlling for patient variables, such as age, sex, Medicaid insurance payment, admission from nursing home, and admission severity scores, and hospital characteristics, such as number of beds, teaching status, and available technologies and procedures.

Results. Admission diagnoses were similar for patients of family physicians and internists. After adjusting for relevant patient and hospital characteristics, there were no differences in mortality or hospital charges; however, the patients of internists experienced slightly higher morbidity (odds ratio=1.07, 95% confidence interval, 1.017 to 1.123) and longer mean length of stay (10.80 vs 10.54 days, $P<.05$) The mean age of patients and the proportion of Medicaid patients was similar in the two specialty groups. Family physicians' patients were more likely to be female (60% vs 57%, $P<.01$), were less likely to be admitted from nursing homes (4% vs 5%, $P<.01$), and had a lower mean admission severity score (1.940 vs 1.964 on a scale of 0 [least seriously ill] to 4 [most seriously ill], $P<.01$). Internists were more likely to work in teaching hospitals and hospitals with sophisticated technology ($P<.01$).

Conclusions. It makes little difference in medical outcomes or hospital charges whether family physicians or internists manage the hospital care of elderly patients for common medical problems. Previously documented lower costs of care by family physicians may be due to outpatient rather than inpatient care.

Key words. Physicians, family; internists; internal medicine; aged; elderly; morbidity; mortality; hospitalization; hospital charges; medical outcomes. (*J Fam Pract 1995; 40:443-448*)

The issue of rising health care costs pushes society as well as health care providers to question how the highest quality health care can be obtained for the lowest possible cost. Whether differences in quality or cost of medical care exist among physicians with different specialty training is an important question, the answer to which could help guide the future of the health care delivery system as well as medical training. The outcome and costs of medical care delivered by family physicians as compared with other specialists have been subjects of investigation for years.[1-5] Studies, however, have suffered from a variety of limitations: uncertainty about the nature or equivalence of the training of the physicians being studied, sample size too small for meaningful comparisons, lack of comparability of patients, and subjective rather than objective outcome measures.[6]

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A recent study, which focused on outpatient resource utilization among specialties while controlling for patient mix, found that general internists had somewhat greater utilization rates than did family physicians on some indicators, and that cardiologists and endocrinologists had consistently higher resource utilization rates than did the two primary care specialties.[7,8]

Several studies comparing hospitalized patient outcomes between family physicians and internists have found no significant difference when controlling for illness severity.[9–11] Two of these studies[10,11] also compared costs of care between these two groups while attempting to control for outcome variables and found little or no difference. However, none of these studies was definitive. One study looked only at critical care in a single hospital[9] and one looked at 13 higher volume diagnostic-related groups (DRGs) in a single hospital.[11] Only one study has compared outcomes for patients of family physicians with those for patients of internists using large numbers of patients from a variety of hospitals.[10] This earlier study by McGann and Bowen, which was performed using only summary data from the 1988 MedisGroups Comparative Database, could not control for differences in patient mix or hospital size, type, and technological sophistication.

The current study, which uses the complete 1989 MedisGroups Comparative Database, was undertaken to determine whether the services rendered by family physicians to a large number of hospitalized elderly patients differed in cost or outcome from those provided by internists. *Cost* is defined as length of stay and total hospital charges. *Outcome* is defined as morbidity and mortality.

Comparability of case mix was determined by controlling for available patient characteristics that have been suggested by previous investigations to affect outcome or costs. These include: age,[9] Medicaid insurance payment as a marker for socioeconomic status,[9] sex,[12,13] admission from a long-term care facility,[14] DRGs,[15,16] and admission severity score as determined by the MedisGroups system.[15,16] Although race has been shown to affect outcome,[17] information on this characteristic unfortunately was unavailable. Since hospital characteristics determine in part the outcome and charges accrued during hospitalization, this study likewise controlled for hospital characteristics that have been shown to affect these variables: hospital type (teaching or not),[18,19] size,[18,19] occupancy rate,[19] and payroll expenses.[19] The study also controlled for other hospital characteristics that theoretically could affect outcome, such as the availability of certain procedures (eg, cardiac catheterization) and technologies (eg, magnetic resonance imaging).

