Do Subspecialists Working Outside of Their Specialty Provide Less Efficient and Lower-Quality Care to Hospitalized Patients Than Do Primary Care Physicians?

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**Background:** Studies show that subspecialists can provide better quality care than primary care physicians when working within their subspecialty for patients with some medical conditions. However, many subspecialists care for patients outside of their chosen subspecialty. The present study compared the quality of care provided by subspecialists practicing outside of their specialty, general internists, and subspecialists practicing within their specialty.

**Methods:** The severity-adjusted mortality rate and the severity-adjusted length of stay were used as indexes of quality of care. Data from 5112 hospital admissions (301 different physicians) for community-acquired pneumonia, acute myocardial infarction, congestive heart failure, or upper gastrointestinal hemorrhage at 6 hospitals in the greater Cleveland, Ohio, area were used in this study. The data were severity adjusted with the CHOICE Severity of Illness System.

**Results:** Subspecialists working outside of their subspecialty cared for 25% of hospitalized patients. When comparing patients cared for by subspecialists practicing outside of their subspecialty, severity-adjusted lengths of stay were longer for patients with congestive heart failure (23% longer; 95% CI, 15%-32%), upper gastrointestinal hemorrhage (22% longer; 95% CI, 7%-39%), and community-acquired pneumonia (14% longer; 95% CI, 5%-24%) than for patients cared for by subspecialists practicing within their subspecialty. Patients also had a slightly higher hospital mortality rate when cared for by subspecialists practicing outside of their specialty than by subspecialists practicing within their subspecialty (mortality rate odds ratio, 1.46; P=0.047). In addition, patients cared for by subspecialists practicing outside of their subspecialty had longer lengths of stay, and prolongations of stay were observed for patients with congestive heart failure (16% longer; 95% CI, 8%-26%), upper gastrointestinal hemorrhage (15% longer; 95% CI, 2%-30%), and community-acquired pneumonia (18% longer; 95% CI, 9%-28%) than patients cared for by general internists.

**Conclusions:** Subspecialists commonly care for patients outside of their subspecialty, despite the fact that their patients may have longer lengths of stay than those cared for by subspecialists practicing within their specialty or by general internists. In addition, such patients may have slightly higher mortality rates than those cared for by subspecialists practicing within their subspecialty.

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SUBJECTS AND METHODS

OUTCOME MEASURES

The primary outcome measures used to indicate the quality of care that patients received were the severity-adjusted mortality rate and hospital length of stay (LOS). The models were constructed based on patients' demographic and clinical data.

DATA SOURCE

Six hospitals in the greater Cleveland area, in northeast Ohio, provided information on their physician subspecialties and patients cared for by these physicians to this study. All of these hospitals were members of the Cleveland Health Quality Choice Coalition Consortium.12-14 Among them, 1 is a rural hospital and 5 are community hospitals. Of the 6 hospitals, only 1 had a hospitalist program, and none had an internal medicine training program, family practice training program, or full-time faculty. Two of the hospitals were part of a health care system and are coded as a single hospital (hospital 4) (Table 1). The Cleveland Health Quality Choice program was a regional effort of health care organizations to compare and improve hospital performance.12-14

Lengths of stay and mortality rates for patients with acute myocardial infarction, congestive heart failure, upper gastrointestinal hemorrhage, or community-acquired pneumonia were examined in this study. Data, including sociodemographic variables, admission source, medications, medical history, vital signs, selected variables from the physical examination, results of laboratory tests, electrocardiographic findings, echocardiographic findings, and do not resuscitate status, were abstracted from the medical record of each patient by medical record technicians. There were explicit protocols for data abstraction, double keystroke entry, identification of out-of-range variables, and independent verification of data quality at each hospital.

Although many studies have compared subspecialists practicing within their chosen specialty with primary care physicians, few have examined the quality and efficiency of care provided by subspecialists practicing outside of their specialty. Using a valid severity of illness model,12,13 the present study compared the quality of care provided by subspecialists caring for patients outside of their specialty with that provided by general internists and by subspecialists caring for patients within their specialty.

