AHIP
America's Health Insurance Plans

Ensuring Quality through Appropriate Use of Diagnostic Imaging

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ENSURING QUALITY THROUGH APPROPRIATE USE OF DIAGNOSTIC IMAGING

I. INTRODUCTION

Advances in medical technology have vastly improved practitioners' ability to detect, diagnose and treat disease and injury at an earlier stage. As a result, Americans are living longer and experiencing higher quality of life than ever before. The ability to create pictures of a patient's internal anatomy and convert them to film through diagnostic imaging has revolutionized the way many diseases and injuries are detected, diagnosed, and treated. Millions of Americans have avoided more invasive, and sometimes more costly, diagnostic procedures through the use of modern imaging technology.

Yet studies show that a range of 20% - 50% of high-tech diagnostic imaging for a variety of conditions fail to provide information that improves patient diagnosis and treatment and may be considered redundant or unnecessary.[1-4] Some studies have begun to raise questions about the added risk of radiation exposure for some imaging tests.[5-7] Others suggest that a full third of imaging procedures may be inappropriate.[8,9] According to a recent study by the McKinsey Global Institute, diagnostic imaging from computed tomography (CT) and magnetic resonance imaging (MRI) scans contribute $26.5 billion in unnecessary use of health services.[10] In addition, the Center for Information Technology Leadership at Harvard University (CITL) estimates that about 20% of hospital radiology tests are duplicates which represents approximately $20 billion a year in wasted spending nationwide.[11,12] As a result, there is a growing interest in pursuing strategies that promote the appropriate use of imaging services, avoid redundancy and unnecessary exposure to radiation, reduce painful and wasteful follow-up procedures, and ensure that the patient is getting the right service the first time. These strategies have the potential to improve both the quality and affordability of health care.

II. BACKGROUND

Many of today's radiology methods were not introduced into clinical practice until the 1960s, when x-ray and ultrasound technology emerged as effective methods for detecting pathology in the skeletal system and soft tissues, respectively. It wasn't until the 1970s that modern radiology methods, such as computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET) were invented. These methods did not make the transition into clinical practice until advancements in precision and image quality proved them to be valuable diagnostic tools.

COMPUTED TOMOGRAPHY (CT): CT scans combine x-ray and computer technology to generate a detailed, cross-sectional image of anatomical structures. A computer combines the images to produce a detailed, two-dimensional view on a computer monitor that can be turned into a three-dimensional image with computer manipulation.

Common uses: CT scans are commonly used for studying chest and abdomen tissues and are also helpful in diagnosing cancers. CT scans are especially effective at detecting appendicitis. Studies have shown that, for patients with suspected appendicitis, a spiral CT has an accuracy rate of 94-100 percent.[†] CT scans are also widely used for the treatment of spinal problems and injuries to skeletal structures.

Low-tech counterpart: X-rays.

MAGNETIC RESONANCE IMAGING (MRI): Like CT scans, MRIs also produce cross-sectional images of internal anatomy, but do so without radiation.

Common uses: MRI is commonly used in the diagnosis of tumors located in the chest, abdomen or pelvis and offers the best soft tissue contrast of all the imaging methods. With advances in scanning speed and resolution, as well as improvements in computer 3D algorithms and hardware, MRI has become a frequently used diagnostic tool in musculoskeletal radiology and neuroradiology as well. New studies suggest that MRI scans detect breast cancer better than the traditional mammogram. For example, a study conducted at the Mayo Clinic in Jacksonville, Florida found that MRI detected ipsilateral breast cancer tumors missed by a mammography in 16% of 390 women studied.[††]

Low-tech counterpart: Bone density scans.

POSITRON EMISSION TOMOGRAPHY (PET): PET scans are often used in nuclear medicine to diagnose and treat disease by determining the presence of disease based on biological changes rather than changes in anatomy.

Common uses: PET scans are used most often to detect cancer and to examine the effects of cancer therapy. PET scans have helped to predict the response to chemotherapy as early as the first cycle of radiation for metastatic breast cancer patients. This ability to predict the response to therapy exceeds the reliability of MRI and CT in predicting therapy response and allows for more individualized treatment and avoidance of ineffective chemotherapy.[†††] PET scans are also being used to test for Alzheimer's disease and other degenerative diseases.

Low-tech counterpart: n/a.

[†] Paulson E, Kalady M, Pappas T. Suspected Appendicitis. N Eng J Med. 2003;348:236-242.

[††] Koester S. The effectiveness of MRI versus mammography in detecting breast cancer. Associated Content. Published online July 20 2007; http://www.associatedcontent.com/article/292088/the_effectiveness_of_mri_versus_mammography.html.

[†††] Schwarz J, Bader M, Jenicke L, et al. Early prediction of response to chemotherapy in metastatic breast cancer using sequential

With these advancements, these methods offered a high-tech alternative to traditional plain film x-rays and ultrasounds. By the 1980s, CT, MRI, and PET had advanced quickly to become the top choices in disease diagnostics. High-tech imaging today also includes variations of these procedures such as magnetic resonance angiography (MRA), magnetic resonance spectroscopy (MRS), computed tomography angiography (CTA), and single-positron emission computed tomography (SPECT).

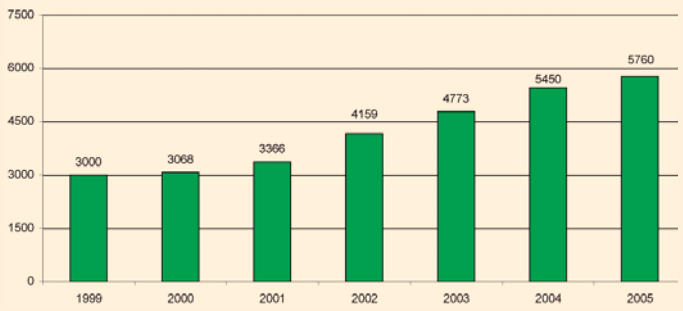
III. GROWTH IN DIAGNOSTIC IMAGING SPENDING AND USE

The U.S. spends nearly 16 percent of its gross domestic product—or $2 trillion—on health care, a higher percentage than any other industrialized nation. Medical technology is considered to be one of the primary drivers of continued growth in health spending, representing approximately 20 percent of total cost growth.[13] Moreover, within the category of medical technology, diagnostic imaging costs are reported to be the fastest growing component, with spending approaching $100 billion a year and expected to double over the next four years.[14,15] Other estimates predict that imaging costs are rapidly approaching 10 percent of total health care costs.[16] Published data from various health insurance plans demonstrate the impact of increased utilization on radiology cost trends. For example, one insurer reported spending 2% of the health care premium on radiology services in 1999. By 2006, the percent of premium spent on these services increased to 6%. Other insurers reported payments increasing by 20% annually for three consecutive years from 2002 – 2004.[17] As a result, the cost of diagnostic imaging has been growing faster than prescription drug costs, with health insurance plans' imaging costs growing by 18-20 percent annually versus 6-8 percent increase for prescription drug costs.[18-19]

Much of the growth in spending on diagnostic imaging is associated with a significant increase in the number of imaging centers over the past several years. The number of diagnostic imaging centers increased from 3,000 in 1999 to 5,760 in 2005, representing a 52 percent increase (Figure 1).[20]

The total number of imaging procedures performed has also grown. Research has shown that many physicians adapt their practices to meet the resources that are locally available. An examination of several new technologies, including diagnostic imaging, found that

Figure 1—Number of Imaging Centers



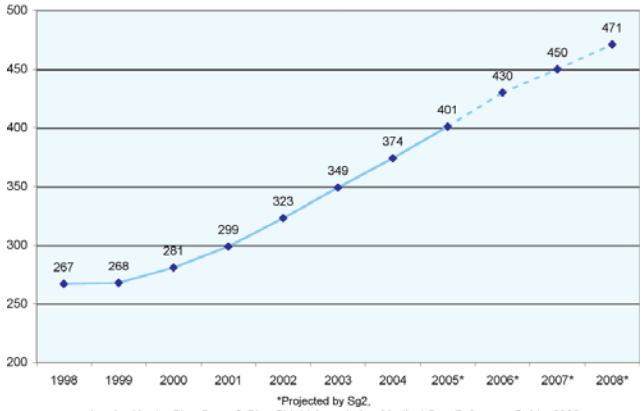
Source: Verispan, 2005

increases in the availability of a service tend to be associated with higher utilization of and spending on that service. With respect to imaging, increased availability of MRI was associated with increases in utilization of and spending on both MRI and CT imaging technology.[21] These trends are supported by the research of John E. Wennberg and colleagues which has determined that an abundance of supply-sensitive services, such as imaging, will lead to overuse of that service.[22,23]

The total number of imaging procedures grew by about 40 percent from 2000-2005 and is projected to grow by another 26 percent by 2008, resulting in nearly half a million procedures performed each year (Figure 2).[24]

The firm Sg2, a healthcare research intelligence company which analyzes clinical development, technology advancements and market trends, has monitored recent CT, MRI, and PET utilization.

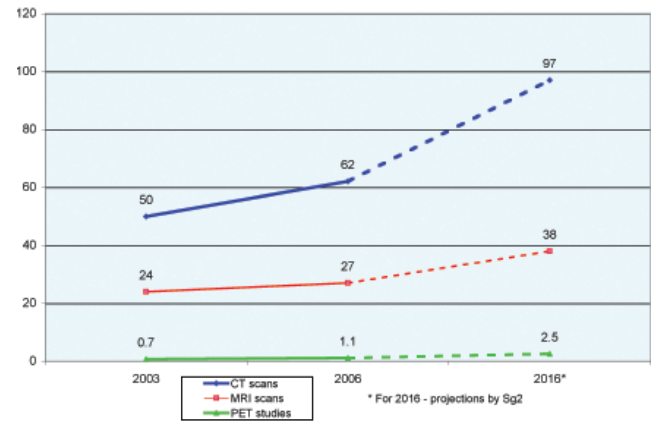
Figure 2—Past and Projected Utilization of Imaging Procedures



*Projected by Sg2.
As cited in the Blue Cross & Blue Shield Association Medical Cost Reference Guide, 2006

Growth in the utilization of these imaging tests is projected to substantially increase thru 2016 (Figure 3).

Figure 3—Trends in Utilization of Selected Imaging Procedures in Millions



The use of diagnostic imaging as a tool for cancer care, for example, continues to grow at a rapid rate. According to Sg2, the use of imaging procedures for cancer will grow 126 percent between 2006 and 2016. A subset of advanced imaging techniques that includes MRI, CT, PET and SPECT is projected to grow 189 percent during that period.[25]

The costs of additional imaging machines, coupled with the costs associated with a greater volume of scans, makes these costs a leading driver of increased spending on diagnostic imaging.[26] A subset of the overall increase in diagnostic imaging equipment are machines located in physicians' offices. Physicians or physician groups are able to lease high-tech, rapidly evolving imaging technology through the ease of leasing arrangements made with the machine manufacturers, leading to potential financial benefits and accessibility for both parties.[27] The improved availability and convenience of in-office diagnostic imaging services are also considered to be contributing factors in the overall rise in utilization of these services and have drawn greater attention to the qualifications of those performing the imaging procedure, the quality of the equipment being used, and the impact these factors have had on overall utilization.[28,29]

IV. INAPPROPRIATE IMAGING AND UNNECESSARY EXPOSURE TO RADIATION

Much of the growth in imaging use is producing positive outcomes. However, estimates suggest that a full third of imaging procedures are inappropriate, costing the country billions of dollars—between $3 billion to $10 billion annually.[30]

For example, use of diagnostic imaging for low back pain is one area under heightened scrutiny, given that research suggests that imaging offers little additional benefit.[31] In 2006, the National Committee for Quality Assurance (NCQA) added a Healthcare Effectiveness Data and Information Set (HEDIS) measure regarding use of imaging for acute low back pain within the first 30 days of experiencing symptoms to address this concern.

Asymptomatic individuals represent another population whose increased use of imaging services is questionable. By some estimates, up to one-third of the nation's health care spending is attributed to the "worried well."[32] Whole body CT scans are increasingly popular with patients, who often choose to pay out-of pocket for them. There are numerous additional uses of CT and other imaging tests for which evidence of effectiveness and value is lacking.

For example, despite the lack of evidence that screening with spiral CT scans improves outcomes among asymptomatic individuals, it is nonetheless being marketed and utilized for that purpose, resulting in false positives and the need for additional testing.[33-36]

More recently, unnecessary exposure to radiation has been raised as a concern especially when attributed to inappropriate imaging. A recent study published in the New England Journal of Medicine suggests that as many as 1.5–2% of cancers in the U.S. may be attributable to radiation from CT scans when adjusted by the current CT use, though no large-scale epidemiologic studies have been performed to date.[37] This is because CT relies on larger doses of radiation than its more traditional counterpart—the x-ray. For example, a chest CT exposes a patient to 80-400 times the radiation of a chest x-ray and an abdominal CT results in a radiation dose 50 times greater than an abdominal x-ray.[38,39]

Children and pregnant women are two examples of vulnerable populations at risk from radiation exposure due to over and unnecessary utilization of services. For example, as the number of CT scans performed each year continues to grow to an estimated 62 million scans in 2006, 4 million are for children.[40] Children are particularly at risk because they are more sensitive to radiation and have more years of life remaining in which to develop radiation-induced cancer.[41]

Pregnant women have also been identified as a potential at-risk population, exposed to twice as much radiation as they were ten years ago. Researchers found that from 1997 to 2006, the number

of imaging studies done on pregnant women increased by 121 percent, with the greatest increases seen in the number of CT scans.[42]

These considerations suggest that the inappropriate use of diagnostic imaging, and the resulting unnecessary exposure to radiation in some cases, have implications for both the quality and cost of health care. A better understanding of the factors that contribute to inappropriate imaging use has helped design strategies to promote the appropriate use of imaging services and reduce overuse.

V. FACTORS CONTRIBUTING TO INAPPROPRIATE IMAGING

There is speculation that the high volume of inappropriate imaging procedures has been caused by several factors: deficiencies in the quality of imaging services by those performing the test; lack of information on imaging effectiveness in some clinical situations; direct-to-consumer advertising and the impact on consumer demand for these services; growing physician ownership interest in imaging centers and equipment, including favorable leasing arrangements; and defensive medicine practices that result in unnecessary scanning in an attempt to mitigate the risk of litigation.

DEFICIENCIES IN QUALITY

As more and more diagnostic imaging services have moved away from the hospital setting to free-standing imaging centers and physicians' offices, there is a growing concern that this may lead to incorrect diagnoses, missed pathology, and the need for additional imaging scans.

Inspection of over 1,000 outpatient imaging facilities that provide diagnostic imaging services in Massachusetts revealed numerous quality failures.[43] Retained by a Massachusetts health plan, Radiology Management Sciences, a diagnostic imaging claims review service, found that thirty-one percent of the centers failed to meet established standards of care developed by the American College of Radiology (ACR), The Joint Commission, and National Committee for Quality Assurance (NCQA), among others. Quality was also evaluated in areas along several other dimensions: (1) staff training and qualifications; (2) equipment specifications and performance; (3) quality control policies and procedures; (4) record management and storage; (5) facility safety; and (6) image audits. Reasons for failure included, but were not limited to, practicing without a state certificate of radiation control, failure to perform annual calibration of equipment, poor patient positioning, scratches or streaks on images, inability to sterilize probes properly between patient exams, failure to post radiation exposure signs, and failure to use adequate radiation monitoring devices.[44]

Quality concerns exist, not just at the facility level, but at the physician level as well. The pace of innovation in imaging technology requires significant ongoing training and education to stay current with technological advances and to perform and interpret newer imaging tests. The heightened involvement of non-radiologists in providing imaging services has resulted in increased attention being paid to the expertise required by all those who order and interpret imaging studies.

In fact, the same Massachusetts health insurance plan that conducted the quality inspection initiated a health care professional quality evaluation in conjunction with its facilities evaluation to help ensure that providers who bill for the professional component of imaging services have the proper training to interpret the images.[45] With input from physicians who bill for diagnostic imaging services and various specialty societies, the health insurance plan developed a list of Current Procedural Terminology (CPT) codes that physicians within different specialties would have privileges to provide. It was estimated that implementation of the facility evaluation and physician privileging program led to a 2 percent decline in total imaging expenditures.[46]

Other health insurance plans have developed similar programs to improve the appropriateness and quality of diagnostic imaging services. (See VI.) However, in evaluating the impact of the Massachusetts health insurance plan's program, the study noted that the effect of a physician privileging program can be significantly influenced by local health care market characteristics. Their review of a similar professional privileging program implemented by a large health insurance plan in New York suggested potential savings of at least 10 percent.[47]

LACK OF INFORMATION ON EFFECTIVENESS AND COST-EFFECTIVENESS

Another factor contributing to the inappropriate use of health services in general, and imaging services in particular, is the lack of information on effectiveness and cost-effectiveness.

The Food and Drug Administration (FDA) evaluates only the safety and efficacy of new drugs and medical devices, and usually bases its decisions on studies of targeted patient groups. Determining the

ability of new drugs and devices, not to mention medical procedures and other technologies, to improve the health of much larger and diverse populations in real-world situations and comparing their use to what is currently being used, is not part of the FDA's responsibilities. As a result, there is a significant lack of reliable information about what works best—a gap that helps to raise health care costs while potentially lowering the quality of health care.

This uncertainty can result in lack of clarity about ordering a CT or a MRI. It can also result in "add on" testing in which the physician orders multiple imaging tests when one would suffice. And lastly, the lack of reliable information on effectiveness and value helps explain the wide variation in the utilization of imaging services across the country.

CONSUMER DEMAND AND SELF-REFERRAL

Increasingly, high-technology screening tests are being marketed directly to consumers through print, electronic and broadcast media. Many consumers who are willing to pay out-of-pocket for these tests can do so without a physician referral. Others are going to their physicians and requesting that they refer them for these screenings. Yet, some of the technologies being marketed are not recommended for the general population, particularly the low-risk population because of a lack of proven benefits. Additionally, screening of asymptomatic individuals carries the risk of false-positive test results which can lead to extensive or invasive follow-up examinations.

The use of coronary heart scans to predict an individual's risk of developing symptomatic coronary disease is another cited example. A meta-analysis of data from studies of asymptomatic populations screened with coronary heart scans indicates that an abnormal heart scan is not a strong predictor of major coronary events, such as myocardial infarction or sudden death. In fact, the majority of patients whose scans showed high calcium scores remained asymptomatic and some individuals with lower calcium scores developed myocardial infarction.[48]

Thus, self-referral for unnecessary and/or inappropriate imaging services not only increases out-of-pocket costs for consumers, but also contributes to overall health care costs. The use of either of the screening tests mentioned above would result in significant follow-up examinations due to false positives. It is likely that at least some of the costs associated with services and procedures that follow a false positive test will be covered by health insurance and thus add to rising health care costs.

PHYSICIAN OWNERSHIP INTEREST IN IMAGING EQUIPMENT

Either through in-office equipment or free-standing centers, a growing number of physicians have an ownership interest in diagnostic imaging machines. The report from the McKinsey Global Institute noted that the growth trend for use of diagnostic imaging is particularly pronounced among physicians who refer to facilities in which they have an ownership interest.[49] Studies show the financial incentive for physicians to refer patients to facilities containing imaging equipment, in which they have an ownership interest, has added to the growth in diagnostic imaging costs and utilization. One study found that physicians refer patients to in-office, owned equipment four times more often than practices without in-office equipment ownership.[50] Another study found that physicians who own their imaging equipment are 2–7 times more likely to order an imaging test.[51]

DEFENSIVE MEDICINE

Defensive medicine—the ordering of tests and/or procedures that are not medically necessary in order to mitigate the threat of lawsuits—has been widely documented as a driver of rising health care costs.

A 2003 Harvard School of Public Health survey of 800 Pennsylvania physicians in six specialties considered to be at high risk of litigation found that nearly all (93 percent) reported practicing defensive medicine. Among the respondents, 59 percent said they ordered more diagnostic tests than were medically indicated. Of the respondents who described their most recent incidence of defensive medicine, 43 percent identified imaging studies. More than half of the reporting emergency physicians, orthopedic surgeons, and neurosurgeons described using CT, MRI or radiography that was not clinically necessary.[52]

VI. RADIOLOGY BENEFIT MANAGEMENT TO PROMOTE QUALITY AND AFFORDABILITY

In response to the extensive growth in imaging services since the late 1990s and the need both to minimize the quality concerns associated with unnecessary imaging and reverse cost trends, many health insurance plans have adopted radiology benefit management programs to promote the appropriate use of diagnostic imaging

services. These programs, which are designed to improve both the quality and affordability of health care, address several of the cost drivers identified above. Methods used by radiology benefit management programs for new imaging technologies aim to encourage the appropriate utilization of imaging services and increase cost-effectiveness through more efficient approvals and the use of evidence-based medicine to change physician ordering patterns. Some health insurance plans use in–house resources while others have turned to radiology benefit management firms, but regardless of the application, the use of radiology management is expected to grow. In 2006, a survey of benefit managers of large U.S. corporations found that 40 percent of companies surveyed had some form of radiology management in place and another 20 percent said they will have one in place within the next two years.[53]