Although the training background of physicians (general practitioner vs family physician and general internist vs internal medicine subspecialist) has been shown to affect utilization of resources and patient mix independently,[20,21] this information was not available for comparison. In the database used in this study, general and family practitioners were jointly categorized as *family physicians*, and general and specialty internists were combined as *internists*.

Methods

For this study, we used the MedisGroups quality assurance system, which compares data from any of the several hundred participating hospitals with the compiled data of the MedisGroups Comparative Database. Only the hospitals that review admissions from all departments are included. Each participating hospital abstracts the chart of every admission. When a hospital's abstracts maintain a 95% accuracy level for a period of 1 year, it is included in the MedisGroups database.

Severity of illness is defined in this system as the potential for major organ failure during the hospitalization. Severity scores are determined for each patient based on his or her condition at the time of admission, as measured by indicators called "key clinical findings" and calculated by algorithm. The patients are then placed in "admission severity groups," using a scale of 0 (least seriously ill) to 4 (most seriously ill). For example, a history of congestive heart failure is consistent with a 0 severity score; congestive heart failure on chest radiograph coincides with a severity score of 2; a Pco_2 >70 mm Hg coincides with a severity score of 3; and coma with blood pressure <60 mm Hg rates a severity score of 4. Admission severity scores are determined retrospectively by chart review performed on day 3 of the hospitalization to allow time for all admission diagnostic reports to be returned to the charts.

Outcome is measured by morbidity, major morbidity, and mortality. Morbidity and major morbidity are also determined by key clinical findings. For example a Pco_2 <50 mm Hg is considered nonmorbid, a Pco_2 of 50 to 70 mm Hg is considered morbidity, and a Pco_2>70 mm Hg is considered major morbidity. Outcome categories are determined by chart review on designated days after admission, usually day 8. If the patient is discharged before day 8, no morbidity review is done. A morbidity review is performed for patients who die or are transferred to an institution of higher level care regardless of when they were discharged.

The 1989 MedisGroups Comparative Database consists of all admissions to a subset of 40 hospitals, balanced for geographical region, size, and type of hospital. Of the 40 hospitals, 8 have fewer than 200 beds, 17 have between 200 and 400 beds, 11 have between 400 and 800

beds, and 4 had more than 800 beds. The numbers of beds at the 40 hospitals ranged from 73 to 1461. Eighteen of the hospitals were defined as teaching hospitals, which are approved to participate in residency training by the Accreditation Council for Graduate Medical Education, and 11 were members of the Council of Teaching Hospitals. The hospitals are located throughout the country but are highly concentrated in the Middle Atlantic region. More detailed descriptions of this database can be found elsewhere.[10,15,16,20–26]

Participation in the MedisGroup quality assurance system was mandated by Pennsylvania state law during the year studied. Therefore, to avoid selection bias by hospital, we used admissions only from Pennsylvania hospitals. Twenty-nine of the 40 hospitals in the 1989 comparative database were in Pennsylvania.

We compared internists' admissions of patients aged 65 years and older for the 10 most common DRGs with those of patients in the same age category who were admitted by family physicians for the same conditions. The number of admissions made by internists was 19,154; the number by family physicians was 12,167. The number of admissions in each diagnostic category, patient variables, and characteristics of the hospitals were determined. Percentages for dichotomous patient and hospital variables were calculated and compared between the specialties using the chi-square statistic. Using a *t* test for independent means, average values for baseline patient and hospital variables were compared between the specialty groups.

Similar analyses were done for outcome variables. For simplicity, we combined patients experiencing morbidity or major morbidity into one group of patients who experienced some degree of morbidity. Per diem hospital charges, such as for room and meals, and ancillary service charges, such as for radiograph, laboratory, and treatment, were combined to reflect total hospital charges. Length of stay was reported in days and provided another way of evaluating cost. Since no postdischarge data were available, mortality reflects in-hospital deaths only.

