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Perspective

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# What Is Value in Health Care?

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In any field, improving performance and accountability depends on having a shared goal that unites the interests and activities of all stakeholders. In health care, however, stakeholders have myriad, often conflicting goals, including access to services, profitability, high quality, cost containment, safety, convenience, patient-centeredness, and satisfaction. Lack of clarity about goals has led to divergent approaches, gaming of the system, and slow progress in performance improvement.

Achieving high value for patients must become the overarching goal of health care delivery, with value defined as the health outcomes achieved per dollar spent.[1] This goal is what matters for patients and unites the interests of all actors in the system. If value improves, patients, payers, providers, and suppliers can all benefit while the economic sustainability of the health care system increases.

Value — neither an abstract ideal nor a code word for cost reduction — should define the framework for performance improvement in health care. Rigorous, disciplined measurement and improvement of value is the best way to drive system progress. Yet value in health care remains largely unmeasured and misunderstood.

Value should always be defined around the customer, and in a well-functioning health care system, the creation of value for patients should determine the rewards for all other actors in the system. Since value depends on results, not inputs, value in health care is measured by the outcomes achieved, not the volume of services delivered, and shifting focus from volume to value is a central challenge. Nor is value measured by the process of care used; process measurement and improvement are important tactics but are no substitutes for measuring outcomes and costs.

Since value is defined as outcomes relative to costs, it encompasses efficiency. Cost reduction without regard to the outcomes achieved is dangerous and self-defeating, leading to false "savings" and potentially limiting effective care.

Outcomes, the numerator of the value equation, are inherently condition-specific and multidimensional. For any medical condition, no single outcome captures the results of care. Cost, the equation's denominator, refers to the total costs of the full cycle of care for the patient's medical condition, not the cost of individual services. To reduce cost, the best approach is often to spend more on some services to reduce the need for others.

Health care delivery involves numerous organizational units, ranging from hospitals to physicians' practices to units providing single services, but none of these reflect the boundaries within which value is truly created. The proper unit for measuring value should encompass all services or activities that jointly determine success in meeting a set of patient needs. These needs are determined by the patient's medical condition, defined as an interrelated set of medical circumstances that are best addressed in an integrated way. The definition of a medical condition includes the most common associated conditions — meaning that care for diabetes, for example, must integrate care for conditions such as hypertension, renal disease, retinal disease, and vascular disease and that value should be measured for everything included in that care.[1]

For primary and preventive care, value should be measured for defined patient groups with similar needs. Patient populations requiring different bundles of primary and preventive care services might include, for example, healthy children, healthy adults, patients with a single chronic disease, frail elderly people, and patients with multiple chronic conditions.

Care for a medical condition (or a patient population) usually involves multiple specialties and numerous interventions. Value for the patient is created by providers' combined efforts over the full cycle of care. The benefits of any one intervention for ultimate outcomes will depend on the effectiveness of other interventions throughout the care cycle.

Accountability for value should be shared among the providers involved. Thus, rather than "focused factories" concentrating on narrow groups of interventions, we need integrated practice units that are accountable for the total care for a medical condition and its complications.

Because care activities are interdependent, value for patients is often revealed only over time and is manifested in longer-term outcomes such as sustainable recovery, need for ongoing interventions, or occurrences of treatment-induced illnesses.[2] The only way to accurately measure value, then, is to track patient outcomes and costs longitudinally.

For patients with multiple medical conditions, value should be measured for each condition, with the presence of the other conditions used for risk adjustment. This approach allows for relevant comparisons among patients' results, including comparisons of providers' ability to care for patients with complex conditions.

The current organizational structure and information systems of health care delivery make it challenging to measure (and deliver) value. Thus, most providers fail to do so. Providers tend to measure only what they directly control in a particular intervention and what is easily measured, rather than what matters for outcomes. For example, current measures cover a single department (too narrow to be relevant to patients) or outcomes for a whole hospital, such as infection rates (too broad to be relevant to patients). Or they measure what is billed, even though current reimbursement practices are misaligned with value. Similarly, costs are measured for departments or billing units rather than for the full care cycle over which value is determined. Faulty organizational structure also helps explain why physicians fail to accept joint responsibility for outcomes, blaming lack of control over "outside" actors involved in care (even those in the same hospital) and patients' compliance.