PHYSICIANS AND PHYSICIAN CLASSIFICATION

The primary physician for selected patients was obtained independently by each hospital participating in this study. The selected physician was the attending physician of record in each case. The subspecialty status of physicians was verified by reviewing information supplied by each hospital (medical staff office), information provided on the American Medical Association and American Board of Internal Medicine Web sites, and other available information on physician subspecialty.13

Physicians were classified as those practicing within their subspecialty, those practicing outside of their subspecialty, general internists, or family practitioners. For community-acquired pneumonia, physicians were classified as practicing within the specialty if they were trained in infectious diseases or pulmonary medicine. For upper gastrointestinal hemorrhage, physicians were classified as practicing within the specialty if they were gastroenterologists. For congestive heart failure or acute myocardial infarction, physicians were classified as practicing within the subspecialty if they were cardiologists.

PATIENTS AND PATIENT CLASSIFICATION

Patients were classified based on the International Classification of Diseases, Ninth Revision, Clinical Modification, principal diagnosis code. Only information on patients who were hospitalized in the 6 hospitals for acute myocardial infarction, congestive heart failure, upper gastrointestinal hemorrhage, or community-acquired pneumonia between January 1, 1997, and December 1, 1997, was used in this study. Data of patients who were younger than 18 years or transferred from other acute-care hospitals were excluded. Patients may have been hospitalized more than one time, and each hospitalization was considered separately.

SEVERITY ADJUSTMENT AND THE CHOICE SEVERITY OF ILLNESS SYSTEM

The CHOICE Severity of Illness System was developed by the Cleveland Health Quality Choice program.12,13 The

RESULTS

PATIENT DEMOGRAPHICS AND CLASSIFICATION

There were a total of 6485 patient hospital admissions that were potentially eligible for the study. Of these patient hospital admissions, 1373 included patients who were not clearly identified as being primarily treated by an internal medicine subspecialist, a general internist, or a family practitioner. The remaining 5112 patient admissions were enrolled in the study. Among them, 1143 patients (22%) had an acute myocardial infarction, 610 (12%) had an upper gastrointestinal hemorrhage, 1946 (38%) had congestive heart failure, and 1413 (28%) had community-acquired pneumonia.

When patients were classified according to the type of physician who provided their care, as seen in Table 2, a total of 1776 patients (35%) were treated by a physician practicing within his or her specialty, 1083 (21%) were treated by an internist without an identified specialty, 990 (19%) were treated by a family practitioner, and 1263 (25%) were treated by a subspecialist practicing outside of his or her specialty. There were 301 different physicians.

The mean ± SD age of the patients was 72.2 ± 13.9 years, 93% were white, and 51% were men. About 72% of the patients had Medicare insurance, and 23% had commercial insurance. The mean ± SD LOS was 5.6 ± 3.9 days.

IN-HOSPITAL MORTALITY

The mean in-hospital mortality was 5.4%. The mean severity-adjusted mortality was 5.5%. Mortality rates for each hospital are listed in Table 1. Patients cared for by
subspecialists practicing outside of their specialty had higher mortality rates than those cared for by subspecialists practicing within their specialty (P = .047) (analysis 1 in Table 3). There were no significant differences in the mortality rates when comparing patients cared for by general internists with those cared for by subspecialists practicing outside of their specialty (P = .17) or when comparing patients cared for by general internists with those cared for by subspecialists practicing within their subspecialty (P = .65) (analysis 2 in Table 3). Similar results were found for the severity-adjusted mortality rate. Too few patients with an upper gastrointestinal hemorrhage died to compare mortality rates by physician types.