Outcome variables were further analyzed, while controlling for patient and hospital characteristics. Patient characteristics included age, sex, admission severity score, admission from nursing home, and Medicaid payment source. Hospital variables included annual hospital payroll, bed total, medical school affiliation, membership in Council of Teaching Hospitals, and availability of cardiac catheterization, open heart surgery, magnetic resonance imaging, and organ transplant services. Logistic regressions were used to compare the dichotomous variables, morbidity and mortality, between the specialties, while controlling first for patient and then for hospital variables. These regressions entered all the variables in the same step. Such selected interaction terms as sex by age and admission from nursing home by admission severity were included in the model for patient variables, and cardiac catheterization by open heart surgery, teaching hospital by medical school affiliation, and yearly payroll expenses by total number of beds were included in the model for hospital variables. Likewise, analyses of covariance were used to compare the continuous variables, total hospital charges and length of stay, between the specialties. Because total charge and length of stay were not normally distributed, square root and natural logarithm transformations were performed on these data. The square root transformation was used to repeat the analyses because it most closely modeled a normal distribution. Because the results of the analyses were unchanged for total charge, results with the original data are reported. However, the transformation for length of stay is reported because it yielded slightly different results.

Since family physicians rarely accept patients transferred from other acute care hospitals, these admissions were excluded from the analysis. Patients discharged to other acute care hospitals also were excluded from the analysis because their inclusion would bias results in favor of a shorter length of stay.

The sample size was adequate to detect a 1.6% difference between groups at a power of .80, and a 1.8% difference at a power of .90. Thus, even minimal clinical significance would have been detected by this sample. The analyses were performed using SPSS software (SPSS Inc, Chicago, Ill).

Results

The most common admission diagnoses were similar for patients of internists and family physicians: the 10 most common diagnoses for internists were among the 11 most common for family physicians. The top 10 internal medicine diagnoses represented 19,154 admissions. Data from these cases were compared with 12,167 family practice admissions for the same 10 conditions (Table 1). The distribution of patients by diagnosis was similar except that internists were more likely to care for patients with ischemic heart disease and cerebral vascular disease. Family physicians were more likely to care for patients with pneumonia, abdominal pain, chest pain, and dehydration.

The average age of patients admitted by internists (77.41 years) was similar to that of patients admitted by family physicians (77.48 years). The proportion of Medicaid patients was the same (0.3%) for both groups. Family physicians' patients were only slightly more likely to be female (60% vs 57%, $P<.01$). Internists' patients were more likely to be admitted from a nursing home (5% vs

Table 1. Admitting Diagnosis, by Physician Specialty

Diagnosis	Internists' Admissions, % (n=19,154)	Family Physicians' Admissions, % (n=12,167)
Congestive heart failure	20	20
Pneumonia	12	13*
Gastrointestinal bleeding	11	10
Cerebral vascular disease	10	9*
Intermediate coronary syndrome	9	7*
Abdominal pain	9	10*
Chest pain	8	10*
Syncope	7	7
Dehydration	7	8*
Transient ischemic attack	6	6

*P<.01.

4%, $P<.01$) and had a higher mean admission severity score (1.964 vs 1.940, $P<.05$).

All hospitals had emergency departments, intensive care units, ultrasound facilities, and were accredited by the Joint Commission on Accreditation of Healthcare Organizations. Table 2 lists other hospital characteristics thought to affect cost and outcome, and the percentage of internists' and family physicians' admissions to hospitals with these characteristics. Internists were significantly more likely than family physicians to work in hospitals affiliated with medical schools and teaching hospitals ($P<.01$). They were also more likely than family physicians to practice in hospitals with sophisticated technology and procedures ($P<.01$). Internists practiced in hospitals with higher mean values for available hospital beds (395 vs 352, $P<.01$) and higher annual hospital payroll expenses ($33,540 million vs $28,423 million, $P<.05$), although the mean occupancy rate was lower for hospitals used by family physicians (70.7% vs 71.2%, $P<.01$).