The concept of quality has itself become a source of confusion. In practice, quality usually means adherence to evidence-based guidelines, and quality measurement focuses overwhelmingly on care processes. For example, of the 78 Healthcare Effectiveness Data and Information Set (HEDIS) measures for 2010, the most widely used quality-measurement system, all but 5 are clearly process measures, and none are true outcomes.[3] Process measurement, though a useful internal strategy for health care institutions, is not a substitute for measuring outcomes. In any complex system, attempting to control behavior without measuring results will limit progress to incremental improvement. There is no substitute for measuring actual outcomes, whose principal purpose is not comparing providers but enabling innovations in care. Without such a feedback loop, providers lack the requisite information for learning and improving. (Further details about measuring value are contained in a framework paper, "Value in Health Care," in Supplementary Appendix 1, available with the full text of this article at NEJM.org.)

Measuring, reporting, and comparing outcomes are perhaps the most important steps toward rapidly improving outcomes and making good choices about reducing costs.[4] Systematic, rigorous outcome measurement remains rare, but a growing number of examples of comprehensive outcome measurement provide evidence of its feasibility and impact.

Determining the group of relevant outcomes to measure for any medical condition (or patient population in the context of primary care) should follow several principles. Outcomes should include the health circumstances most relevant to patients. They should cover both near-term and longer-term health, addressing a period long enough to encompass the ultimate results of care. And outcome measurement should include sufficient measurement of risk factors or initial conditions to allow for risk adjustment.

For any condition or population, multiple outcomes collectively define success. The complexity of medicine means that competing outcomes (e.g., near-term safety versus long-term functionality) must often be weighed against each other.

The outcomes for any medical condition can be arrayed in a three-tiered hierarchy (see Figure 1), in which the top tier is generally the most important and lower-tier outcomes involve a progression of results contingent on success at the higher tiers. Each tier of the framework contains two levels, each involving one or more distinct outcome dimensions. For each dimension, success is measured with the use of one or more specific metrics.

