As insurer representatives, the authors appreciate the benefits associated with the development and evolution of imaging. At the same time, they are concerned about the escalating costs associated with the use of these and other technologies. In 2003, Booz Allen Hamilton reported that diagnostic imaging was the most costly type of health care technology. The use of diagnostic imaging is increasing rapidly. The number of imaging procedures is projected to grow by 26% by 2008, when almost half a billion procedures will be done each year. Health plans have undertaken a variety of responses to these trends and to address concerns about maintaining the quality and affordability of care as imaging services have proliferated rapidly. The challenge for health plans, for radiologists, and for referring physicians is how to reduce the use of unnecessary or inappropriate imaging while ensuring access to clinically valuable imaging, especially in a period of rapid technological advancement and increased use. The BlueCross BlueShield Association and Blue Cross and/or Blue Shield plans are exploring ways to collaborate with the ACR and other specialty societies to promote the safe, effective, and efficient provision of imaging services.

Key Words: Radiology, cost, utilization, health plans, diagnostic imaging

As insurer representatives, we appreciate the benefits associated with the development and evolution of imaging. Several years ago, internists were asked to evaluate 30 innovations from the previous 30 years [1]. Specifically, they were asked to consider the likely effect on the length and quality of life, taking into account the proportion of patients in their practices who would be affected, if the innovations did not exist. They ranked magnetic resonance imaging (MRI) and computed tomography (CT) first in terms of importance, followed by angiotensin-converting enzyme inhibitors, angioplasty, statins, and mammography (Fig. 1). If patients were asked for their views on these innovations, they would probably rank imaging even higher, because these technologies affect almost all patients.

At the same time, we are concerned about the escalating costs associated with the use of these and other technologies. In 2003, Booz Allen Hamilton [2] estimated health care expenditures on technology by all payers for the BlueCross BlueShield Association. They reported that diagnostic imaging was the most costly type of technology, with estimated fully loaded costs of $65 billion to $75 billion in 2000 and an expected growth of $18 billion to $21 billion by 2005. The category of diagnostic imaging includes x-ray procedures, ultrasound, CT, MRI, and nuclear medicine.

The use of diagnostic imaging is increasing rapidly (Fig. 2). The consulting firm Sg2 [3] estimated that the total number of imaging procedures nationally grew by about 40% over the past 5 years. It is projected to grow by another 26% by 2008, when almost half a billion procedures will be done each year.

Fig. 3 shows that outpatient expenditures associated with the more sophisticated and expensive technologies are growing most quickly, although somewhat surprisingly, spending on x-ray procedures grew by 18% between 1999 and 2001 [4]. Sg2 [3] projected that the number of x-ray procedures will decline by 9% between 2002 and 2008, while MRI use will grow by 133%, CT use by 122%, ultrasound use by 57%, and the use of “other” technologies by 10% (including 25% growth for positron emission tomography [PET]). So, the highest cost imaging is growing at the fastest rate [3]. When used properly in accordance with extant guidelines, these techniques are also potentially the most effective. However, they can be misused and overused. For example, they may be used when a simple x-ray study would suffice.
At the same time, there is increasing concern about the radiation exposure associated with unnecessary imaging, especially CT scans. When clinically indicated, the diagnostic benefits should outweigh the risks associated with the radiation involved. But when an imaging procedure is not necessary, the exposure to radiation is a serious concern.

The expansion in the use of imaging comes at a substantial cost. Booz Allen Hamilton [2] estimated that between 2000 and 2005, about 26,000 ultrasound machines, 4300 CT machines, 3860 MRI machines, and 300 PET machines would be sold, at a total cost of about $17 billion (Table 1).

Baker et al. [5] looked at the relationship between the supply of four types of technology—diagnostic imaging, cardiac procedures, specialized cancer care, and neonatal intensive care units—and the use and costs of these technologies. Their strongest results were for diagnostic imaging, for which they found that use and costs were higher in cities with more imaging capacity. They also found that rather than acting as partial substitutes for each other, CT scanners and MRI machines were complementary; that is, having more MRI capacity was associated with higher CT use. This result was affirmed after controlling for the CT capacity in an area. Areas with more MRI machines are likely also to have more CT scanners.

Fig. 1. Percentage of internists saying that the loss of an innovation would have the most adverse effect on their patients. ACE = angiotensin-converting enzyme inhibitors; CABG = coronary artery bypass grafting; CT = computed tomography; MRI = magnetic resonance imaging; PPI = proton pump inhibitor; SSRI = selective serotonin reuptake inhibitor. Source: Fuchs and Sox [1].

Fig. 2. Growth in imaging procedures, U.S. market, 1998 to 2008. Source: Sg2 [3].
According to estimates by the Tiber Group [6], imaging costs are rapidly approaching 10% of health care costs. In 2001, imaging costs rose by 23%, whereas drug costs rose by 16%. The impact of rising imaging use is being felt by both public and private payers. The federal Centers for Medicaid and Medicare Services predicted that imaging use for Medicare patients will increase by 140% over the next decade (as reported by the Tiber Group [6]).

A recent New York Times article titled “An M.R.I. Machine for Every Doctor? Someone Has To Pay” [7] focused on the proliferation of advanced imaging equipment in physicians’ offices:

In the Syracuse area, the number of magnetic resonance imaging machines has grown by a third over the last three years. In the 12 months ended last June alone, use of MRI scans in the area increased 23 percent, according to National Imaging Associates, a company that works with insurers to manage costs.

In the greater Pittsburgh area, there are now more than 160 MRI scanners, more than all of the scanners in Canada. For a large health plan in that area, outpatient imaging expenses rose by 20% for each of the past 3 years to greater than $500 million annually, and 134 of every 1000 members receive CT scans [8].

It is widely acknowledged that the inappropriate use of radiologic procedures exists. According to one estimate, one third of imaging procedures are inappropriate [5]. For example, studies on low back pain in primary care patients suggest that imaging usually is not needed [9,10], yet it is often performed. The National Committee for Quality Assurance [11] recently added a Health Plan Employer Data and Information Set measure to look at use of imaging for acute low back pain within the first 30 days of having symptoms.

Health plans have undertaken a variety of responses to these trends and to address concerns about maintaining quality and affordability of care as imaging services have proliferated rapidly.

- Some have instituted prior authorization for selected nonemergency, high-cost procedures, comparing requests for procedures against established guidelines. They also review payments for selected imaging procedures performed in physicians’ offices and provide feedback to physicians on appropriate imaging, targeted at areas where use is high and varies substantially from peer practice. In a few cases, potential misuse has been detected when, for example, a physician’s referral

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**Table 1. Projected imaging equipment sales, 2000-2005**

<table>
<thead>
<tr>
<th>Imaging Modality</th>
<th>Total Equipment Sales</th>
<th>No. of Machines Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI</td>
<td>$6.4 billion</td>
<td>25,282</td>
</tr>
<tr>
<td>CT</td>
<td>$5.2 billion</td>
<td>3,859</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>$5.2 billion</td>
<td>4,325</td>
</tr>
<tr>
<td>PET</td>
<td>$0.3 billion</td>
<td>300</td>
</tr>
<tr>
<td>Total</td>
<td>$17.1 billion</td>
<td>33,766</td>
</tr>
</tbody>
</table>

**Fig. 3.** Outpatient imaging costs per member per month. CT = computed tomography; MRI = magnetic resonance imaging. Source: BlueCross BlueShield Association [4].
rate “skyrocketed” after the purchase of an imaging machine.

- In one community, health plan executives meet with community leaders representing businesses, consumers, physician organizations, and hospital and health systems. The group advises payers and other stakeholders on the need for certain health care services and technologies and provides nonbinding recommendations. In part as a result of this process, the community has the equivalent of one PET scanner, on the basis of community need, whereas a nearby city with only a slightly larger population has five PET scanners.

- Another plan has piloted a program in which radiologists call referring physicians if they have questions about whether the imaging modality selected is appropriate. The radiologists are paid a fee similar to the reading fee regardless of whether radiologic procedures are performed. The response by referring physicians has been positive. Referring physicians have also begun to provide more detailed information on referral forms, when appropriate, which makes it easier for radiologists to determine whether diagnostic tests are warranted.

- Finally, another plan has instituted rigorous quality privileging standards for imaging facilities. To contract with the plan for CT and MRI scanning, a facility must have at least one certified radiologist on site during normal business hours and must offer at least five different imaging modalities. Magnetic resonance imaging facilities must be accredited by the ACR.

Radiologists have played a leading role in creating guidelines in an effort to reduce inappropriate use. The ACR’s Appropriateness Criteria are a step in the right direction, but there is more work to be done to fully incorporate such information into algorithms of care. A number of articles in peer-reviewed journals document apparently unnecessary use. Unnecessary imaging not only adds to costs but also limits the resources available for other potentially more effective uses, such as new imaging applications or helping purchasers compete more effectively in a global economy. So the challenge for health plans, radiologists, and referring physicians is how to reduce use of unnecessary or inappropriate imaging while ensuring access to clinically valuable imaging, especially in a period of rapid technological advancement and increased use.

The BlueCross BlueShield Association and Blue Cross and/or Blue Shield plans are exploring ways to collaborate with the ACR and other specialty societies to promote the safe, effective, and efficient provision of imaging services.

We will find opportunities to implement solutions to address this important issue to

1. enhance access to clinically important imaging, even as costs rise;
2. eliminate unnecessary procedures and reduce the use of marginal procedures to help maintain the affordability of health care coverage; and
3. safeguard the quality of care in the nontraditional settings that now offer such services.

We all know that this must be done. We can, and if we must, we will do it alone. How much better might the outcome be if done in collaboration with the leadership of imaging communities?

REFERENCES