Among those who pay for health care and those who are responsible for making policy that affects utilization and costs of health care, as well as among radiologists whose business is threatened by self-referral by their physician colleagues.

In this article, we examine the published evidence on the relationship between self-referral and utilization of imaging. Virtually every study on the subject shows that self-referral by nonradiologist physicians leads to higher utilization. Radiologists need to be familiar with this evidence if they hope to be effective advocates for rectifying the problem, but we radiologists ourselves have contributed to the problem of higher utilization because we have not done enough to police our own referral patterns.

The older evidence on self-referral

Self-referral in imaging appears to have been around almost as long as imaging itself. In 1937, Merrill Sosman, then chief of radiology at the Peter Bent Brigham Hospital in Boston, complained about it [2]. The first formal study of self-referral was published in 1972 by Childs and Hunter [3], who found that among 13,000 patients in an old-age assistance program in California, physicians who owned their own x-ray machines were more than twice as likely to order radiographs as those who instead referred to radiology facilities. The year 1990 saw several additional articles on the subject. Radecki and Steele [4] looked at imaging self-referral compared with referral to radiologists.
Self-Referral and Use of Advanced Diagnostic Imaging

among 10 medical specialties and found that in nine of them, self-referral led to higher utilization, with odds ratios of 1.2–1.7. That same year, Hemenway et al. [5] studied the use of radiography by a group of 15 primary care physicians working at an ambulatory care center with on-site x-ray equipment before and after a financial incentive plan was instituted. Before then, the physicians were paid straight salaries; after the plan was implemented, they could earn bonuses if they generated more revenue for the center by doing such things as ordering more radiographs. The study found that during a period shortly after the incentive plan was begun, 11 of the 15 physicians ordered more radiographs than before and that the group’s overall radiography utilization increased by 16%.

In 1990 and 1992, Hillman et al. [6, 7] published what have turned out to be the seminal papers on self-referral in imaging. Using an episode-of-care approach, they compared utilization of imaging between two groups of physicians. One group had their own in-office equipment and self-referred patients when imaging was needed. The other group referred their patients to radiologists. The episodes of care were common clinical conditions (e.g., heart failure, difficulty urinating, low back pain, and pregnancy). Hillman et al. found that self-referring physicians used imaging between 1.7 and 7.7 times as often as those who referred to radiologists. At about the same time, the General Accounting Office (now called the Government Accountability Office) conducted a somewhat similar study in Florida of imaging self-referral versus referral to radiologists [8]. Their comparisons were made by imaging technique rather than clinical episode. They found that self-referring physicians used imaging between 1.95 and 5.13 times as often (depending on technique) as those who referred to radiologists.

The More Recent Evidence on Self-Referral

In the first decade of the 21st century, more evidence came to light on the self-referral issue, and the refrain is much the same. In an episode-of-care approach similar to that of Hillman et al. [6, 7], Gazelle et al. [9] studied imaging utilization in 4 million beneficiaries of a national employer-based health plan between 1999 and 2003. They used six common episodes of care and matched them with types of imaging that were commonly used to evaluate those conditions. Some of these involved the use of more advanced techniques, such as CT, MRI, and nuclear scanning. Claims data were used and allowed identification of the specialties of both the imaging providers and the ordering physicians. The rates of imaging use were found to be from 1.2 to 3.2 times as high among ordering physicians who referred to themselves or colleagues in their same specialty (often their partners in practice) as among ordering physicians who referred to radiologists. Litt et al. [10] compared the use of extremity radiography among one group of ordering physicians who had their own x-ray units with that among another group who referred to radiologists. The patient population consisted of over 1 million subscribers in a New York fee-for-service HMO. All ordering physicians were orthopedic surgeons, podiatrists, or rheumatologists. The study showed that the self-referring physicians obtained 32 radiographs per 100 office visits, whereas physicians who referred to radiologists obtained 17 radiographs per 100 office visits.

Cardiac nuclear scanning is a good model with which to study self-referral because it is a high-tech high-cost procedure that is widely performed by both radiologists and cardiologists. When it is performed by cardiologists, cardiac nuclear scanning is almost always a self-referral situation, whereas there is almost never self-referral involved when it is done by radiologists. A recent study by our group [11] used the nationwide Medicare Part B database to compare growth in utilization rates of these scans in private cardiology and private radiology offices. Between 1998 and 2006, the rate increased by 32% among radiologists, compared with 215% among cardiologists. Clearly, self-referral in nuclear scanning had become an attractive option for cardiologists. However, our analysis of more recent Medicare data has shown that, between 2006 and 2008, the growth curve in cardiologists’ offices has flattened considerably (authors’ unpublished data), and the cardiology community deserves some credit for that.