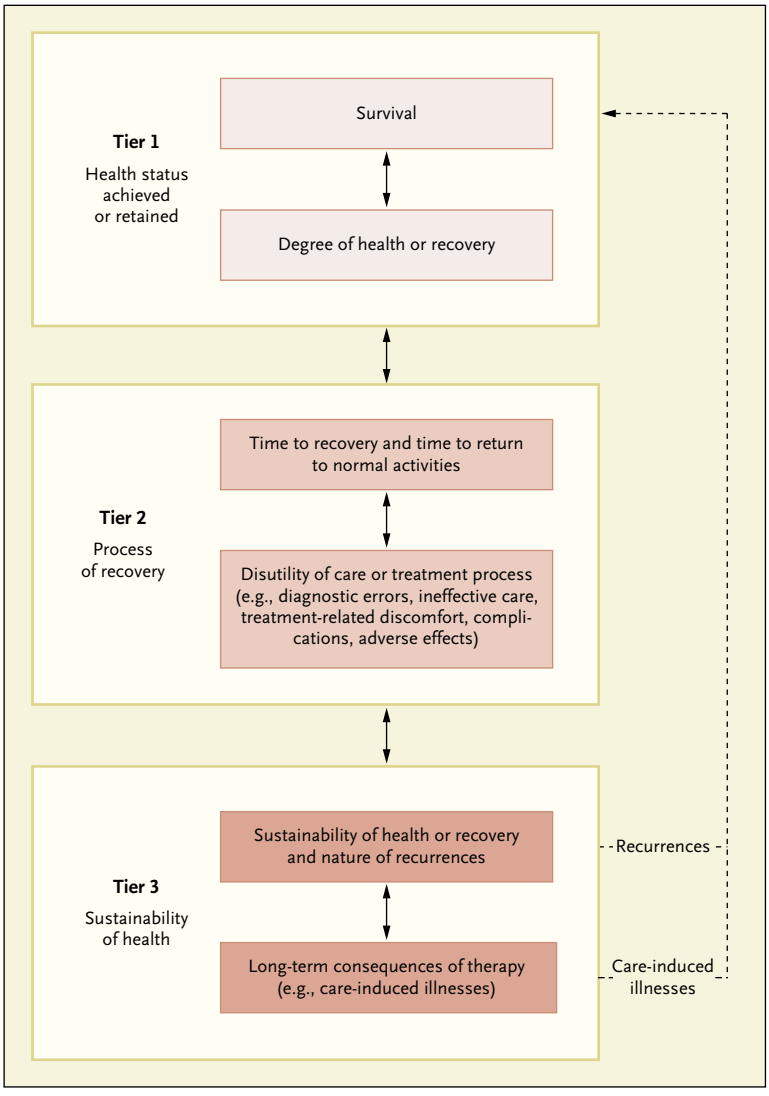


**Figure 1. The Outcome Measures Hierarchy.**

Tier 1 is the health status that is achieved or, for patients with some degenerative conditions, retained. The first level, survival, is of overriding importance to most patients and can be measured over various periods appropriate to the medical condition; for cancer, 1-year and 5-year survival are common metrics. Maximizing the duration of survival may not be the most important outcome, however, especially for older patients who may weight other outcomes more heavily. The second level in Tier 1 is the degree of health or recovery achieved or retained at the peak or steady state, which normally includes dimensions such as freedom from disease and relevant aspects of functional status.

Tier 2 outcomes are related to the recovery process. The first level is the time required to achieve recovery and return to normal or best attainable function, which can be divided into the time needed to complete various phases of care. Cycle time is a critical outcome for patients — not a secondary process measure, as some believe. Delays in diagnosis or formulation of treatment plans can cause unnecessary anxiety. Reducing the cycle time (e.g., time to reperfusion after myocardial infarction) can improve functionality and reduce complications. The second level in Tier 2 is the disutility of the care or treatment process in terms of discomfort, retreatment, short-term complications, and errors and their consequences.