**LENGTH OF STAY**

The mean patient hospital LOS was 5.7 days. The mean LOS was 5.5 days for general internists’ patients, 5.6 days for family practitioners’ patients, 5.2 days for patients cared for by subspecialists practicing within their specialty, and 6.6 days for those cared for by subspecialists practicing outside of their specialty. The severity-adjusted LOS was longer for patients treated by subspecialists practicing outside of their specialty than for those cared for by subspecialists practicing within their specialty (Table 4). These differences were observed for patients with acute myocardial infarction, congestive heart failure, gastrointestinal hemorrhage, and pneumonia. In addition, patients cared for by subspecialists practicing outside of their subspecialty had longer LOSs than those treated by general internists (Table 4).

**COMMENT**

This study demonstrated that subspecialists caring for patients outside of their specialty may provide less efficient care, as evidenced by longer LOSs, than either subspecialists practicing within their subspecialty or general internists. In addition, patients cared for by physicians practicing outside of their specialty may have slightly higher mortality rates than those cared for by subspecialists practicing within their specialty. The odds ratio for subspecialists caring for patients outside of their subspecialty when compared with subspecialists caring for...
Table 1. Observed Mortality Rates From Different Hospitals*

<table>
<thead>
<tr>
<th>All Diseases Combined</th>
<th>No. of Missing Data†</th>
<th>Observed Mortality, % (n1/n2)</th>
<th>Severity-Adjusted Mortality, %</th>
<th>Analysis 1</th>
<th>Analysis 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hospital 1</td>
<td>Hospital 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hospital 3</td>
<td>Hospital 4‡</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hospital 5</td>
<td></td>
</tr>
<tr>
<td>Within-specialty subspecialists (n = 1776)§</td>
<td>227</td>
<td>5.04 (78/1549)</td>
<td>5.4</td>
<td>5.66 (19/342)</td>
<td>6.42 (7/109)</td>
</tr>
<tr>
<td>General internist (n = 1083)</td>
<td>71</td>
<td>5.14 (52/1012)</td>
<td>5.6</td>
<td>6.99 (13/186)</td>
<td>9.76 (4/41)</td>
</tr>
<tr>
<td>Family practitioner (n = 990)</td>
<td>14</td>
<td>4.51 (44/976)</td>
<td>5.5</td>
<td>5.17 (15/290)</td>
<td>8.33 (12/144)</td>
</tr>
<tr>
<td>Out-of-specialty subspecialist (n = 1263)§</td>
<td>38</td>
<td>6.53 (80/1225)</td>
<td>5.7</td>
<td>7.31 (28/383)</td>
<td>17.46 (11/63)</td>
</tr>
</tbody>
</table>

* n1 denotes the number of patients who died in the hospital, and n2 denotes the total number of patients in each group. The number of patients in each hospital represents only those for whom we have information on mortality.
† Patients with no data on mortality were excluded in the calculation of mortality rate.
‡ Hospital 4 is actually 2 hospitals belonging to a single health system.
§ P values for χ² tests for within-specialty, family practitioner, and out-of-specialty subspecialist physician types were .25, .04, and <.01, respectively. Too few patients died in some of the hospitals to perform the χ² test for general internist.

There were no significant differences in mortality rates between hospitals 1, 2, 3, and 4. Hospital 5 had a significantly lower severity-adjusted mortality rate than the other hospitals.

Table 2. Demographics of Patients Treated by Different Types of Physicians*

<table>
<thead>
<tr>
<th></th>
<th>Within-Specialty Subspecialists (n = 1776)</th>
<th>General Internists (n = 1083)</th>
<th>Family Practitioners (n = 990)</th>
<th>Out-of-Specialty Subspecialists (n = 1263)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean ± SD, y</td>
<td>69.0 ± 13.7</td>
<td>74.4 ± 13.2</td>
<td>73.3 ± 14.5</td>
<td>72.9 ± 13.7</td>
</tr>
<tr>
<td>Male</td>
<td>996 (56)</td>
<td>512 (47)</td>
<td>425 (43)</td>
<td>570 (45)</td>
</tr>
<tr>
<td>White</td>
<td>1665 (94)</td>
<td>1001 (92)</td>
<td>929 (94)</td>
<td>1127 (89)</td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
<td>757 (43)</td>
<td>179 (17)</td>
<td>96 (10)</td>
<td>111 (9)</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>627 (35)</td>
<td>403 (37)</td>
<td>369 (37)</td>
<td>547 (43)</td>
</tr>
<tr>
<td>Upper gastrointestinal hemorrhage</td>
<td>139 (8)</td>
<td>165 (15)</td>
<td>146 (15)</td>
<td>160 (13)</td>
</tr>
<tr>
<td>Community-acquired pneumonia</td>
<td>253 (14)</td>
<td>336 (31)</td>
<td>379 (38)</td>
<td>445 (35)</td>
</tr>
</tbody>
</table>