Radiology benefit management programs are designed to monitor and reduce utilization of high-tech imaging services by emphasizing the use of standards to safeguard patient safety and promote imaging quality, physician education, and the use of evidence-based guidelines. After implementation of a radiology benefit management program, health insurance plans report utilization rates have dropped the annual trend significantly, ranging from 20% to greater than 100%.[54] Most programs enable each imaging service to be tracked and linked to the individual physician or physician practice that ordered the service, thereby allowing for customized assessment of utilization trends.

An important component of many radiology benefit management programs is the development and use of standards to promote imaging quality and patient safety in "real time" by using the latest communication technology during consultations. An increasing number of health insurance plans require physicians to undergo a privileging process in order to receive reimbursement for imaging services. The privileging process requires specified training and competency with respect to using imaging equipment and interpreting the diagnostic scans. Similar privileging/quality standards have been implemented for imaging centers. These standards address the quality of the imaging equipment, the quality of the images, the qualifications of the radiology technicians, and the safeguards for patient safety.

Health insurance plans can either directly require that these standards be met by participating providers or require that these providers become accredited by an accrediting organization, such as the American College of Radiology (ACR). By only reimbursing imaging services offered by qualified physicians and qualified facilities, health insurance plans are able to improve the quality of the services provided as well as diagnostic and treatment outcomes.

Health insurance plans are also disseminating nationally-recognized, evidence-based guidelines. These guidelines provide a valuable resource for referring physicians regarding the appropriate use of diagnostic imaging. The ACR has developed criteria for the appropriate use of imaging for a number of common conditions and provides guidance regarding tests that have proven to be effective versus those that have proven to be less effective. In addition, the American College of Cardiology (ACC) has developed evidence-based guidelines and appropriateness criteria for certain imaging services to help ensure appropriate use of imaging services by cardiologists.

In radiology benefit management programs, when a treating physician orders an imaging service, the order is compared to these nationally-recognized, evidence-based guidelines. The physician either receives a confirmation to proceed or a recommendation to review the evidence-based literature relevant to the imaging service being prescribed in "real time". If the treating physician wishes to proceed with the use of an imaging service that is not supported by the available evidence, the treating physician is asked to consult with a radiology professional who is available to discuss alternate, more appropriate imaging services. The goal of these reviews is to ensure appropriate use of imaging. It is important to point out that making sure the patient gets the right test the first time may result in modifying the original request so that the patient receives a more expensive, but also more effective, imaging test. Radiology benefit management programs rarely result in a denial but rather provide a process through which requests for imaging services can be evaluated for their appropriateness based on the best available medical evidence.

An additional component of the benefit management process entails providing physicians with data on their imaging ordering patterns and how they compare to their peers. Profiling physicians, particularly those who have a pattern of ordering diagnostic imaging that varies greatly from their peers, and providing feedback to physicians is another way health insurance plans have been able to provide information on appropriate imaging.

Published reports illustrate how initial radiology benefit management programs are able to achieve 10 to 20 percent reduction in actual expenditures; while mature programs can hold annual costs trends between 5 and 7 percent.[55] Several health insurance plans have reported reductions in the average growth of utilization from 25% to 1% after a radiology benefit management program was implemented. Others report an 82% decrease in utilization of inappropriate imaging and reductions of up to $2.00 per member per month over two years.[56]

Figure 4—Radiology Benefit Management Core Components

VII. CONCLUSION

With spending and utilization of high-tech imaging services projected to climb, health insurance plans are pursuing strategies designed to improve quality and reduce costs by promoting the appropriate use of diagnostic imaging. Management tools such as use of evidence-based guidelines, consultation with radiology professionals, privileging, and feedback on practice patterns have succeeded in beginning to address the underlying cost and quality issues (Figure 4). With a growing number of health insurance plans and employers looking to implement radiology benefit management programs, continued analysis of the success of these programs, as well as identification of additional innovative strategies to address key cost drivers and ensure appropriateness, will be essential to realizing further improvements in quality and affordability.

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