Tier 3 is the sustainability of health. The first level is recur-

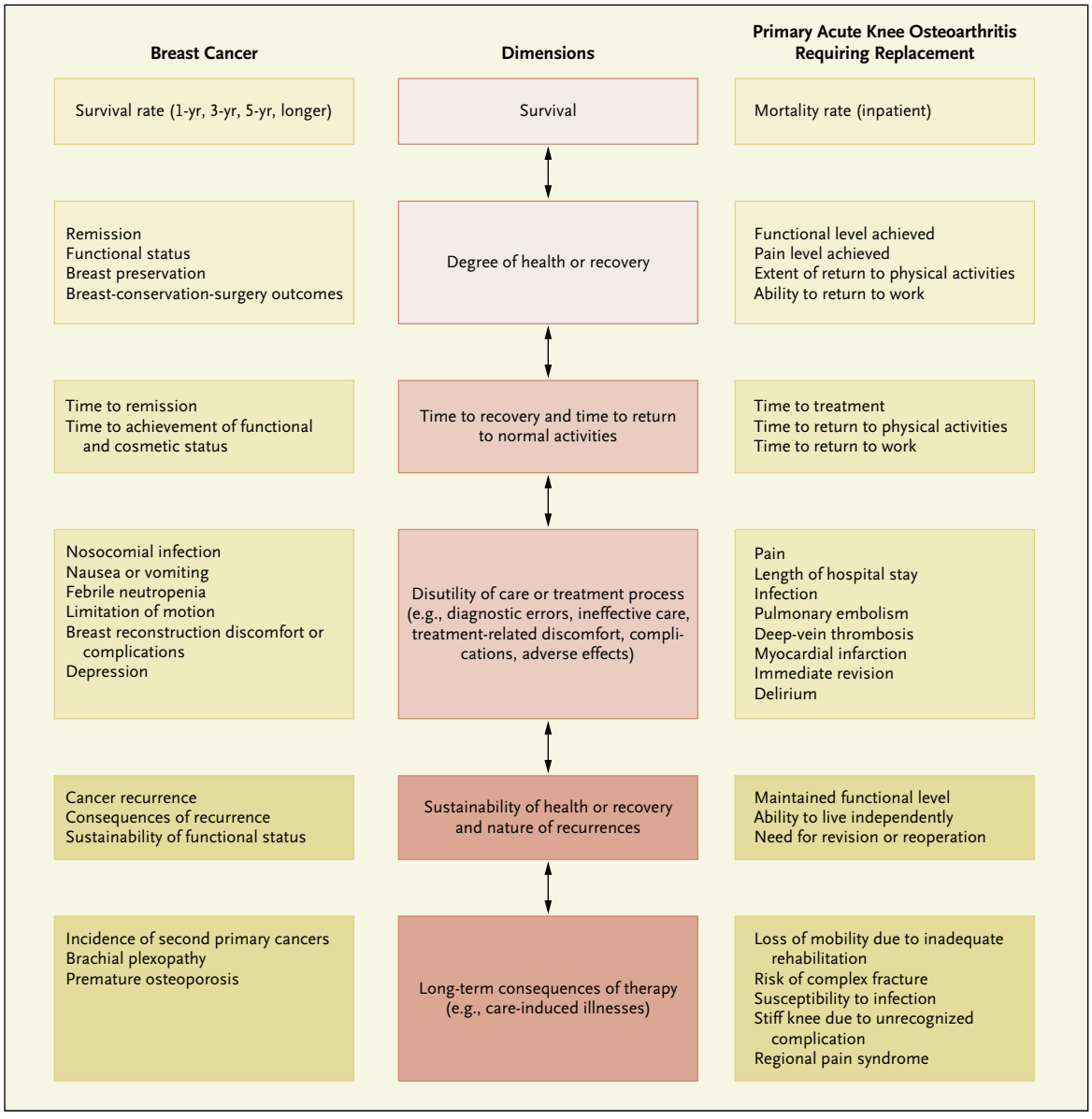


**Figure 2. Outcome Hierarchies for Breast Cancer and Knee Osteoarthritis.**

rences of the original disease or longer-term complications. The second level captures new health problems created as a consequence of treatment. When recurrences or new illnesses occur, all outcomes must be remeasured.

With some conditions, such as metastatic cancers, providers may have a limited effect on survival or other Tier 1 outcomes, but they can differentiate themselves in Tiers 2 and 3 by making care more timely, reducing discomfort, and minimizing recurrence.

Each medical condition (or population of primary care patients) will have its own outcome measures. Measurement efforts should begin with at least one outcome dimension at each tier, and ideally one at each level. As experience and available data infrastructure grow, the number of dimensions (and measures) can be expanded.

Improving one outcome dimension can benefit others. For example, more timely treatment can improve recovery. However, measurement can also make explicit the tradeoffs among outcome dimensions. For example, achieving more complete recovery may require more arduous treatment or confer a higher risk of complications. Mapping these tradeoffs, and seeking ways to reduce them, is an essen-

tial part of the care-innovation process.

Figure 2 illustrates possible outcome dimensions for breast cancer and acute knee osteoarthritis requiring knee replacement. Most current measurement efforts fail to capture such comprehensive sets of outcomes, which are needed to fully describe patients' results. No organization I know of systematically measures the entire outcome hierarchy for the medical conditions for which it provides services, though some are making good progress. (Further details, including risk adjustment, are addressed in a framework paper, "Measuring Health Outcomes," in Supplementary Appendix 2, available at NEJM.org.)

The most important users of outcome measurement are providers, for whom comprehensive measurement can lead to substantial improvement.[5] Outcomes need not be reported publicly to benefit patients and providers, and public reporting must be phased in carefully enough to win providers' confidence. Progression to public reporting, however, will accelerate innovation by motivating providers to improve relative to their peers and permitting all stakeholders to benefit fully from outcome information.

Current cost-measurement approaches have also obscured value in health care and led to cost-containment efforts that are incremental, ineffective, and sometimes even counterproductive. Today, health care organizations measure and accumulate costs around departments, physician specialties, discrete service areas, and line items such as drugs and supplies — a reflection of the organization and financing of care. Costs, like outcomes, should instead be measured around the patient. Measuring the total costs over a patient's entire care cycle and weighing them against outcomes will enable truly structural cost reduction, through steps such as reallocation of spending among types of services, elimination of non–value-adding services, better use of capacity, shortening of cycle time, provision of services in the appropriate settings, and so on.

Much of the total cost of caring for a patient involves shared resources, such as physicians, staff, facilities, and equipment. To measure true costs, shared resource costs must be attributed to individual patients on the basis of actual resource use for their care, not averages. The large cost differences among medical conditions, and among patients with the same medical condition, reveal additional opportunities for cost reduction. (Further aspects of cost measurement and reduction are discussed in the framework paper "Value in Health Care.")

The failure to prioritize value improvement in health care delivery and to measure value has slowed innovation, led to ill-advised cost containment, and encouraged micromanagement of physicians' practices, which imposes substantial costs of its own. Measuring value will also permit reform of the reimbursement system so that it rewards value by providing bundled payments covering the full care cycle or, for chronic conditions, covering periods of a year or more. Aligning reimbursement with value in this way rewards providers for efficiency in achieving good outcomes while creating accountability for substandard care.

