The Practice of Radiology by Nonradiologists: Cost, Quality, and Utilization Issues

David C. Levin

Another problem yet to be solved is the question of the general practitioner who wishes to do his own x-ray work as far as he can, and also the specialist or internist who does the x-ray work pertinent to his own field. . . . Unfortunately, many have purchased machines chiefly for the purpose of increasing their own revenues with the assurance of the salesman, "If you get stuck, you can always take the films to Dr. X at hospital Y, who is glad to help you out." To me this certainly seems to be obtaining money under false pretenses, charging the patient a regular fee for an x-ray examination which is usually not well done and then sponging on the full-time roentgenologist for a free opinion—often with films of inferior quality and insufficient detail.

Merrill C. Sosman, Annual Report of the Peter Bent Brigham Hospital, 1937

A man with a hammer sees lots of things that need to be hammered.

Mark Twain

Although some things have not changed much since Merrill Sosman's time, many ethical and economic aspects of medical practice are now being scrutinized much more closely than in the past. Among the questions being asked are the following: Are physicians overutilizing technology? How much and by what criteria are physicians being paid (or overpaid)? Is the best possible quality of care being provided to patients?

During the past few years, several colleagues and I have worked with a group at Pennsylvania Blue Shield (PBS) to study utilization, cost, and quality issues associated with the practice of radiology by nonradiologists. Compelling data and concepts have emerged from these studies. This article reviews some of our findings and other issues in three areas: (1) utilization patterns and costs for outpatient radiographic, sonographic, CT, and MR imaging examinations of PBS subscribers throughout the state during 1991; (2) recent trends in the utilization of barium enemas, colonoscopy, and percutaneous transluminal coronary angioplasty (PTCA); and (3) comparison of the quality of radiographic examinations performed by radiologists and nonradiologists. Although these subjects are somewhat disparate, they all bear on the three health policy questions posed above. They also relate to the landmark studies of Hillman et al. [1, 2], who demonstrated that self-referring nonradiologist physicians who perform their own radiographic and sonographic studies perform two to eight times as many of these studies as do other physicians who instead refer their patients to radiologists.

Utilization and Costs of Radiographic Studies

PBS insures almost 6 million subscribers through its various private business (non-Medicare) contracts in Pennsylvania. We studied the utilization of plain radiographic examinations of these patients in private offices during 1991 [3]. For each claim, the PBS data base provides information about the Health Care Finance Administration Common Procedure Coding System (HCPCS) procedure code, type of
claim (global or professional component only), the location where the study was provided, the specialty of the physician provider, the physician’s charge, and PBS’s reimbursement allowance. We included only global claims because the vast majority of private office examinations in Pennsylvania are billed this way. Only those studies performed more than 1000 times during 1991 were included. Examinations performed in hospital settings on either inpatients or outpatients were not included, nor were the relatively small number of examinations performed by multispecialty groups, where the specialty of the providing physician often was unknown. Sixty-five procedure codes met the volume criterion for inclusion, and 787,703 of these studies were performed in private offices on PBS subscribers during 1991. Approximately 551,000 (70%) of these examinations were performed by nonradiologists. Grouping the codes together by category, skeletal radiography accounted for two thirds of all office-based radiographic examinations, and among these codes, radiologists performed only approximately 13%. Radiologists performed 48% of chest radiographs, 81% of abdominal studies, and 85% of mammograms. Global charges for these radiographic examinations totaled $63 million, of which $39 million (62%) in charges were submitted by nonradiologists. Reimbursement allowances by PBS totaled $44 million, of which more than $27 million (66%) was paid to nonradiologists. The average charges submitted by nonradiologists were higher for 40 codes, whereas those submitted by radiologists were higher for the remaining 25. The average PBS reimbursement allowances to nonradiologists were higher for 49 codes, whereas those to radiologists were higher for only 16 codes. Hillman et al. [1, 2] found that nonradiologists tend to charge more for imaging examinations than do radiologists. Charges do not accurately reflect the costs of medical care, however, because reimbursements paid by third-party insurance carriers may differ substantially from charges. Our data extend the findings of Hillman et al. by showing that actual reimbursements (true costs) paid to nonradiologists are also generally higher than those paid to radiologists.