Outcome data are summarized in Table 3. The unadjusted morbidity rate and mean length of stay were lower for patients of family physicians than for patients of internists. Mortality and total hospital charges were not significantly different. Results of further multivariate analysis are listed on Table 4. The small differences in morbidity and average length of stay remained statistically significant when controlling for both patient and hospital characteristics.

Table 2. Internists' and Family Physicians' Admissions to Hospitals, by Hospital Technology or Procedure

Hospital Technology/Procedure	Internists' Admissions, % (n=19,154)	Family Physicians' Admissions, % (n=12,167)
Magnetic resonance imaging	29	26*
Hemodialysis	57	56*
Transplant service	6	1*
Radiation therapy	58	47*
Therapeutic radioisotope	69	61*
Open heart surgery	35	28*
Cardiac catheterization	70	57*
Skilled nursing facility	1	1
Medical-school affiliation	66	57*
Teaching hospital	25	15*

*P<.01.

Table 3. Unadjusted Patient Outcome, by Physician Specialty

Outcome	Internists' Admissions	Family Physicians' Admissions
Patients experiencing morbidity, %	37.8	35.7*
Mortality rate, %	11.8	11.9
Average total charges, $	17,577	17,021
Average length of stay, d	12.73	12.15*

*P<.01.

Discussion

These data suggest that family physicians and internists hospitalize patients for similar diagnoses. The patient groups are also similar in age, sex distribution, Medicaid insurance status, residence in a nursing home, and admission severity of illness. Internists in this study were more likely than family physicians to hospitalize patients in teaching hospitals and in larger hospital with more sophisticated technology.

Outcomes for patients in the two specialist groups were also similar. The adjusted differences in mortality and total hospital charges were not statistically significant. Although the adjusted difference of .26 days greater length of stay for patients of internists was still statistically significant, it is of questionable clinical importance. Likewise, the proportion of patients experiencing morbidity was only slightly higher for patients of internists, but remained statistically significant. These differences require very careful interpretation.

The number of admissions considered in this analysis was over 30,000. It is important to realize that with numbers that large, any small difference is likely to be statistically significant, and thus should be evaluated carefully for clinical significance. Since differences in baseline patient and hospital characteristics were small and their impact can be controlled for by logistic and multivariate statistical techniques, we will not discuss them further here. Outcome variables, however, deserve close scrutiny.

Differences in the proportion of patients experiencing morbidity were calculated by collapsing morbidity and major morbidity into a single category. One could argue that this categorization was too simplistic, or that the algorithm for calculating morbidity could be too crude for reliable distinction of this small magnitude. We

Table 4. Outcome Variables by Specialty, Adjusted for Patient and Hospital Characteristics

Outcome Variable	Patient Characteristics*		Hospital Characteristics†	
	Internists	Family Physicians	Internists	Family Physicians
Morbidity				
Odds ratio	1.085‡	1.000	1.069‡	1.000
95% CI	(1.031–1.142)		(1.017–1.123)	
Mortality				
Odds ratio	.9677	1.000	.9800	1.000
95% CI	(.899–1.041)		(.911–1.054)	
Total hospital charges, mean $	17,508	17,130	17,558	17,081
Average length of stay, mean number of days	10.86§	10.41	10.80‡	10.54

**Age sex, admission severity, admission from nursing home, Medicaid payment.*
†Annual hospital payroll, bed total, medical school affiliation, membership in Council of Teaching Hospitals, available cardiac catheterization, open heart surgery, magnetic resonance imaging, organ transplant service.
‡P<.05; §P<.01.
CI denotes confidence interval.

cannot know for sure if the slight increased risk of morbidity for patients of internists (odds ratio, 1.07) is clinically significant, and thus are obliged to discount it. It is also difficult to ascribe clinical significance to .26 of a hospital day when the total hospital charges were not different.