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# Putting the Value Framework to Work

Thomas H. Lee, M.D.

"Value" is a word that has long aroused skepticism among physicians, who suspect it of being code for "cost reduction." Nevertheless, an increasing number of health care delivery organizations, including my own, now describe enhancement of value for patients as a fundamental goal and are using concepts developed by Michael Porter (see pages 2477–2480, and the framework papers in Supplementary Appendixes 1 and 2 of that article) to shape their strategies.

# Supplementary Appendix 1

This appendix has been provided by the author to give readers additional information about his work.

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# VALUE IN HEALTH CARE

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In any field, improving performance and accountability depends on having a shared goal that unites the interests and activities of all stakeholders. In most fields, the preeminent goal is value. The concept of value refers to the output achieved relative to the cost incurred. Defining and measuring value is essential to understanding the performance of any organization and driving continuous improvement.

In health care, value is defined as the patient health outcomes achieved per dollar spent. Value should be the preeminent goal in the health care system, because it is what ultimately matters for customers (patients) and unites the interests of all system actors.[1] If value improves, patients, payers, providers, and suppliers can all benefit while the economic sustainability of the health care system improves. Value encompasses many of the other goals already embraced in health care, such as quality, safety, patient centeredness, and cost containment, and integrates them. It is also fundamental to achieving other important goals such as improving equity and expanding access at reasonable cost.

Despite the overarching significance of value in health care, however, it has not been the central focus. Indeed, value remains largely unmeasured not only in the United States but around the world, perpetuating health care delivery as an art and not a science amenable to continuous improvement. (Value must be measured directly in health care because profitability, the proxy for value in most industries, is not a reliable indicator of value in health care because of flawed reimbursement and lack of competition based on actual results.)

Instead of value, health care stakeholders have myriad, often conflicting goals, including access to services, profitability, high quality, cost containment, safety, convenience, and patient satisfaction. Quality, a crucial concept for health care improvement, is used in so many ways as to have lost its meaning and usefulness. The Institute of Medicine's own definition of goals for the health care delivery system includes no less than six disparate elements: safety, effectiveness, patient centeredness, timeliness, efficiency, and equity.[2] Lack of clarity on goals has led to divergent approaches, gaming of the system, and slow progress in performance improvement.

The failures to adopt value as the central goal in health care and to measure value are arguably the most serious failures of the medical community. This has hobbled innovation, led to slow diffusion of innovation, allowed pseudo-innovation with no meaningful value benefits, resulted in ill-advised cost containment, and encouraged micromanagement of physician practices, which imposes significant costs of its own. Failure to measure value is one of the principal reasons why reform in health care has been so difficult as compared with other fields.

In this article, I define value in health care, delineate its components and show how value relates to other goals. How value should be measured is described as well as the limitations of current practice. Today, value tends to be defined by what can be easily measured in our current misaligned structure, rather than what actually matters for patients. The paper concludes with some of the implications of value principles for reimbursement.

**Defining Value**

Value is neither an abstract ideal nor a code word for cost reduction, but value should define the framework for performance improvement in health care. Rigorous, disciplined measurement and improvement of value is the best way to drive system progress. Yet value in health care remains largely misunderstood.

In any field, value should be defined around the *customer*, not the supplier. In health care, value is defined as patient health outcomes achieved relative to the costs of care. It is value for the *patient* that is the central goal, not value for other actors per se. In a well-functioning health care system, the creation of value for patients will determine rewards for all system actors.

Value is measured by outputs, not inputs. Hence value in health care depends on the actual patient health *outcomes*, not the volume of services delivered. More care is not always better care, and shifting focus from volume to value is a central challenge.[3,4] Nor is value measured by the process of care utilized; process measurement and improvements are important tactics but no substitutes for measuring outcomes and costs.

Value is based on the results achieved relative to the inputs (or cost) required, and as such it encompasses efficiency. Setting the goal as cost containment, rather than value improvement, has been devastating to health care reform efforts. Cost reduction, without regard to the outcomes achieved, is dangerous and self-defeating, leading to false "savings" and potentially limiting effective care. A focus on value, not just costs, avoids the fallacy of limiting treatments that are discretionary or expensive but truly effective.

