Patients’ Role in the Use of Radiology Testing for Common Office Practice Complaints

Ira B. Wilson, MD, MSc; Kim Dukes, MA; Sheldon Greenfield, MD; Sherrie Kaplan, MPH, PhD; Bruce Hillman, MD

Background: Radiological studies are an important component of ambulatory medical costs, and guidelines often focus on their appropriate use. However, little is known about the correlates of the use of these services, particularly the influence of patients’ preferences on physicians’ utilization decisions.

Objectives: To study patients presenting for outpatient treatment of respiratory problems and low back pain, and to examine the magnitude of the effect of the patients’ perceived need for radiological studies (radiology preference score) on use of those services.

Design: Cross-sectional survey.

Setting: Office practices of generalist physicians in predominantly rural areas of 8 states.

Participants: A total of 52 generalist physicians agreed to enroll consecutive Medicare-eligible patients making office visits for respiratory problems or low back pain. Of 1785 eligible patients invited to participate, 132 (7%) refused and 1137 (69%) of 1653 returned questionnaires.

Measurements: Radiology utilization rates (plain film, computed tomographic scan, or magnetic resonance image scan) were determined by patient self-report. To assess perceived need for radiological studies, we asked patients how necessary they believed an x-ray film was in the evaluation of 4 common complaints (respiratory problems, low back pain, knee pain, and knee swelling). A summary radiology preference score was created from 3 of the 4 items, excluding the item referring to the patients’ index complaint.

Results: Six hundred fifteen respiratory and 522 low back pain patients were enrolled; mean ages were 69 and 64 years, respectively. Radiology utilization rates were 37% for respiratory and 26% for low back pain patients. In multiple logistic regression models, for respiratory patients radiology utilization was related significantly to the radiology preference score (odds ratio [OR] for fourth quartile compared with first quartile, 1.94; 95% confidence interval [CI], 1.11-3.37; \( P = .02 \)), to having a physician who owned radiology equipment (OR, 1.81; 95% CI, 1.23-2.66; \( P = .002 \)), and current smoking (OR, 1.58; 95% CI, 1.04-2.41; \( P = .03 \)). For low back pain patients, radiology utilization was significantly related to the radiology preference score (OR for fourth compared with first quartile, 3.74; 95% CI, 1.29-5.06; \( P = .007 \)), bothersomeness of the pain (OR for fourth compared with first quartile, 3.74; 95% CI, 1.74-8.04; \( P < .001 \)), and a diagnosis of osteoporosis (OR, 1.67; 95% CI, 1.01-2.75; \( P = .04 \)).

Conclusions: Patients’ perceived need for radiological studies was significantly associated with use of those services for outpatients with respiratory problems and low back pain. These findings suggest that patients communicate their wishes to physicians, either directly or indirectly, regarding services they think are necessary. Differences in physicians’ adherence to guidelines regarding radiology utilization may in part reflect variations in patients’ perceived need for those services. Efforts to educate patients about when radiological studies are medically indicated may be an important complement to practice guidelines or other utilization-related financial incentives.

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SUBJECTS AND METHODS

SUBJECTS

This study was part of a larger initiative to assess the impact of a radiological reimbursement policy change instituted by the United Mine Workers of America Health and Retirement Funds (hereafter Funds) on radiology utilization.10

PHYSICIANS

Eligible physicians were generalists (internal medicine, family practice, and general practice) with 30 or more Funds patients in their panel. Most practiced in rural (coal mining) areas. We used a quota sampling strategy with a goal of enrolling 60 physicians. Using the Funds’ claims-history and provider databases, 449 generalist physicians were identified. All were sent an invitation to participate by mail. Follow-up telephone calls were made by a physician who personally invited them to participate. Because of the possibility that radiology utilization would differ for physicians who owned their own imaging equipment,14 efforts were made during the telephone follow-up phase of physician enrollment to oversample self-referring physicians who comprised only 20% of eligible physicians.

PATIENTS

Receptionists in participating physicians’ offices were asked to enroll 30 or more consecutive eligible patients. Patients were eligible if they visited the outpatient office of a participating physician for a respiratory problem or low back pain during the study period and had either Funds or Medicare insurance. Funds patients were Medicare eligible, and the Funds administered both the Medicare and supplemental insurance components of physician reimbursements for Funds beneficiaries. Eligible patients with respiratory problems could have shortness of breath, cough, or allergy symptoms, such as runny nose or chest congestion. Eligible patients with low back pain could have acute or chronic low back pain.

Patient enrollment took place between September 1, 1994, and August 1, 1995. Nonrespondents were contacted by telephone and answered an abbreviated series of sociodemographic and health questions.

DATA COLLECTION

Patients were surveyed by mail 1 month after the enrollment visit. The patient questionnaire included specific items about receipt of radiological studies, patients’ perceptions of the necessity of radiological services, condition-specific symptoms and functioning; health habits and personal characteristics; the presence and severity of comorbid conditions; utilization of radiological services; and general health status.

We asked participating physicians about practice characteristics, background and training, and whether plain films, computed tomographic (CT) scanning, and magnetic resonance image (MRI) scanning were done at their offices.

VARIABLES

Dependent Variable

Radiology utilization was determined by patients’ self-report. Descriptions of x-ray films, CT scans, and MRI scans were provided, and patients were asked whether they had received such a test or tests in the 4 weeks since the enrollment visit. A dichotomous utilization variable was created reflecting any radiology utilization.

Independent Variables

Four items were developed to assess patients’ perceptions of the necessity of radiological studies in the evaluation of physical complaints that are common in the elderly. We asked patients how necessary they thought it was “in order to get the best medical care” to get an x-ray or a scan for each of the following common problems: pain in the lower back, cough, knee pain, and swelling of the knee. Each item was measured using a 5-point Likert scale ranging from “very necessary” to “not at all necessary.” One “radiology preference score” was created for patients with respiratory complaints and another for patients with low back pain. In each case, the scale was the sum of 3 preference score items that did not pertain to the index condition. The item referring to the index complaint was not included in the radiology preference scale because of the possibility that the patients’ actual recent experience (receiving or not receiving an x-ray examination) might influence their perception of the necessity of an x-ray for that particular complaint. Thus, for respiratory patients, the scale was composed of items about low back pain, knee pain, and knee swelling; and, for low back pain patients, the scale was composed of items about cough, knee pain, and knee swelling. The scale was the sum of the 3 items, transformed linearly to a 0 to 100 scale where a higher score represents the perception that radiological studies are necessary to get the best medical care. We performed principal components analyses to verify hypothesized item groupings. Internal consistency reliability was assessed using Cronbach’s.15 To assess validity, we tested whether imaging rates were higher for specific services on utilization of those services has not been studied.

We therefore examined the relationship between patients’ perceived need for radiological studies and use of radiological testing in a population of elderly outpatients. We focused on episodes of care for respiratory complaints and low back pain in Medicare-eligible outpatients because these are common problems among the elderly and because we believed...
for patients in the fourth quartile of the radiology necessity score than for patients in the first quartile.

Other independent variables included sociodemographic, clinical, and nonclinical variables. Sociodemographic variables included age, sex, race, income, and education. Patient-reported clinical variables included condition-specific symptom severity, functioning related to those symptoms, comorbid conditions, and general functioning and well-being. Health habits included current smoking and current alcohol use. Condition-specific clinical factors for respiratory patients included patients’ reports of a prior diagnosis of black lung, emphysema, chronic bronchitis, frequency of cutting down on usual activities because of respiratory problems, and symptom severity. Upper- and lower-tract respiratory symptom severity was assessed using scales modified from Monto and Cavallerio, which included fever. For back pain patients, condition-specific clinical factors included the presence of sciatica, frequency of cutting off on usual activities due to pain, bothersomeness of pain, chronicity, and a history of back surgery. We did not ask back pain patients about fever because empirical studies show that fever is uncommon in general medical outpatients being evaluated for back pain. Low back pain was classified as chronic if patients reported that they had the pain all the time. The presence and severity of comorbidities were assessed using a 64-item modified form of the Total Illness Burden Index (TIBI) designed to capture domains salient to an elderly population. General functioning and well-being were assessed using the Medical Outcomes Study SF-36.21 Nonclinical variables included insurance coverage and physician self-referral vs radiologist-referral classification. For insurance, patients were classified as having either Medicare or Funds coverage. Insurance type was provided by physicians’ offices. Funds beneficiaries receive full reimbursement, with no copayments, for all outpatient diagnostic imaging examinations. However, the supplemental insurances of the Medicare patients in the study could vary widely and could potentially impact utilization of radiological services. To measure this barrier, we asked patients how much out-of-pocket costs interfered with their ability to “get the lab tests, x-rays, and scans that the doctor recommends.”

Physicians were classified as either self-referring or radiologist-referring according to their responses to a survey item inquiring whether they routinely obtained plain films in their own office (self-referring physicians). We used data from the Funds’ administrative database to validate this classification. The Funds’ database classified physicians as self-referring if they had charged a professional fee, a technical fee, or both for performing and/or interpreting a radiological study in the 6 months preceding January 1, 1994. For the 38 physicians who could be classified using both survey and database approaches, there was agreement between the 2 methods in 82% of cases (κ statistic, 0.63).

**RESULTS**

**PHYSICIAN CHARACTERISTICS**

Participating physicians were from 8 different states: Alabama, Indiana, Kentucky, Pennsylvania, Tennessee, Utah, and that physicians would respond with greater use of radiological studies.
Virginia, and West Virginia. They were mostly male (n = 48; 92%), had a mean age of 50 years, and had been practicing at their current practice site for an average of 17 years (Table 1).

To assess whether our quota sampling strategy for physicians had introduced important biases, we examined differences between participating and nonparticipating physicians. By design, participating physicians were more often self-referring for radiological examinations than nonparticipating physicians (P < .05). Participating physicians were also more likely to practice in a group practice as opposed to solo practice (P < .05) settings. There were no differences between participating and nonparticipating physicians in any other salient study characteristics.

**PATIENT CHARACTERISTICS**

During the enrollment period, 1785 eligible patients were invited to participate. One hundred thirty-two (7%) refused, and 1137 (69%) of 1653 returned questionnaires. For respiratory patients, the mean age was 69 years, 45% were women, and 62% had Medicare insurance (Table 2). Educational levels were low, with a mean of 8.4 years of education. For back pain patients, the mean age was 64 years, 54% were women, and 68% had Medicare insurance. For back pain patients, the mean age was younger than 65 years because of patients who qualified for Medicare due to disability (Supplemental Security Income recipients). In both groups, 98% of patients were white and 58% had a yearly income of less than $15000 per year. Thirty-nine percent of respiratory and 37% of back pain patients had a self-referring physician.

To determine the nature of patients’ response bias, 191 (37%) of the 516 nonrespondents were contacted by telephone and responded to a short survey. Compared with survey respondents, nonrespondents contacted by telephone reported worse role function and emotional function, were younger, were not as well educated, and had lower incomes (all P < .05). There were no differences in sex, race, or overall health ratings.

**CLINICAL CHARACTERISTICS**

Forty-three percent of respiratory patients reported that they were current smokers, 46% had emphysema, 51% had chronic bronchitis, 46% reported a diagnosis of “black lung,” and 11% had a history of non-skin cancer (Table 3). Thirty-two percent reported having to cut down their usual activities “a lot” due to their respiratory problems, and 39% reported that their health was “poor” (the most extreme of 5 response categories). Thirty-seven percent of respiratory patients had at least 1 chest radiological study during the study period.

Fifty-three percent of the back pain patients were current smokers and 7.3% had a history of non–skin cancer (Table 3). The back pain was characterized as chronic by 56% of patients and 18% reported having had back

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**Table 1. Characteristics of 52 Physicians**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex, No. (%)</td>
<td>48/52 (92)</td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>50 (9.7)</td>
</tr>
<tr>
<td>Years practicing at current site, mean (SD)</td>
<td>17 (9.1)</td>
</tr>
<tr>
<td>Completed residency program, %</td>
<td>39/51 (76)</td>
</tr>
<tr>
<td>Completed internal medicine training, %</td>
<td>25/51 (49)</td>
</tr>
<tr>
<td>% of those completing residency</td>
<td></td>
</tr>
<tr>
<td>Completed family medicine training, %</td>
<td>16/51 (31)</td>
</tr>
<tr>
<td>% of those completing residency</td>
<td></td>
</tr>
<tr>
<td>No. of other physicians practicing at site, including self, mean (SD)</td>
<td>2.6 (4.1)</td>
</tr>
<tr>
<td>Hours per week participating physicians spend seeing office patients, mean (SD)</td>
<td>35 (7.6)</td>
</tr>
<tr>
<td>Patients seen per week in office by participating physicians, mean (SD)</td>
<td>141 (70)</td>
</tr>
</tbody>
</table>

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**Table 2. Patient Sociodemographic Characteristics**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Respiratory Group (n = 615)</th>
<th>Back Pain Group (n = 522)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD), y</td>
<td>69 (11)</td>
<td>64 (14)</td>
</tr>
<tr>
<td>Female sex, %</td>
<td>45</td>
<td>54</td>
</tr>
<tr>
<td>Insurance, % Medicare</td>
<td>62</td>
<td>68</td>
</tr>
<tr>
<td>Education, highest grade, mean (SD)</td>
<td>8.4 (3.5)</td>
<td>9.5 (3.4)</td>
</tr>
<tr>
<td>Race, % white</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>Income, % &lt;$15 000/y</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>Self-referring physician, %</td>
<td>39</td>
<td>37</td>
</tr>
</tbody>
</table>

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**Table 3. Patient Clinical Characteristics, Radiology Utilization Rates, and Radiology Preference Score**

<table>
<thead>
<tr>
<th>Clinical Characteristic</th>
<th>Respiratory Group (n = 615)</th>
<th>Back Pain Group (n = 522)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking currently, %</td>
<td>43</td>
<td>53</td>
</tr>
<tr>
<td>Emphysema, %</td>
<td>46</td>
<td>...</td>
</tr>
<tr>
<td>Chronic bronchitis, %</td>
<td>51</td>
<td>...</td>
</tr>
<tr>
<td>Diagnosis of black lung, %</td>
<td>46</td>
<td>...</td>
</tr>
<tr>
<td>Chronic back pain, %</td>
<td>...</td>
<td>56</td>
</tr>
<tr>
<td>History of back surgery, %</td>
<td>...</td>
<td>18</td>
</tr>
<tr>
<td>Bothered “a lot” or “extremely” by sciatica, %</td>
<td>...</td>
<td>42</td>
</tr>
<tr>
<td>History of non–skin cancer, %</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Report cutting down usual activities “a lot,” %</td>
<td>32</td>
<td>...</td>
</tr>
<tr>
<td>Report cutting down usual activities “a lot” or “a whole lot,” %</td>
<td>...</td>
<td>59</td>
</tr>
<tr>
<td>Report health is “poor,” %</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td>Radiology utilization rate, %</td>
<td>37</td>
<td>26</td>
</tr>
<tr>
<td>Plain film, %</td>
<td>35</td>
<td>24</td>
</tr>
<tr>
<td>CT, %</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>MRI, %</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Radiology preference score, mean (SD)</td>
<td>49 (26)</td>
<td>43 (24)</td>
</tr>
</tbody>
</table>

*CT indicates computed tomographic; MRI, magnetic resonance imaging; and ellipses, not applicable.
†For respiratory patients, the item had 5 response categories, with “a lot” being the most extreme. For back patients, the 2 most extreme categories were “a lot” and “a whole lot.”
‡The radiology preference score ranges from 0 (radiological studies not at all necessary for the best quality care) to 100 (radiological studies necessary for the best quality care).
Forty-two percent were bothered “a lot” or “extremely” by sciatica, and 59% reported cutting down on usual activities “a lot” or “a whole lot” because of back pain. Thirty-five percent described their health as “poor.” Having a radiological procedure during the study period was reported by 26% of back pain patients.

For both respiratory and low back pain patients, mean scores were below the 25th percentile for patients 65 to 75 years on all 8 dimensions of the SF-36 (data not shown).

**PATIENTS’ PERCEIVED NEED FOR RADIOLOGY STUDIES**

A score of 100 indicated that a patient believed that a radiological study was “very necessary” for all 3 complaints, and a score of 50 indicated that a radiological study was “sometimes necessary.” The mean radiology preference score for both respiratory and back pain patients were 49 and 43, respectively (Table 3). Internal consistency reliability as assessed by Cronbach α was high for both respiratory and low back pain patients at 0.82 and 0.75, respectively.

**UTILIZATION ANALYSES**

**Respiratory Problems**

In bivariate analyses, shown in the left-hand column of Table 4, radiology preference score was significantly related to radiology utilization, with patients in the fourth quartile of the preference score more likely to have a radiological study compared with those in the first quartile (44% vs 29%; \( P = .008 \)). Patients of self-referring physicians more often underwent radiological studies than patients of radiologist-referring physicians (45% vs 31%, \( P < .001 \)). Current smokers had more chest radiological studies conducted than nonsmokers, though the bivariate trend did not reach statistical significance (43% vs 34%, \( P = .07 \)). More functional impairment due to respiratory symptoms also was associated with greater utilization, with patients in the fourth quartile more likely to have had a radiological study than those in the first quartile (43% vs 28%, \( P = .02 \)). There was a trend toward more respiratory symptoms being associated with greater radiology utilization when the fourth and first quartiles were compared (41% vs 31%, \( P = .08 \)). Insur-
Table 5. Significant Bivariate and Multivariable Correlates of Radiology Utilization in Patients With Back Pain*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Bivariate Analysis</th>
<th></th>
<th></th>
<th>Multivariable Analysis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Utilization Rate, %</td>
<td>Odds Ratio† (95% CI)</td>
<td>P</td>
<td>Odds Ratio† (95% CI)</td>
<td>P</td>
</tr>
<tr>
<td>Radiology preference score (quartiles)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>15</td>
<td>. . .</td>
<td>. . .</td>
<td>. . .</td>
<td>. . .</td>
</tr>
<tr>
<td>2</td>
<td>26</td>
<td>1.95 (1.05-3.64)</td>
<td>.03</td>
<td>1.76 (0.88-3.33)</td>
<td>.11</td>
</tr>
<tr>
<td>3</td>
<td>23</td>
<td>1.62 (0.80-3.30)</td>
<td>.18</td>
<td>1.33 (0.59-2.96)</td>
<td>.49</td>
</tr>
<tr>
<td>4</td>
<td>34</td>
<td>2.64 (1.54-5.23)</td>
<td>&lt;.001</td>
<td>2.55 (1.29-5.06)</td>
<td>.007</td>
</tr>
<tr>
<td>Bothersomeness of pain (quartiles)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>11</td>
<td>. . .</td>
<td>. . .</td>
<td>. . .</td>
<td>. . .</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>1.98 (0.88-4.44)</td>
<td>.10</td>
<td>1.90 (0.78-4.66)</td>
<td>.16</td>
</tr>
<tr>
<td>3</td>
<td>31</td>
<td>3.55 (1.86-6.77)</td>
<td>&lt;.001</td>
<td>3.08 (1.49-6.34)</td>
<td>.002</td>
</tr>
<tr>
<td>4</td>
<td>39</td>
<td>5.07 (2.55-10.07)</td>
<td>&lt;.001</td>
<td>3.74 (1.74-8.04)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>32</td>
<td>1.95 (1.26-3.00)</td>
<td>.002</td>
<td>1.67 (1.01-2.75)</td>
<td>.04</td>
</tr>
<tr>
<td>No</td>
<td>20</td>
<td>. . .</td>
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</table>

*CI indicates confidence interval; ellipses, reference group.
†For variables expressed in quartiles, the first quartile is the reference group for odds ratios.

The multivariable model for back pain patients (Table 5, right-hand column) included the following variables: radiology preference score, bothersomeness of pain, and osteoporosis. The radiology preference score was independently associated with radiology utilization for back pain patients with an OR comparing the fourth with the first quartile of 2.55 (95% CI, 1.29-5.06; P = .007). Bothersomeness of pain was significantly associated with radiology utilization with an OR comparing the fourth with the first quartile of 3.74 (95% CI, 1.74-8.04; P < .001), as was a diagnosis of osteoporosis (OR, 1.67; 95% CI, 1.01-2.75; P = .04).

COMMENT

To determine factors associated with use of outpatient radiological services, we studied a population of elderly, mostly rural-dwelling patients from 8 different states who made office visits for respiratory problems and low back pain. For both groups of patients, the perception that diagnostic radiology was needed for the best quality care was significantly related to radiology utilization.

This is the first study of which we are aware that attempts to correlate patients’ general perceptions about the need for specific medical services to utilization of those services. Our findings support what clinical anecdotes suggest—that patients communicate their wishes to physicians, either directly or indirectly, regarding services they think are necessary, and that this communication influences physicians’ actions. While a number of studies have measured patients’ expectations about specific elements of the clinical encounter, including expectations about diagnostic testing, these studies largely have focused on the relationship between expectations and patients’ satisfaction. These studies not on actual utilization of services. This study also differs from others in that we studied patients of multiple practitioners over a wide geographic area, supporting the generalizability of the results.

Findings from this study have potentially important implications for the design of utilization and quality management programs in which guidelines, preauthorization, utilization profiling, and other related approaches are used. Our data suggest that efforts to reduce utilization of radiological studies that focus only on physicians and that do not take account of patients perceptions of the need for such imaging, may be less effective than anticipated. The same concerns may hold for other types of office-based testing, such as laboratory testing. Recent physician-focused interventions that have attempted to reduce radiology utilization by guidelines and feedback, mandatory radiological consultation, and fi-
nancial penalties,10 have failed. Stiell and colleagues39 successfully implemented a guideline focused on the diagnostically relevant evaluation of acute knee injuries, but the generalizability of such acute-care guidelines to office practice where complaints are more chronic may be limited. One small randomized trial that we are aware of supports the premise that patients' expectations about receiving radiological studies for low back pain can be modified.40

Compared with radiologist-referring physicians, self-referring physicians in this study ordered more radiological studies for their patients with respiratory complaints but not for their patients with low back pain. Previous studies, which used the episode of care as the unit of analysis, found that self-referral was consistently associated with higher radiology utilization.14,41 Our data, which assess 2 types of radiology utilization in the same group of physicians, suggest that the self-referral at the level of the individual physician is not best understood as a simple, uniform economic inducement. It is possible, for example, that the generalist physicians we studied were more comfortable interpreting chest films than lumbar spine films, and that this lack of comfort reduced the impact of whatever economic inducement existed for self-referring physicians to order more lumbar spine films.

There are some relevant study limitations. First, patients' perceptions about the necessity of radiological studies were not assessed prior to the office visit. To eliminate the possibility that having or not having an x-ray study for a respiratory complaint or low back pain influenced the radiology preference score, we excluded the item that referred to the index condition from the radiology score. Furthermore, the high internal consistency reliabilities of the scales suggest that they capture a generalized perception on the part of the patient about the role of x-ray films in the evaluation of acute complaints, as opposed to a perception that varies according to the specific complaint.

Second, patients' self-report of radiology utilization may be inaccurate. We did not review patients' charts to verify whether radiological studies were done because the majority of the physicians in the study had to send patients to radiologists to get radiological studies, and we thought it unlikely that office records would capture this out-of-office utilization in an unbiased way. Third, these data do not permit us to assess the appropriateness of the radiological studies done for these patients. Fourth, we do know how many of these patients were visiting their physician for the first time; such patients would likely receive imaging more frequently. Because patients were elderly, rural-dwelling patients with chronic medical conditions, we believe few were likely to be visiting their physician for the first time. Fifth, these findings may not be generalizable to younger patients or patients with higher levels of education. Finally, because this study was cross-sectional in design, it cannot prove causal relationships between the variables assessed.

Our findings have several important implications. Efforts to control costs by “profiling” and comparing physicians or groups of physicians regarding radiology utilization, and perhaps other types of utilization as well, may be confounded by variations in patients' perceived need for different types of services. More important attempts to educate patients about when specific types of utilization are medically necessary may be a useful complement to interventions aimed at physicians such as practice guidelines and utilization-related financial incentives.

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