It is of interest at this point to introduce the concept of excess reimbursement. Assume, for example, that for hypothetical HCPCS code 12345, radiologists perform 800 studies and receive an average reimbursement of $80 per examination. At the same time, assume that nonradiologists perform 1000 of these studies, for which they receive an average reimbursement of $100 per examination. The excess reimbursement (which could also be construed as unnecessary cost) to the higher-paid group of physicians (nonradiologists in this example) is their marginal incremental revenue of $20 multiplied by the 1000 studies they perform, or $20,000. Applying this calculation to all 65 codes, the excess reimbursement paid to nonradiologists for the 49 codes for which they received higher average reimbursement allowances totaled $2,067,713. The excess reimbursement paid to radiologists for the 16 codes for which they received higher average reimbursement allowances was only $117,768. The reason for this large discrepancy, aside from just the number of codes involved, was that for codes for which radiologists received higher average reimbursement allowances, both their marginal dollar increments and the volume of studies tended to be lower.

One might ask why PBS (which is aware of these discrepancies) tolerates a situation wherein they reimburse untrained physicians to a greater extent to practice diagnostic imaging than they do radiologists, who are highly trained in the field. The answer is complex [4] and has to do partly with historical charge patterns among various specialties under PBS’s “usual, customary and reasonable” reimbursement system, partly with the fact that other nonradiologist specialists may have higher practice and malpractice insurance costs, and partly with the fact that PBS is a not-for-profit organization that is chartered and heavily regulated by the state. In any event, PBS is now in the process of taking steps to establish a uniform fee schedule for all providers (one that is lower for everyone).

Utilization and Costs of Sonography

The findings with respect to sonography [3] were similar to those for plain radiographic studies. Here the analysis called for 100 office-based examinations as the minimum number for inclusion, and 29 sonographic codes met this criterion. Among 159,281 of these 29 types of studies, almost 100,000 (63%) were performed by nonradiologists. Among categories of codes, more than two thirds of all studies were obstetric or pelvic, and radiologists performed only 30% of these. Radiologists performed 14% of vascular studies and 64% of abdominal/retroperitoneal studies. Global charges for all office sonographic examinations were $40 million, of which $27 million (67%) were submitted by nonradiologists. Reimbursement allowances paid by PBS were almost $25 million, of which almost $17 million (68%) went to nonradiologists. Higher average charges were submitted by nonradiologists for 23 of the 29 codes. Higher average reimbursement allowances were paid to nonradiologists for 17 of the 29 codes. The excess reimbursement paid to nonradiologists for sonography totaled $1,794,852, whereas that paid to radiologists was $94,961. Thus, with sonography as with plain film radiography, nonradiologists charge more and are paid more per examination.

Utilization of Body CT and MR Imaging

The use of both body CT and body MR imaging in private offices in 1991 by radiologists and nonradiologists was also studied (Levin DC et al., presented at the Radiological Society of North America meeting, December 1992) by using the same volume criterion for inclusion as for sonography. Among 7107 examinations in nine body CT codes, 91% were performed by radiologists and 9% by nonradiologists. During the same year, 14,774 examinations were performed in seven body MR imaging codes. Radiologists performed 94% of these, whereas 6% were performed by nonradiologists. Thus, there does not appear to be large-scale self-referral for body CT and MR imaging in Pennsylvania, as there is for plain film radiography and sonography.

We did not closely examine charges and reimbursements for CT and MR imaging because PBS has a policy of reim-
busing for these by using a cost-based formula, which incorporates a fixed professional component ($60 for CT and $108 for MR imaging) and a variable technical component based on documented practice costs such as depreciation, interest, and personnel.

Relative Utilization of Barium Enemas and Diagnostic Colonoscopy

Barium enema and colonoscopy are methods of examining the entire colon that are to a considerable extent competitive. Barium enemas are rarely self-referred, whereas colonoscopy is often self-referred by gastroenterologists, surgeons, or internists. Preliminary evidence from the PBS data base (Levin DC et al., presented at the RSNA meeting, December 1991, and Harford RJ et al., presented at the RSNA meeting, December 1993) reveals that the frequency of barium enemas per thousand subscribers declined 40% from 1985 through 1992. During the same time, the use of diagnostic colonoscopy increased by 129%. Can this dramatic difference be explained by the greater efficacy, safety, or cost effectiveness of colonoscopy?

