

# Value of Imaging Part I: Perspectives for the Academic Radiologist

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With payers and policymakers increasingly scrutinizing the value of medical imaging, opportunities abound for radiologists and radiology health services researchers to meaningfully and rigorously demonstrate value. Part one of this two-part series on the value of imaging explores the concept of value in health care from the perspective of multiple stakeholders and discusses the opportunities and challenges for radiologists and health service researchers to demonstrate value. The current absence of meaningful national value metrics also presents an opportunity for radiologists to take the lead on the discussions of these metrics that may serve as the basis for future value-based payments. As both practitioners and investigators, radiologists should consider the perspectives of multiple stakeholders in all they do—interdisciplinary support and cooperation are essential to the success of value-focused imaging research and initiatives that improve patient outcomes. Radiology departments that align their cultures, infrastructures, and incentives to support these initiatives will greatly increase their chances of being successful in these endeavors.

**Key Words:** Imaging; Radiology; Comparative effectiveness; Value of imaging; Health services research.

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## INTRODUCTION

With payers and policymakers increasingly scrutinizing the value of medical imaging, opportunities abound for radiologists and radiology health services researchers to meaningfully and rigorously demonstrate value. Value-focused investigation, however, represents a conundrum for many imaging practitioners and researchers, who have traditionally focused on whether services or technologies were effective, rather than being a good value for the money (1).

In this first of a two-part report from the Radiology Research Alliance Task Force on the value of imaging in health care, we describe various definitions of value and outline challenges in measuring it from both the patient encounter and the larger societal perspective. In the second part, we detail several actionable opportunities for the imaging community to demonstrate its value to patients, payers, ordering providers, health systems, and society at large. Although value-focused

research represents a substantive departure from traditional avenues pursued by most investigators, it creates considerable opportunities for those who adapt and innovate, particularly for younger academicians seeking to align their pursuits with long-term societal agendas.

## Pressure on Radiology to Demonstrate Value

Claims of overutilization of medical imaging (2–4) have resulted in substantial scrutiny by the Centers for Medicare and Medicaid Services (CMS), other payers, and a variety of policymakers. In an attempt to both curb that utilization and promote appropriateness and quality, a variety of metrics and mandates have been imposed on radiology providers and facilities. For example, comparisons of hospital advanced imaging utilization, such as the rate of magnetic resonance imaging in patients with low back pain without initial trial of treatment, are publicly available on the Medicare Hospital Compare website (5). Clinical decision support tools have been introduced in some health systems, and Congress has recently mandated their implementation for advanced imaging ordering beginning in 2017 (6). Although the growth of medical imaging has slowed in recent years (7–10), radiology's historical disproportionate contribution to rising overall healthcare expenditures has been the focus of many parties (2,11).

This increased scrutiny has prompted the imaging community to consider how it can demonstrate the value of imaging to payers and other stakeholders. Research in radiology has traditionally been focused on diagnostic accuracy and efficacy (performance of an intervention under ideal conditions) rather

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than comparative effectiveness (effect of an intervention in “real-world” conditions compared to other diagnostic tests) and cost-effectiveness. Until recently, comparative evidence for diagnostic imaging uses in oncology, cardiovascular care, and for other conditions has been relatively limited (12). As discussed in part II of this series, radiologists are also demonstrating value beyond imaging interpretation such as by reducing radiation dose, guiding appropriate ordering of imaging studies, and communicating results directly to patients. The link between imaging and clinical outcome is crucial—the Department of Health and Human Services recently announced that reimbursements will be increasingly tied to quality or value with 30% of Medicare payments tied to alternative payment models by 2016 (13). Therefore, work that demonstrates the value of imaging to clinical outcomes is urgently needed to justify imaging’s role in these evolving healthcare delivery models.

### Defining Value in Health Care and in Radiology

A simple way of defining value is quality divided by cost ( $V = Q/C$ )—or more colloquially as “bang for the buck” (1). This permits the value seeker—whether he is a clinician, administrator, or researcher—to focus efforts on either quality or cost and, ideally, towards both. In addition, the definition of each differs depending on the stakeholder of interest. Administrators, for example, may be focused more on the bottom line of their practices, whereas physicians may prioritize clinical outcomes and their own workflow efficiencies.

In an effort to better link quality to outcomes and other factors, Gary Kaplan has defined quality using the following equation:  $Q = Ax(O + S)/W$  (14). In this scheme,  $A$  = appropriateness,  $O$  = outcomes,  $S$  = service, and  $W$  = waste. Using this concept, an inappropriate exam would not be valuable to the patient even if the patient was provided excellent service and had a favorable outcome.

Outcomes in the above equation should be viewed from different stakeholder perspectives. The outcomes that matter most to patients—and other important stakeholders such as health systems and payers—are not always the same as those historically prioritized by clinicians or researchers. To date, many health services researchers pursuing value have focused largely on objective and traditional outcomes measurements such as diagnostic accuracy, turnaround times, and lengths of stay. Patients, however, also value less quantifiable metrics such as communication with their physicians. In at least some circumstances, patients value direct communication of imaging findings to them by radiologists (15–17). To this end, researchers may want to expand their work on quality to include service, rather than just traditional outcomes metrics.

Waste, the last component of Gary Kaplan’s equation, will likely garner increased attention in an emerging consumer-driven environment in which patients are increasingly engaged in their care and have a higher cost burden. Waste refers to the inefficiencies in health care that can be categorized as administrative, operational, or clinical (18). Using Lean methodology and other approaches, radiology departments are

increasingly motivated to improve their administrative, operational, and clinical processes to provide safer and more efficient care through standardization of work (19).

Gary Kaplan’s equation is only one way to define quality—there is no single accepted definition (14,20). Likewise, the denominator of the value equation (i.e., cost) may appear easier to measure, but this too can be considered in many ways (21). Health services researchers and economists often assess costs from the perspective of payers and society. Because regional and private payer amounts vary considerably, CMS allowable payment amounts often serve as a national cost surrogate. But, as healthcare payments shift from insurer indemnity models with relatively small patient contributions to increasing patient responsibility for deductibles and co-payments, additional layers of complexity are added to the equation. For instance, savings to Medicare or other payers can be an illusory accounting exercise because those “savings” really represent shifts in costs from payers to patients, rather than true savings. To that end, investigators seeking to study costs must increasingly consider the perspectives of multiple stakeholders—those paying the bills (i.e., patients, employers, and payers) and also those receiving payments (e.g., physicians and facilities)—because those payments may not actually match the costs incurred in delivering those services. Short-term and long-term costs should be assessed to ensure that initial cost reductions due to a policy change, for example, are not associated with future costly medical care or social services. Complicating matters further are costs that are not directly monetary ones (e.g., lost time from work) or those less easily measured (e.g., costs associated with false-positive examinations).

Cost-effectiveness assessment represents another approach to assess and define value and has gained popularity since the 1990s. Standard approaches have been described by Drummond et al. (22) and Gold et al. (23) for conducting cost evaluation and cost-effectiveness assessment for medical technologies. The basic incremental cost-effectiveness ratio is generally presented as:  $(\text{cost of new technology} - \text{cost of old technology}) / (\text{effect of new technology} - \text{effect of old technology})$ . Effects may be measured using a variety of outcomes, such as biological metrics (e.g., cholesterol reduction), time (e.g., life years saved), or quality-adjusted life years. Specific imaging-related outcomes could include diagnostic accuracy, influence on decision-making, and influence on processes of care. Typically, the perception of value is based on the willingness-to-pay threshold of the stakeholder of interest (e.g., payer). Increasingly, however, there is also a consideration of budget impact and sustainability, but few countries or payers have identified a monetary threshold to use as an explicit standard for policymaking (24).

### Multiple Stakeholders in Health Care

Defining and demonstrating the value of imaging services requires broad consideration of comprehensive value-added work processes and communication processes. In the previous section, we identified general value definitions, value-based

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