There are some weaknesses in the study design. The first is the lack of information about race. This characteristic has been shown to influence morbidity and mortality in some disease states,[17] and we do not know for sure if there was a difference in this characteristic between the patient groups. However, the patients were all from the same region, the proportion of Medicaid patients was the same for physicians of both specialties, and we see no reason for blacks to choose an internist over a family physician or vice versa.

Self-selection of the physician by the patient is also a potential confounding variable that could not be controlled in this study. It is possible that patients' attitudes toward their own health and the use of medical technology influence their choice of physician.

The inability of this database to differentiate residency training, board certification, and subspecialty training is another weakness. We could speculate endlessly on how this might confound the results. For instance, most general practitioners were trained before family practice residency training and board certification were available. This factor could make general practitioners less comfortable with newer technology, and thus charges would be less for their patients because they would not use such technology or more because they would consult subspecialists more freely. This problem cannot be corrected or controlled for, since it is integral to the database. Information concerning physician charges, readmission rates, and postdischarge mortality also would be helpful but is not available in this database.

To some degree, the small geographic area controls for variations in care, patient population, and selection bias, but it limits the generalizability of the data. We do not know if results in the state of Pennsylvania reflect care in the rest of the country.

Fundamental to this study is the validity of the MedisGroups algorithms for estimating morbidity and severity of illness. In assessing the MedisGroups system, several factors should be considered. The system is proprietary, and the complete algorithm is not available for unrestricted, independent clinical scrutiny. Many key clinical findings are procedural in nature, and the system measures immediate severity rather than the extent of underlying disease. Knowing the extent of the underlying condition is particularly important in diseases such as intermediate coronary syndrome and transient ischemic attacks, for which physical findings can be normal or minimally abnormal even if the patient is on the edge of medical disaster. Some feel that MedisGroups does not fairly adjust for interhospital case mix difference in patients admitted with acute myocardial infarction.[25,26] This purported lack of adjustment might easily translate to intermediate coronary syndrome, which was a significantly more common diagnosis for internists' admissions. The system also misses morbidity that occurs in patients who are discharged before the 8th day of hospitalization. These inherent weaknesses are the primary reason why the 7% difference in adjusted morbidity cannot be considered clinically significant.

Nevertheless, this is a system that was designed to compare quality of care. Based on the logical premise that increasing severity parallels increasing potential for major organ failure, this system has been shown to predict mortality over a large group: 60% of patients who are admitted with the highest score die, compared with only 1% of patients with the lowest two scores.[16] MedisGroups data have also been used for validation of a prognostic index

for pneumonia.[22] Even with its shortcomings, it is still a reasonable system for comparing quality between groups.

Despite these weaknesses, this study contributes important information to the question of variations in the care provided by family physicians and internists to hospitalized patients. Using an objective measure for a large number of hospitalized elderly patients with the same common major diagnoses and comparable illness severity, it shows more similarities than differences in medical outcome and hospital charges between internists and family physicians. It does not deal with utilization of resources in the outpatient setting either before or after hospitalization, as do some other studies [7,18,27,28] nor does it include information concerning physician charges for care. Conclusions must be limited to elderly inpatients and hospital charges.

The differences reported earlier using MedisGroups summary data in 1988 were reproduced in this investigation.[10] However, once selection bias, baseline hospital characteristics, and patient variables were controlled, differences diminished to statistical or clinical insignificance.

This study suggests that it makes little difference in medical outcome or hospital charges whether family physicians or internists manage the hospital care of elderly patients for common medical problems. Savings to the health care system attributable to physician specialty may occur predominately outside the hospital.

References

1. Couch JB, Nash DB. Severity of illness measures: opportunities for clinicians {letter}. Ann Intern Med 1988; 109:771–3.
2. Leduc DR, Pless IB. Pediatricians and general practitioners: a comparison of the management of children with febrile illnesses. Pediatrics 1982; 70:511–5.
3. Klein R, Klein BEK, Anderson S, et al. Hypoglycemic therapy in patients diagnosed to have diabetes at 30 years of age or older. J Chronic Dis 1984; 37:159–65.
4. Franks P, Dickinson JC. Comparison of family physicians and internists. Process and outcome in adult patients at a community hospital. Med Care 1986; 24:941–8.
5. Strauss MJ, Conrad D, Logerfo JP, et al. Cost and outcome of care for patients with chronic obstructive lung disease. Analysis by physician specialty. Med Care 1986; 24:915–24.
6. Bowman MA. The quality of care provided by family physicians. J Fam Pract 1989; 28:346–55.
7. Kravitz RL, Greenfield S, Rogers W, et al. Differences in the mix of patients among medical specialties and systems of care. Results from the medical outcomes study. JAMA 1992; 267:1617–23.
8. Greenfield S, Nelson EC, Zubkoff M, et al. Variations in resource utilization among medical specialties and systems of care. Results from the Medical Outcomes Study. JAMA 1992; 267:1624–30.
9. Hainer BL, Lawler FH. Comparison of critical care provided by family physicians and general internists. JAMA 1988; 260:354–8.
10. McGann KP, Bowman MA. A comparison of morbidity and mortality for family physicians' and internists' admissions. J Fam Pract 1990; 31:541–5.
11. MacDowell NM, Black DM. Inpatient resource use: a comparison of family medicine and internal medicine physicians. J Fam Pract 1992; 34:306–12.
12. Pearson ML, Kahn KL, Harrison ER, et al. Differences in quality of care for hospitalized elderly men and women. JAMA 1992; 268: 1883–9.
13. Tobin JN, Wassertheil-Smoller S, Wexler JP, et al. Sex bias in considering coronary bypass surgery. Ann Intern Med 1987; 107: 19–25.
14. Zweig S, Lawhorne l. Factors predicting mortality in rural elderly hospitalized for pneumonia. J Fam Pract 1990; 30:153–9.
15. Iezzoni LI, Ash AS, Cobb JL, et al. Admission MedisGroups score and the cost of hospitalization. Med Care 1988; 26:1068–80.
16. Iezzoni LI, Meskowitz MA. A clinical assessment of MedisGroups. JAMA 1988; 260:3159–63.
17. Becker LB, Han BH, Meyer PM, et al. Racial differences in the incidence of cardiac arrest and subsequent survival. N Engl J Med 1993; 329:600–6.
18. Keeler EB, Rubenstein LV, Kahn KL, et al. Hospital characteristics and quality of care. JAMA 1992; 268:1709–14.
19. Hartz AJ, Krakauer H, Kuhn EM, et al. Hospital characteristics and mortality rates. N Engl J Med 1989; 321:1720–5.
20. Iezzoni LI. A primer on MedisGroups. Pa Med 1989; 92:28–33.
21. MedisGroups {letter}. JAMA 1989; 261:3408–9.
22. Fine MJ, Singer DE, Hanusa BH, et al. Validation of a pneumonia prognostic index using the MedisGroups Comparative Hospital Database. Am J Med 1993; 94:153–9.
23. Iezzoni LI, Ash AS, Coffman G, et al. Admission and mid-stay MedisGroups scores as predictors of death within 30 days of hospital admission. Am J Public Health 1991; 81:74–7.
24. Iezzoni LI, Hotchkin EK, Ash AS, et al. MedisGroups data bases. Med Care 1993; 31:277–83.
25. Blumberg MS. Biased estimates of expected acute myocardial infarction mortality using MedisGroups admission severity groups. JAMA 1991; 265:2965–70.
26. Bias estimates of mortality using MedisGroups {letter}. JAMA 1991; 266:2704–5.
27. Rosenblatt RA. Specialists or generalists. On whom should we base the American health care system? JAMA 1992; 267:1665–6.
28. Specialists or generalists: The Medical Outcomes Study {letters}. JAMA 1992; 268:1537–9.