The relative merits of barium enemas and colonoscopy in detecting large-bowel neoplasms have been widely debated for years. A comprehensive discussion of this information is beyond the scope of this article, although a number of excellent reviews are available [5–9]. Suffice it to say that good arguments can be made for either case and there appear to be no clear-cut advantage for one technique over the other. Colonoscopy fails to provide a complete examination of the entire colon in approximately 15% of cases. However, barium enemas may also fail because of poor preparation of patients. The major complication of the two examinations, perforation of the colon, occurs more than 10 times as often during colonoscopy as it does during barium enema. The sensitivities of the two examinations for detecting polypoid lesions larger than 1.0 cm (lesions smaller than that usually are not considered premalignant) are comparable. On the basis of data from PBS and Independence Blue Cross of Philadelphia, we calculated that the actual costs of a double-contrast barium enema were $121 and $211 for outpatients and inpatients, respectively, vs $502 and $767 for colonoscopy. Thus, the cost per case of colonoscopy is approximately four times higher than that of a double-contrast barium enema.

Given these facts, it is both puzzling and disturbing that a recent review on screening for colorectal cancer in the New England Journal of Medicine [10] totally ignored the barium enema except for one single mention in passing. Equally puzzling is another proposal in the same journal [11] supporting flexible sigmoidoscopy as the cornerstone for a screening program. This recommendation resulted from a calculation that such a screening program could lead to a 30% reduction in mortality, as at least 50% of all colorectal cancers and adenomatous polyps arise in the distal 60-cm portion of the large bowel that can be reached with the flexible sigmoidoscope. This is akin to a radiologist advocating screening mammography of left breasts only, on the theory that this would detect half of all breast cancers and would cost substantially less than bilateral mammographic screening. Such a proposal would be considered patently absurd, yet it is not much different from a proposal to screen only the distal portion of the large bowel because that is where half of all colorectal neoplasms are located.

All things considered, it seems hard to escape the conclusion that diagnostic colonoscopy has grown rapidly at the expense of the barium enema because the former procedure is largely self-referred, whereas the latter is generally one that must be referred to a radiologist.

Percutaneous Transluminal Coronary Angioplasty

PTCA is performed almost exclusively by cardiologists, and it is to a large extent a self-referred procedure, as workup of patients with suspected coronary disease by cardiologists generally is done before making a decision regarding PTCA or its competing procedure, coronary artery bypass graft (CABG) surgery. The growth in PTCA has been explosive in recent years. Part B Medicare data reveal almost a fourfold increase in the rate of use of PTCA on Medicare beneficiaries between 1985 and 1989 [12], and it is estimated that 350,000 of these procedures were performed in the United States in 1991 [13]. This has occurred despite the fact that PTCA is a flawed procedure with a 6-month restenosis rate as high as 50% [14] and long-term results that are clearly inferior to those of CABG surgery.

Although PTCA is an efficacious procedure for some patients with coronary disease (e.g., those with localized lesions in a single major vessel), recently published nonrandomized studies comparing the two techniques have consistently shown long-term event-free survival (lack of myocardial infarction, need for CABG, or need for repeat PTCA) to be significantly better after CABG than after PTCA [15–19]. In commenting on the paradox of rapid growth of PTCA despite disappointing results, Nicod and Scherrer [20] suggest that the explanation is because PTCA is a self-referred, lucrative procedure that offers excitement and challenge to the interventional cardiologist.

Image Quality

The recent debate on health care reform has focused largely on access and cost, but quality of care must remain an important concern of all patients and physicians. In the period 1984–1985, PBS conducted an internal audit of image quality of three common types of radiographic studies performed by radiologists and nonradiologists. This information was published only recently [21]. For the audit, PBS obtained 1086 plain radiographic studies from 46 Pennsylvania physician providers, nine of whom were radiologists. The three types of studies were chest, foot and ankle, and spine. All films were reviewed by a single board-certified radiologist who did not know their origin and who graded them as acceptable or unacceptable with respect to image quality. The parameters used in assessing image quality included adequacy of identification, presence of artifacts, evidence of improper processing, overexposure, underexposure, cone cuts, poor contrast, fog, motion, and poor positioning. The
results are shown in Table 1. The frequency of unacceptable image quality was disturbingly high for most nonradiologic specialties, ranging from 41% among internists to 82% among podiatrists. Only radiologists and orthopedic surgeons had what might be construed as appropriately low levels of unacceptable image quality, at 12% and 13%, respectively.