*Data are given as number (percentage) of patients except for age. Differences in demographics between patient populations between the 4 different physician types were significant at P <.01.

Table 3. Comparison of Patient Mortality Rates Among Physician Types*

<table>
<thead>
<tr>
<th></th>
<th>Observed Mortality, %</th>
<th>Analysis 1</th>
<th>Analysis 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OR (95% CI)</td>
<td>P Value</td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
<td></td>
<td>Reference</td>
<td>...</td>
</tr>
<tr>
<td>Within-specialty subspecialist (n = 757)</td>
<td>8.36</td>
<td>Reference</td>
<td>...</td>
</tr>
<tr>
<td>General internist (n = 179)</td>
<td>8.33</td>
<td>0.90 (0.38 to 2.11)</td>
<td>.13</td>
</tr>
<tr>
<td>Family practitioner (n = 96)</td>
<td>6.89</td>
<td>0.41 (0.13 to 1.30)</td>
<td>.13</td>
</tr>
<tr>
<td>Out-of-specialty subspecialist (n = 111)</td>
<td>16.33</td>
<td>1.23 (0.54 to 2.79)</td>
<td>.62</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td></td>
<td>Reference</td>
<td>...</td>
</tr>
<tr>
<td>Within-specialty subspecialist (n = 627)</td>
<td>3.44</td>
<td>Reference</td>
<td>...</td>
</tr>
<tr>
<td>General internist (n = 403)</td>
<td>4.30</td>
<td>1.15 (0.57 to 2.35)</td>
<td>.69</td>
</tr>
<tr>
<td>Family practitioner (n = 369)</td>
<td>3.28</td>
<td>0.85 (0.38 to 1.89)</td>
<td>.69</td>
</tr>
<tr>
<td>Out-of-specialty subspecialist (n = 547)</td>
<td>5.25</td>
<td>1.51 (0.81 to 2.84)</td>
<td>.20</td>
</tr>
<tr>
<td>Community-acquired pneumonia</td>
<td></td>
<td>Reference</td>
<td>...</td>
</tr>
<tr>
<td>Within-specialty subspecialist (n = 253)</td>
<td>4.38</td>
<td>Reference</td>
<td>...</td>
</tr>
<tr>
<td>General internist (n = 336)</td>
<td>5.70</td>
<td>1.02 (0.43 to 2.41)</td>
<td>.97</td>
</tr>
<tr>
<td>Family practitioner (n = 379)</td>
<td>6.35</td>
<td>1.30 (0.58 to 2.93)</td>
<td>.53</td>
</tr>
<tr>
<td>Out-of-specialty subspecialist (n = 445)</td>
<td>6.44</td>
<td>1.39 (0.63 to 2.07)</td>
<td>.41</td>
</tr>
<tr>
<td>All diseases combined</td>
<td></td>
<td>Reference</td>
<td>...</td>
</tr>
<tr>
<td>Within-specialty subspecialist (n = 1776)</td>
<td>5.04</td>
<td>Reference</td>
<td>...</td>
</tr>
<tr>
<td>General internist (n = 1083)</td>
<td>5.14</td>
<td>1.10 (0.73 to 1.67)</td>
<td>.65</td>
</tr>
<tr>
<td>Family practitioner (n = 990)</td>
<td>4.51</td>
<td>0.87 (0.56 to 1.35)</td>
<td>.53</td>
</tr>
<tr>
<td>Out-of-specialty subspecialist (n = 1263)</td>
<td>6.53</td>
<td>1.46 (1.00 to 2.12)</td>
<td>.047</td>
</tr>
</tbody>
</table>

