SA-CME EDITOR'S CHOICE

# The Total Value Equation: A Suggested Framework for Understanding Value Creation in Diagnostic Radiology

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As a result of macroeconomic forces necessitating fundamental changes in health care delivery systems, *value* has become a popular term in the medical industry. Much has been written recently about the idea of value as it relates to health care services in general and the practice of radiology in particular. Of course, cost, value, and cost-effectiveness are not new topics of conversation in radiology. Not only is value one of the most frequently used and complex words in management, entire classes in business school are taught around the concept of understanding and maximizing value. But what is value, and when speaking of value creation strategies, what is it exactly that is meant? For the leader of a radiology department, either private or academic, value creation is a core function. This article provides a deeper examination of what value is, what drives value creation, and how practices and departments can evaluate their own value creation efficiencies. An equation, referred to as the Total Value Equation, is presented as a framework to assess value creation activities and strategies.

**Key Words:** Value, operations, management, strategy

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## INTRODUCTION

As a result of economic pressures necessitating fundamental changes in health care delivery systems, *value* has become a popular term in the medical industry. Much has been written recently about the idea of value as it relates to health care services in general and the practice of radiology in particular [1-4]. Of course, cost, value, and cost-effectiveness are not new topics of conversation in radiology [5,6]. Not only is *value* one of the most frequently used and complex words in management, entire classes in business school are taught around the concept of understanding and maximizing value. For the leader of a radiology department, either private or academic, value creation is a core function. But what exactly is value, and when speaking of value creation strategies, what is it that is meant? This article provides a deeper examination of what value is, what drives value creation, and how practices and departments can evaluate their own value creation efficiencies. An equation, referred to as the total value equation (TVE), is presented as a framework to assess value creation activities and strategies.

The concept of value, namely, the idea of benefits in relation to cost, is intuitively understood by consumers. When shopping for a car, customers consider their fundamental needs from a car, additional benefits they desire from a car, their budget, and the various product offerings. Combining these concepts, customers narrow down their choices and settle on a car that provides them the greatest value, or benefit for their purchase price.

Value, understood from a business perspective, combines these intuitively understood concepts. It is occasionally described as equal to (or at least proportional to) benefits divided by or minus price. Others have described value as proportional to cost and quality multiplied by efficiency [7]. A classic corporate strategy text defines value as "the difference between the benefits enjoyed by a firm's customers and its cost of production" [8]. Value thus combines the concepts of customer desires, the benefits received from a product (or service), and the costs associated with producing the product (or service).

In traditional corporate strategy theory, value is deconstructed into 3 variables. The first is the benefits ($B$) a consumer receives from a good or service. This can be quantified in monetary terms and understood as the

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maximum willingness to pay for a good or service. The second variable is the costs of production (*C*) of that good or service. The difference between *B* and *C* defines the total value created. That is, the difference between the cost to produce a good and the maximum that a second party will pay for that good represents the value created. The third and final variable is the price (*P*) charged for the product. This final variable divides the total value created into two not necessarily equal portions. The difference between *B* and *P*, or the maximum willingness to pay and the actual price charged, is the value to the consumer. The value proposition of a firm is the difference between *B* and *P*, given its service offerings. The difference between price charged and the costs of production, or *P* and *C*, is the value captured by the firm producing the good or service.

Value, understood from a health care perspective, typically equates benefits and patient outcomes. It has been suggested that for the medical industry, value should be understood as the health outcomes achieved given the dollars spent to achieve them [9]. Given comparative effectiveness research, the relationship between services (and value) and outcomes is increasingly important [10].

The value of a radiology department depends on to whom the question is posed. In health care, there are numerous stakeholders, including patients, physicians, insurance companies, the government, hospitals, pharmaceutical companies, and many others, all of whom may have differing perceptions of value. Understanding that patient care is always most important, for the purposes of this article, value is examined from the point of view of a hospital leader or chief executive officer, referred to as the client. This is whom radiologic service providers ultimately must negotiate their contracts with, thus monetizing their value creation activities. Hospital leaders must have the broadest view, for their mission is to satisfy the various stakeholders, keep an eye on the finances, and never lose sight of their top priority: patient care. As has been previously written, for any value assessment of health care to have meaning, it must be inherently patient centered and have a clear focus on optimizing outcomes [11].

Returning to the car analogy, customers will define the minimum characteristics they require from an automobile. For most car customers, chief among these is a reliable mode of transportation. Beyond this, they have varying wants and desires that they value at different strengths. For example, they may want a car with 4-wheel drive for bad weather conditions and be willing to pay quite a bit more for this feature. They may also prefer one color over another but not be willing to pay much for that option.

Although the comparison is not perfect, given the complex task of balancing the concerns of the various stakeholders in a health care organization, as opposed to the individual needs of a car shopper, hospital leaders evaluating radiologic service providers are at least analogous to car consumers. They must set a minimum level of services that need to be provided and then evaluate the other options groups may offer, along with the costs of these options. Given its budget and its varying desires for additional services beyond a core minimum, a hospital decides on a service provider that affords it the greatest value. To better understand how hospital leaders could more formally frame this value analysis, the TVE is suggested.

## THE TOTAL VALUE EQUATION

Emphasized by the fee-for-service model, radiologists are traditionally thought of as employed to interpret medical imaging examinations and issue formal reports to ordering physicians. Typical metrics of departmental function with respect to this service are speed of interpretation and overall interpretation quality. Means of quantifying these were developed, including turnaround times and various quality assurance parameters. This type of value is referred to as interpretive value and has been frequently understood as a core driver of value for a department or practice.

Distinct from interpretive value, there is also value derived from noninterpretive, or so-called value-added, activities. These are benefits derived from a radiology department that are separate from image interpretation. This is a large category of activities, which can be subdivided into factors that directly affect patient care and those that do not. Noninterpretive value-creating activities that affect patient care include consultation with clinical colleagues, working conferences such as tumor boards, and ongoing optimization of imaging algorithms and protocols. Collaborating on utilization management efforts may also be a form of adding noninterpretive value. Factors that add noninterpretive value to the system but do not directly affect patient care include education efforts and research. Although not directly reimbursed in the fee-for-service model, noninterpretive value has financial implications.

The concept of noninterpretive value has been recognized as a crucial component of a firm's overall value proposition. As hospitals and health care networks analyze the benefits from their medical imaging service providers, the value from noninterpretive activity will likely become increasingly relevant. Regarding radiology department functions in the setting of an accountable care organization, an ACR white paper in 2011 noted, "This will most likely entail changing . . . focus from interpretative productivity, in the traditional sense of number of examinations interpreted, to becoming recognized as experts in noninterpretative areas that add additional value" to the accountable care organization [12].

Combining these two benefit-related concepts of value, interpretive and noninterpretive, the TVE can be