In another smaller but more recent study of chest radiographs also involving PBS, Hopper et al. [22] found inadequate film quality in 3% of examinations performed by radiologists but in 28% of those performed by nonradiologists. Their study also included review of the radiographic reports, which revealed serious errors of interpretation in no cases interpreted by radiologists but in 7% of cases interpreted by nonradiologists. In a study of interpretation of radiographs by emergency room house staff in England, Vincent et al. [23] found that these physicians missed 35% of abnormal findings and 39% of clinically significant abnormalities. Moreover, their performances did not improve with increasing experience.

There has been a paucity of research on the quality of images obtained by various specialists and the accuracy of interpretation of these images. Nevertheless, the few studies cited here indicate clearly that physicians who are not formally trained in imaging will produce poor-quality examinations and/or misinterpret those examinations with considerable frequency. The magnitude of this problem is illustrated by PBS reimbursement data. In 1989, PBS reimbursed all physician providers a total of $84 million for plain radiographic examinations in Pennsylvania: 58% paid to radiologists, 10% to orthopedic surgeons, and 32% distributed among all other specialists. If, as shown by the 1984–1985 PBS quality audit, radiologists and orthopedic surgeons are the only two specialists who can routinely produce images of satisfactory quality, almost one third of reimbursement allowances paid by PBS may represent money paid for a questionable product. It is frightening to think of what the consequences may be for the care of patients.

Financial Implications

From the data of Hillman et al. [1, 2] and our own, it is possible to estimate the number of unnecessary radiographic and sonographic studies performed on PBS subscribers in 1991 and the resulting unnecessary costs. For this estimate, we will assume that studies referred to radiologists represent appropriate utilization, because there are no financial or other incentives for referring physicians to order them. Hillman et al. showed that self-referral opportunities lead to approximately a two- to eightfold higher utilization of imaging studies per episode of illness. If one adopts a conservative approach and uses the low end of this range, it would appear that nonradiologists perform at least twice as many studies as are actually needed. If this is so, about half of all imaging studies that are self-referred by nonradiologists represent overuse. This would mean that in 1991 as many as 275,000 radiographic examinations and 50,000 sonographic examinations, costing PBS approximately $13.5 million and $8 million, respectively, in actual reimbursements, may have been performed unnecessarily as a result of self-referral in the private offices of nonradiologists. If we consider that these numbers refer only to a single insurance carrier (albeit a large one) in a single state and do not include CT, MR imaging, nuclear medicine, neuroradiology, or interventional radiology, it becomes apparent that the potential waste and additional imposed cost is enormous.

Diagnostic imaging is not the only area of medicine in which inappropriate utilization may occur as a result of self-referral. The problem has also been demonstrated in coronary angiography [24], CABG surgery [25], cardiac pacemaker insertion [26], cesarean sections [27], hysterectomy [28], upper gastrointestinal endoscopy [29], carotid endarterectomy [29], and, recently, physical therapy and rehabilitation services [30]. Although appropriateness analysis has not yet been applied to diagnostic colonoscopy and PTCA, the growth trends for these two procedures suggest the need for further scrutiny.

Policy Implications

Merrill Sosman decried self-referral in diagnostic imaging over half a century ago, but the process is still with us and has in fact grown to the point where it has become a blight on our health care system. On the basis of what I have discussed here and the findings of Hillman et al. [1, 2], it is apparent that most imaging outside of hospitals is now done by self-referring nonradiologists who have never been formally trained in radiology. This has led to millions of unnecessary studies annually in the United States at a cost of billions of dollars. Many of these studies are of inferior technical quality, and clinically significant misinterpretations occur in a significant proportion of them. Self-referral has allowed a procedure like colonoscopy to grow rapidly at the expense of the barium enema, even though the latter is a far less expensive alternative. It has also allowed massive growth in a procedure like PTCA, despite disappointing results that in many circumstances compare unfavorably with those of CABG surgery.