At a meeting of the influential Medicare Payment Advisory Commission (MedPAC) in September 2008, Laurence Baker presented data (personal communication, not yet published) on the referral of patients by orthopedic surgeons and neurologists for MRI scans within 7 days after an office visit. He contrasted the physicians who owned their scanners with those who instead referred to radiology facilities. Neurologists who owned scanners performed MRI on 14.5% of their patients within 7 days, whereas those who referred out to radiology facilities obtained them for 9.3% of patients. Orthopedic surgeons who owned scanners performed MRI on 7.5% of their patients within 7 days, whereas those who referred out obtained MRI on 4.7% of patients.

Invasive Procedures

In at least one instance, self-referral appeared to hinder the substitution of a noninvasive, less expensive procedure for an invasive and more expensive one. This happened in the diagnosis of lower extremity arterial obstructions. Until a few years ago, the standard way of documenting these obstructions was through the use of catheter angiography, an invasive procedure. More recently, techniques such as CT angiography (CTA) and MR angiography (MRA) have been introduced, and they can accomplish the same goal noninvasively and much less expensively on an outpatient basis. Radiologists, surgeons, and cardiologists all perform diagnostic catheter angiography, but virtually all CTA and MRA examinations are referred to radiology facilities. When surgeons or cardiologists perform diagnostic catheter angiography, it is usually through self-referral. Levin et al. [12] reported that in the Medicare population, between 2000 and 2004, the utilization rates of CTA and MRA among radiologists grew rapidly, while at the same time, their utilization of catheter angiography declined to a virtually identical degree. This is of course the desirable pattern that most policy makers would like to see. However, among surgeons and cardiologists, the utilization rate of diagnostic catheter angiography increased by 70% between 2000 and 2004. It seems hard to justify this kind of increase in use of an invasive and more expensive procedure when a noninvasive, less expensive alternative is available.

The MedPAC Study

The June 2009 MedPAC report to the Congress contained a chapter entitled, “Impact of Physician Self-Referral on Use of Imaging Services Within an Episode” [13]. The MedPAC study evaluated 493,000 episodes of care, which fell into 13 common clinical conditions. The report studied the use of imaging in these episodes, comparing episodes involving a self-referring physician and those in which self-referral did not occur. All types of episodes showed higher imaging use with self-referral; those patients were up to 2.3 times more likely to receive at least one imaging test during the episode than patients.
treated by physicians who did not self-refer. Episodes in which a self-referring physician was involved had 5–104% higher imaging spending than those in which no self-referral occurred. As an example, 14% of all patients with migraine episodes involving self-referring physicians had MRI, compared with 8% of migraine episodes without self-referral.

The News Media on Self-Referral

In recent years, a number of stories on self-referral have appeared in the media. For example, in the summer of 2009, the Washington Post [14] reported on a Midwestern urology group's utilization of CT among the patient population of a large commercial insurer. After the group purchased its own CT scanner, their utilization quickly increased by over 700%, compared with what it had been previously when they referred to radiology facilities. A year earlier in the New York Times [15], cardiologist Sandeep Jauhar described a conversation he had with a cardiologist friend who had acquired his own nuclear scanner. Jauhar asked the other cardiologist whether he felt pressure to do more nuclear scans to meet his costs, whether or not the patients needed them. The cardiologist replied, "That is what I have to do to break even." In a widely read essay in The New Yorker in 2009 [16], Atul Gawande described the situation in McAllen, Texas, where health care costs are far higher than in other communities in the area. The reason was entrepreneurship and self-referral among the physicians there for all kinds of medical services, including imaging. These are a few examples from among a number of such stories that have appeared in the print media and on television.

How Quickly Are Self-Referring Physicians Acquiring Advanced Imaging Equipment?

It is possible to determine ownership of nonhospital facilities in which imaging is performed. In most claims databases, physicians must identify their medical specialty. A physician owner (or lessee) of an imaging facility will file for reimbursement using either global or technical component claims. By tabulating these claims, but excluding professional component claims for interpretation of the tests, one can determine the number of imaging tests conducted in facilities owned or leased by physicians in various medical specialties. Using this method, Mitchell [17] compared 2000–2004 growth in use of MRI and CT in facilities owned or leased by self-referring physicians in California with similar growth in facilities owned by radiologists and hospitals. She divided a commercially insured patient population into eight categories on the basis of sex, age, and whether they lived in northern or southern California. In all eight categories for MRI and for seven of eight categories for CT, the growth rate in imaging utilization in self-referring facilities between 2000 and 2004 was considerably greater than that in radiologist or hospital facilities. An earlier study by Mitchell [18] had shown that ownership or leasing of advanced imaging equipment by California nonradiologist physicians was widespread. In 2004, according to Mitchell, 33% of MRI facilities, 22% of CT facilities, and 17% of PET facilities were owned or leased by nonradiologist physician groups who were in a position to self-refer. Others have studied the growth of MRI and CT ownership or leasing by nonradiologist physicians in the Medicare population. Between 2000 and 2005, private office ownership or leasing of MRI units among nonradiologist physicians grew by 254% in the Medicare population, and their share of the private office MRI market increased from 11% to 20% [19]. Between 2001 and 2006 in Medicare, private office ownership or leasing of CT scanners among nonradiologist physicians grew by 263%, and their share of the private office CT market increased from 16% to 28% [20].

What Happens When There Is No Self-Referral?

As noted earlier, there is a considerable amount of self-referral in cardiac imaging, and one result is that it has grown rapidly [11]. It is of interest to compare this with noncardiac imaging of the rest of the thorax. For whatever reason, pulmonologists and other physicians involved in the care of patients with other thoracic diseases have not gotten involved in noncardiac thoracic imaging. A study of the utilization rates of this type of imaging in the Medicare population revealed only a 1% increase between 1996 and 2005 [21]. The primary reason for the lack of growth was thought to be the lack of major involvement by nonradiologist physicians, who might otherwise be in a position to self-refer and drive up utilization.

Related Issues

What Are the Responsibilities of Radiologists, and Have They Met Them?

Imaging technology has changed and improved rapidly in the last two decades, especially in the high-tech areas such as MRI, CT, PET, and other nuclear scanning. As the technology has advanced, new applications for it have emerged; examples include coronary CTA and CT colonography. Radiologists have largely been the beneficiaries of the advances, but along with those advances is a responsibility to manage utilization growth and ensure that imaging tests are performed only when there are appropriate indications. In this area, radiologists and the American College of Radiology (ACR) have done some good things, such as developing extensive appropriateness criteria for the use of imaging in many clinical circumstances and the creation of an accreditation program for imaging facilities. However, they have also fallen down in some ways.

First, radiologists have been accused of recommending too many additional imaging tests in their dictated reports, and there is no doubt that this is true to some extent [22–24]. This tendency should be curbed. Benchmarks for this practice should be established by hospitals and radiology groups, and radiologists who exceed the norm should be counseled.

Second, the ACR's appropriateness criteria for the use of imaging cover a large number of clinical conditions and are available at the ACR's Web site [25]. The problem is that the criteria have not been widely publicized and many referring physicians are apparently not aware of them. A recent study showed that only 3% of referring physicians used the criteria as a primary resource in deciding on the most appropriate imaging test to order for their patients [26]. The ACR should take steps to broaden the awareness and knowledge of the appropriateness criteria within the rest of the medical community.

Third, radiologists have not been diligent enough at consulting with referring physicians before imaging studies get done and weeding out those that are unnecessary or inappropriate for the patient's clinical condition. This is a complex problem. Like all other physicians, radiologists strive to build a successful practice, and keeping their referring physicians happy is an important way of doing so. If they frequently call referring physicians to question their judgment in ordering imaging tests, those physicians might decide to take their referrals elsewhere. Moreover, if a patient shows up in the middle of a busy day with a requisition for an inappropriate MRI or CT scan, it is often difficult or impossible for the radiologist to contact and confer with the ordering physician, who might be in the operating room or busy seeing patients in the office.

Levin and Rao
less, radiologists should make more concerted efforts than they have in the past. One possibility would be for them to try to benchmark inappropriate ordering by referring physicians and take steps to educate those who are outliers. Another possibility is for radiologists to work more with physicians from other specialties to develop clinical rules to be followed before ordering advanced imaging tests. For example, there is general agreement that CTA is overused in emergency departments in cases of suspected pulmonary emboli. There are well-defined clinical rules for establishing the level of risk for this disease—the Wells score and the Geneva score—before resorting to advanced imaging [27, 28]. Yet these rules are rarely followed at most emergency departments and radiology facilities.

Fourth, radiologists are sometimes themselves the source of inappropriate examinations by adding on series or sequences that are unnecessary. One recent preliminary study from an academic radiology department evaluated 500 abdominal and pelvic CT scans that had been performed at outside institutions and were referred in for second interpretations. In reinterpreting the scans, the investigators determined that in a substantial percentage of cases, unnecessary series (e.g., without contrast material or delayed phase imaging) had been performed [29], leading to increased radiation exposure and, in some cases, additional cost. More of such research needs to be done and radiologists should be held accountable for preventing this kind of overuse.

Finally, in response to the rapid growth of high-tech imaging in recent years, radiology benefits management companies have been developed. These commercial firms have been shown to help limit the rapid growth in advanced imaging through the use of preauthorization programs [30, 31]. The ACR has criticized radiology benefits management companies [32, 33] on the basis that they interfere with patient care and create hassles for ordering physicians. Instead, the ACR advocates the use of a computerized order entry system with embedded decision support [33, 34]. This system has been tested on a limited basis, and although the initial results are promising, it is not yet clear how well it would work on a larger scale. The ACR and the Radiology Business Management Association recently issued a joint document proposing best practices guidelines for radiology benefits management companies [35], most of which seem reasonable and achievable. We think that the combination of order entry with decision support and radiology benefits management company–based preauthorization could be more effective in controlling utilization than either alone and that the ACR should be willing to explore the use of both techniques.

Policy Recommendation

The evidence summarized above indicates that self-referral is growing and that it almost invariably leads to increased utilization of imaging. It is likely that much of this increase is unnecessary. Accordingly, we think that the scope of the in-office ancillary services exception should be narrowed. It seems reasonable to allow it to continue for less-advanced forms of imaging, such as radiography and ultrasound. Those examinations are often ancillary to a physician’s workup of a patient at the time of that patient’s office visit, but the exception should no longer be allowed for the more advanced high-tech forms of imaging, such as MRI, CT, PET, and other nuclear imaging. These are very complex and costly examinations, and in-depth knowledge is necessary to perform them properly. These examinations are generally done on an elective basis. A carve-out could be established that would allow cardiologists to perform cardiac nuclear imaging. This is probably justified because, aside from radiologists, cardiologists are the only other specialty to formally educate their trainees during their fellowships in how to perform and interpret these examinations. No other medical specialty provides this kind of training. Moreover, cardiac nuclear imaging has become a traditional part of cardiology practice over the years. Some cardiologists might advocate that carve-outs also be established allowing them to perform CT and MRI of the heart, but that is debatable at the moment. Restricting the in-office ancillary services exception makes sense from both a quality and a cost perspective.

The American Medical Association and most other nonradiologic specialty societies are in favor of continuing the in-office ancillary services exception in its current form. However, we believe that most physicians who think this issue through carefully should support restricting this large loophole in the manner we suggest, because most nonradiologist physicians do not own MRI, CT, PET, or nuclear scanners. If the few nonradiologist physicians who do own these scanners overuse them through self-referral, the nonowner majority is victimized. Payment for physician services is a zero-sum game, and when payments for imaging increase because of self-referral, there are fewer dollars available to pay for services the many other nonowner physicians provide, such as evaluation and management, surgical procedures, and other types of tests.

In conclusion, self-referral in advanced diagnostic imaging is increasing among nonradiologist physicians and has been shown to be a major contributor to higher utilization and costs of imaging, but radiologists also share some of the blame. Most self-referral comes about as a result of the in-office ancillary services exception, a large loophole in the Stark laws. This exception should be closed as it pertains to most MRI, CT, PET, and nuclear scanning.

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Addendum

After this article had gone to press, the December 2010 issue of Health Affairs came out, containing three important new research studies on self-referral in imaging: “Imaging Self-Referral Associated With Higher Costs and Limited Impact on Duration of Illness” by Hughes et al. [1], “The Practice of Imaging Self-Referral Doesn’t Produce Much One-Stop Service” by Sunshine and Bhargavan [2], and “Acquisition of MRI Equipment by Doctors Drives Up Imaging Use and Spending” by Baker [3].

Hughes et al. [1] used Medicare beneficiary files and episode-treatment-grouper software to construct 10 common episodes of care involving physicians who self-referred for imaging and other physicians who referred to radiology facilities. For each type of episode, they examined the use of one or more imaging studies that are commonly used to evaluate that condition. There were a total of 20 episode-imaging modality pairs. They found that self-referral was associated with significantly higher mean imaging costs in 15 of the 20 pairs and that mean total costs of care were significantly higher in 14 of the 20.

Sunshine and Bhargavan [2] studied what might be called the “convenience factor” in response to claims by self-referring physicians that having imaging equipment in their offices fosters efficiency and patient convenience by allowing patients to have their imaging tests on the same day as an office visit. They found that although most self-referred conventional radiography was performed on the same day as an office visit, only 15% of self-referred advanced imaging was performed on the same day as an office visit. They therefore recommended that Medicare restrict the in-office ancillary services exception to conventional radiography only.

Baker [3] studied referral patterns for MRI among orthopedic surgeons and neurologists who acquired their own MRI units between 1999 and 2005. He found that among both specialties, MRI acquisition was associated with substantial increases in the likelihood of patients’ receiving MRI examinations. These three new studies add to the extensive literature reviewed in this article, showing that self-referral in imaging invariably leads to higher utilization and costs.

References

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Levin and Rao