*Analysis 1 performed using specialists practicing within their specialty as the reference group; analysis 2, using general internists as the reference group. OR indicates odds ratio; CI, confidence interval.
patients within their subspecialty was 1.46 (P = .047). Patients cared for by physicians outside of their subspecialty also had 19% longer LOSs for the total population of patients, and significantly longer LOSs for patients with congestive heart failure, upper gastrointestinal hemorrhage, and community-acquired pneumonia. These differences suggest that subspecialists practicing outside of their specialty may provide less efficient care and possibly lower-quality care when compared with physicians providing care within their subspecialty.

When comparing the mortality rates of patients treated by physicians practicing outside of their specialty with those of patients cared for by general internists, there were no statistically significant differences. However, LOSs for patients cared for by subspecialists practicing outside of their specialty were 17% longer than those of patients cared for by general internists, and prolongations of stay were observed for patients with congestive heart failure, upper gastrointestinal hemorrhage, and community-acquired pneumonia. Therefore, LOSs were shorter when patients were treated by general internists rather than subspecialists practicing outside of their specialty.

This study is one of few that have examined the potential implications of having subspecialists care for patients outside of their subspecialty. The strengths of the present study include the following: (1) it had more than 5112 patients treated at 6 different hospitals and (2) a severity-of-illness adjustment was performed to minimize the chance that differences in LOSs and mortality rates could be attributed to differences in patient severity of illness.12,13

This study also has limitations. First, teams of physicians often care for hospitalized patients, including different subspecialists. It can be difficult to attribute the efficiency or quality of care to a single physician or type of physician. However, the identified physician in the study was the primary attending physician of record as coded by the hospital. Although we attempted to control for the number of patients with a particular condition treated by a physician, we only had access to the information of patients treated in the hospitals that participated in this study. It is possible that a physician might have admitted patients to hospitals other than these 6. Therefore, the real volume of patients treated by physicians in this study might be higher than what was measured. Information regarding the volume of patients treated by different types of physicians could be inaccurate and, thus, was not used as a variable in the analyses. In addition, there were some differences in demographics between those patients cared for by general internists, subspecialists practicing within their subspecialty, and subspecialists practicing outside of their subspecialty. However, patients’ LOSs and mortality rates were adjusted for patient severity of illness, which should account for any difference that patient severity of illness or age might have had on LOS. In addition, the LOS may impact hospital mortality rates. Finally, this study used the patient as the unit of analysis rather than the hospital or the physician.
The observed differences in LOS may demonstrate that physicians caring for patients outside of their chosen specialty are less familiar with patients with these conditions because volume-outcome relationships have been shown for many conditions in medicine, and subspecialists practicing outside of their subspecialty may be a marker for low patient volume. Moreover, subspecialists frequently care for patients outside of their chosen subspecialty, because 25% of patients were cared for by subspecialists practicing outside of their subspecialty. A recent study\textsuperscript{8} showed that many primary care physicians believe that the scope of conditions that they are expected to treat is greater than it ought to be. Because many subspecialists may perform primary care and treat hospitalized patients outside of their subspecialty, it is possible that subspecialists may have similar concerns that the scope of conditions that they treat outside of their subspecialty is greater than it should be.

In conclusion, subspecialists commonly care for patients outside of their subspecialty. Patients cared for by subspecialists practicing outside of their subspecialty had longer LOSs and possibly higher mortality rates than those cared for by subspecialists practicing within their subspecialty; they also had longer LOSs when compared with those cared for by general internists. If patients are cared for by subspecialists practicing outside of their specialty, their LOSs, and possibly even mortality rates, may be higher than those of patients cared for by subspecialists practicing within their subspecialty.

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REFERENCES