As unfortunate as these developments are, they seem almost foreordained by three major characteristics of the physician reimbursement system that currently exists in this country. First, there is no formal mechanism to monitor the medical necessity of self-referred imaging studies or other
diagnostic tests. Nonradiologist physicians with equipment in their own offices are free to perform imaging studies as often as they deem necessary or desirable. Second, reimbursements are generally paid without any monitoring of the quality of the equipment used to perform them. Examinations performed with low-cost, low-quality, or obsolete machines are billed by procedure code and reimbursed at the same rates as those performed with state-of-the-art units. Third, there is no monitoring of the training, experience, or overall competence of a physician in imaging. Any physician with a state medical license is free to perform, interpret, and bill for imaging examinations with no questions asked as to his or her competence.

What Can Be Done?

Recent federal and state legislation has restricted self-referral when a physician has an ownership interest in a joint venture facility to which his or her patients might be referred. However, these laws do not affect imaging studies carried out in a physician's private office. One thing that needs to be done, therefore, is to restrict or eliminate payments to nonradiologist physicians for imaging examinations performed in private offices unless they have been fully and formally trained in doing those examinations. This could be accomplished either by legislation or by insurance carrier policy determination and could be monitored fairly easily because physicians must list their medical specialty when filing claims. A somewhat less restrictive plan (Bleshman M, personal communication) might be to disallow imaging claims when the referring and providing physicians are the same person or members of the same group. Some exceptions allowing self-referral would likely have to be made. For example, it is probably reasonable to allow orthopedic surgeons to obtain radiographs in their offices of patients with skeletal trauma and to allow family practitioners to do plain film radiography when they practice in remote areas without access to a radiologist. It is of note that after publication of the work of Hillman et al. [2], the United Mine Workers Health and Retirement Fund adopted a policy of no longer paying a professional component when reimbursing nonradiologist physicians who do their own imaging [31].

The second thing that needs to be done is to institute stricter surveillance of the equipment used in private office imaging. The best example of this is the American College of Radiology (ACR) mammography accreditation program [32], which led to the Mammography Quality Standards Act of 1992 [33]. The net effect of these important developments is to make it much more difficult for a physician to practice mammography without the proper equipment and training. It is hoped that the ACR will extend this kind of program to other areas of radiologic practice, such as obstetrical sonography, MR imaging, and chest radiography. Another interesting program along these lines was recently initiated by PBS, which contracted with the Emergency Care Research Institute, a technology assessment agency in Plymouth Meeting, PA, to survey radiographic equipment located in physicians' private offices in Pennsylvania. So far, 600 survey questionnaires have been returned. The preliminary findings (Ricci JA, personal communication) are that 15% of respondents have indicated they are giving up obtaining office radiographs because of all the outside scrutiny and that another 27% have major equipment deficiencies. PBS is considering adopting a policy of nonpayment for studies performed with these units.

A third important need is for greater involvement by radiologists in outcomes and other types of health services research. This is clearly a major new frontier in American medicine, and radiology must be represented. It is not sufficient just to proclaim the need for "radiology by radiologists," although we may believe in this credo. Hard data are needed. The ACR is actively and effectively involved in this type of research, and it is crucial that academic radiology departments follow suit.

Conclusions

Can we as radiologists win the battle against private office self-referral, given the near certainty that the American Medical Association and other groups within organized medicine will strongly oppose our position? I believe we can. Legislation against self-referral to physician-owned joint venture facilities is a step in the right direction. At least the policymakers have begun to recognize that a problem exists. Quality initiatives by some third-party payers are another hopeful sign. Even cardiologists have begun some self-examination of their cash cow, PTCA [13, 20]. These developments are encouraging. The most important of all reasons for pursuing the battle, however, is the fact that our position is right—we are on the side of ethical medical practice, good patient care, cost savings, and appropriate use of technology. Federal policymakers and health care insurance carriers are now studying ways to implement meaningful reform, and they should find the logic of these facts unassailable.

REFERENCES

This article has been cited by:

