NIHCM FOUNDATION

expert voices

November 2007

ESSAYS ON TRENDS, INNOVATIVE IDEAS AND CUTTING-EDGE RESEARCH IN HEALTH CARE

Medical Imaging Capacity and Health Care Spending:

Is There Cause for Concern?

Laurence C. Baker, Ph.D. Professor of Health Research and Policy, Stanford University

Introduction

The American health care system is perhaps the most technologically advanced in the world, often to the benefit of those who can receive access to advanced treatments. But these advances often come with high price tags. Balancing the costs and benefits to achieve efficient diffusion and use of new technologies is one of the most important challenges we face in efforts to maintain and strengthen our health care system.

Many of the broader questions about medical technology advances crystallize in the case of imaging technology. Over the course of more than 3 decades, CT scanners, MRI machines, PET scanners, and other powerful technologies have been developed and improved. The U.S. health care system has been remarkably effective at encouraging the adoption of these technologies. For example, the U.S. has 3 to 5 times as many MRI and CT machines per capita as Canada or the United Kingdom (Figure 1). With widespread availability has come widespread use. In just the ten years between 1995 and 2005, the number of CT scans per Medicare beneficiary rose by about 250 percent and the number of MRIs tripled (Figure 2), paralleling growth outside of Medicare and in other types of imaging.[1,2] Expanding utilization has made imaging an important cost center for American medicine, and one which appears poised to continue growing rapidly. Maintaining an efficient balance in our health care system demands careful attention to the links between imaging availability, use, and spending, while considering whether we get our money's worth as we use additional services.

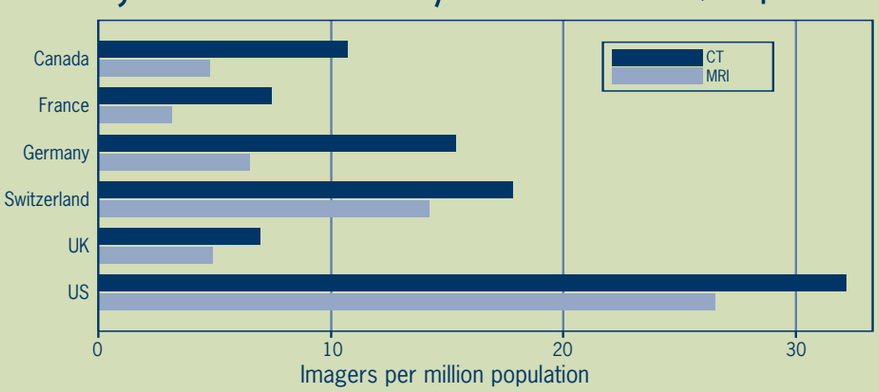
The Relationship between Imaging Capacity, Use and Spending

For many years observers of health care systems have noted that the number of providers of a given service is closely related to the rate at which the service is used. An early example is John Bunker's observation that the U.S. had twice as many surgeons as the UK, and also did twice as much surgery, without any clear indications that the population of the U.S. had twice the number of underlying medical reasons for surgery.[3]

Imaging availability is clearly related to the rate at which imaging is used (and the rate at which money is spent on imaging) in the U.S. today. One of the most remarkable features of imaging availability in the U.S. is the lack of uniformity from one area to another. In 2004 across 324 metropolitan statistical areas (MSAs), the 16 cities with the lowest availability levels all had fewer than 11 MRI machines per million persons, while the 16 cities with the highest levels all had more than 51. My own calculations with Medicare data from these MSAs show that an increase of ten MRI scanners per million people is associated with an increase of more than 10,000 MRI scans per million beneficiaries.

Such a relationship can also be demonstrated in more careful analyses. In a longitudinal analysis published in *Health Affairs*, my colleagues and I studied the relationship between expanding availability of outpatient CT and MRI imaging equipment and use and spending in Medicare and in a privately insured population.[4] For both technologies, we found that areas experiencing growth in the availability of the equipment also saw noticeable increases in the number of procedures performed with that equipment. We also studied whether performing more MRI scans offsets the use of CT or other imaging services (or vice versa) but found no evidence that this was occurring. In fact, if anything, we found that areas that expanded their MRI capacity had higher rates of both MRI and CT use, and similarly for expansions in CT availability. Areas with more MRI or CT availability do more imaging in total, not less as one would expect if expanding MRI or CT use were substituting for other types of imaging. Finally, we found strong relationships between the availability of MRI and CT equipment and total medical spending. While the effects we found were too large to be due to MRI or CT availability driving up total spending all by themselves, these results reinforce the existence of powerful relationships between technology expansion, perhaps more broadly than just imaging equipment, and rising costs.

Figure 1: MRI and CT Availability in 6 Selected Countries, 2004



Souce: Organisation for Economic Cooperation and Development (OECD) Health Data

Causes and Effects

The potential policy response to these relationships turns on the question of whether or not expanding availability of imaging technology is the cause of the increased use and spending. It is not hard to believe that it is. In medicine there is frequently opportunity for practice patterns to adapt to changes in the availability of new equipment. As the availability of imaging equipment grows there will be expanded opportunities to use the new equipment (and perhaps even efforts by the owners to facilitate use). It would not be surprising for treatment approaches to evolve toward heavier imaging use.

Health economists often caution, however, that relationships between technology availability and use could simply reflect variations in the underlying preferences of the population. If some people want more imaging than others, perhaps it is those interests that drive both the adoption of more scanners and the higher use.

This concern cannot be dismissed out of hand and, as is usually the case, our *Health Affairs* study cannot prove with complete certainty that expanding availability is the cause of the expanded use. We do, however, believe that the possibility deserves serious consideration. It seems difficult to believe that underlying preferences about imaging vary so substantially from one place to another – that, for example, the population of Dubuque, IA, with 44 MRI scanners per million population, has more than 3 times the desire for MRI services as the population of Davenport, IA, just 70 miles away with 14 per million or more than 5 times the desire as Sioux City, IA with 8. Rather more likely seems the possibility that some places have ended up with more imaging capacity due to variations in sales efforts, internal hospital decision-making processes, philanthropy, or other factors – and this has led to variations in use. Our study also took some analytic steps to minimize the chance that our results were simply due to variations in preferences, including focusing on changes over time within areas, in which one would expect preferences to remain relatively constant. In the end, we find it difficult to resist the view that availability of imaging equipment is an important driver of the use of and spending for imaging.

Questions about the Value of Expanding Utilization

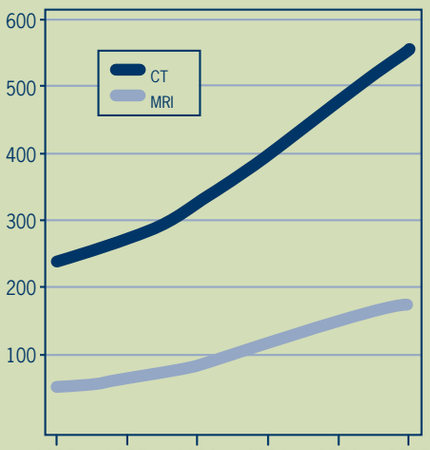
Growth in imaging utilization and spending may be acceptable, even beneficial, if more imaging use produces benefits that exceed the additional costs. For example, more diagnostic imaging may improve diagnoses and reduce the need for invasive testing. On the other hand, we should be concerned if more imaging does not contribute sufficient additional benefits. Some testing, for example, may create only small benefits for patients but incur large costs, lead to more false positives, which may be detrimental for patients, or even raise cancer risks.[5]

Any global pronouncement about the ultimate value of imaging would be unwise; there are many different possible tests, and the value of any particular procedure will depend on the patient and the circumstances. There are clinical studies supporting the value of many imaging procedures in many circumstances. At the same time we should remain vigilant about the rapid continuing advance of imaging services. Some studies, such as the work by Fisher and colleagues, reinforce the point that increases in spending can sometimes be difficult to tie to improvements in patient health.[6] As new technologies spread, they frequently come to be used in populations other than those in which the value of the technology was originally demonstrated. Top-of-mind new services may be used where older, less costly technologies could have been sufficient but have become ignored. While we may never have the data to assess fully whether all of the spending on advanced imaging is ultimately worth it, the past performance of the health care system in other areas provides reasons to worry that the tendency to expand imaging availability rapidly will come with much unneeded, expensive utilization.

Questions for Policy

What then to do? At the very least, those who would improve the health care system must devote continuing attention to the costs and benefits of a wide range of new technologies that come with the potential for both important benefits for patients and unnecessary overuse. More important, though, will be efforts to create incentive structures that reward appropriate adoption of new technologies. Past efforts to adopt regulatory frameworks, such as certificate of need programs, frequently proved susceptible to political manipulation or other problems that rendered the process ineffective at rationalizing infrastructure growth. In light of previous work demonstrating that financial incentives in insurance structures can influence technology adoption,[7,8] a more promising approach may be to involve Medicare and private insurers in efforts to adopt new payment systems that reward efficient diffusion. One potentially promising approach would be to encourage the creation of delivery system entities that can be accountable for costs and outcomes of defined populations, taking responsibility for the delivery of a complete package of care and thus internalizing incentives for the optimal use of technologies like imaging. ■

Figure 2: Medicare MRI and CT Claims, 1995-2005



Souce: Author's calculations using Medicare data

1 *Bhargavan M, Sunshine JH. "Utilization of Radiology Services in the United States: Levels and Trends in Modalities, Regions, and Populations." Radiology 234:3 (March 2005) 824-832.*

2 *Miller ME, "MedPAC Recommendations on Imaging Services." Testimony before the U.S. House of Representatives, Committee on Ways and Means, Subcommittee on Health, March 17, 2005. Accessed September 8, 2007 at http://www.medpac.gov/publications/congressional_testimony/031705_TestimonyImaging-Hou.pdf*

3 *Bunker J. "Surgical manpower. A comparison of operations and surgeons in the United States and in England and Wales." New England Journal of Medicine 282:3 (January 15, 1970) 135-144.*

4 *Baker LC, Birnbaum H, Geppert J, Mishol D, Moyneur E. "The Relationship Between Technology Availability and Health Care Spending." Health Affairs Web Exclusive (November 5, 2003) W3:537-W3:551.*

5 *Brenner DJ, Hall EJ. "Computed Tomography – An Increasing Source of Radiation Exposure." The New England Journal of Medicine 357:22 (November 29, 2007) 2277-84.*

6 *Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder EL. "The implications of regional variations in Medicare spending. Part 1: the content, quality, and accessibility of care. Part 2: health outcomes and staisfaction with care." Annals of Internal Medicine 138:4 (February 18, 2003) 273-98.*

7 *Baker LC. "Managed Care and Technology Adoption in Health Care: Evidence from Magnetic Resonance Imaging." Journal of Health Economics 20:3 (May 2001) 395-421.*

8 *Baker LC, Phibbs CS. "Managed Care, Technology Adoption, and Health Care: The Adoption of Neonatal Intensive Care." Rand Journal of Economics 33:3 (Autumn 2002) 524-548.*