Outcomes, the numerator of the value equation, refer to the actual results of care in terms of patient health. For any medical condition (or patient population, in the case of primary care), there is no single outcome that captures the results of care. Rather, for each medical condition there is a set of multidimensional outcomes that jointly constitute patient benefit, including survival, functional status, sustainability of recovery, and others.[5] Patients' circumstances and preferences will affect the importance of these outcomes to some degree. A fuller discussion of outcome measurement is contained in a companion paper.[5]

The full set of outcomes, adjusted for individual patient circumstances, constitutes the quality of care for a patient. As I will discuss, the word "quality" has other meanings in health care, which has contributed to the slow progress on value measurement and improvement.

Cost, the denominator of the value equation, refers to the *total costs* involved in the full cycle of care for the patient's medical condition (or for his or her primary and preventive care), not just the costs involved in any one intervention or care episode. Costs should reflect the full array of resources involved in caring for the patient's condition, including inpatient, outpatient, and rehabilitative care, along with all associated drugs, devices, services, and ancillary equipment. Value is increased by

reducing the total costs involved in care, not necessarily minimizing the cost of individual services. To reduce cost, the best approach is often to spend more on some high-value services, frequently including preventive or other earlier-stage care, in order to reduce the cumulative cost of care over the full care cycle. In contrast, shifting costs from one type of service or provider to another, or to the payer, does not add value and in fact may undermine it by reducing the effectiveness of care or increasing administrative expenses. Such misunderstandings about costs and flawed approaches to cost reduction are endemic in health care delivery in the United States and elsewhere.

Outcomes and costs should be measured *separately*. Some measurement systems, such as the ECHO (Economic, Clinical, and Humanistic Outcomes) framework, include economic factors as a category of outcome.[6,7] However, treating cost as an outcome will only obscure value by confusing the process of care with the results of care, as I will discuss further.

Changes in either the numerator or denominator of the value equation can drive value improvement. Value increases when better outcomes are achieved at comparable (or lower) cost, or when equivalent outcomes are achieved at lower cost. Yet outcomes and costs are not independent. Outcome improvement is often a powerful lever for reducing costs; for example, early detection of disease can permit the use of less complex care, less invasive treatment, more timely care processes, care leading to faster recovery and fewer complications, or better management of disease resulting in less need for subsequent care. (Not all outcome improvement automatically lowers cost. For example, prevention and screening that is inefficient or directed at overly broad patient populations can be value-destructive.)[8] Holding all system participants accountable for value, not just outcomes, harnesses the power of quality in cost reduction.

Better quality lowers cost in many fields, hence the phrase "quality is free," but the power of quality (outcome) improvement to drive down costs is greater in health care than in any other field I have encountered. Yet providers still react with skepticism to the notion that quality lowers costs, often because of a focus on the individual interventions under their direct control rather than the overall care cycle of the patient.

How does value relate to other expressed goals in health care? Many of the other common goals noted earlier are incorporated into the value equation. Value brings together quality and cost, both defined around the patient. Quality is properly understood as patient outcomes. Safety, or the avoidance of errors, is one type of outcome in the overall set of outcomes for any medical condition. Evidence-based medicine can contribute to good outcomes but is not an outcome itself. Patient satisfaction with the process of care or the service experience can be a contributor to outcomes but is also not a true outcome.

Access to care is a basic requirement of any health care system, but access per se does not constitute value. Access to ineffective, inadequate, or inefficient care is surely not the goal. Value is the goal, and improving value is essential to making access affordable.

Equity in care across individuals is another desirable goal, but equity is most appropriately assessed by comparing health outcomes, not just comparing access to care. We believe that the best way, and perhaps the only way, to improve the equity of care is to measure value, make value transparent, and reward value improvement. In this way, the value delivered for every patient counts, including those who are now poorly served.

**The Unit of Value Measurement**

The proper unit for measuring value should encompass all services or activities that jointly determine success in meeting a set of patient needs. Health care delivery involves numerous organizational units, ranging from hospitals, to departments and divisions, to physicians' practices, to units providing single services. However, none of these traditional units reflects the boundaries within which value is truly created. A central tenet of organizational theory is that service should be organized around customer needs, not around individual steps.

In health care, needs for specialty care are determined by the patient's medical condition. A medical condition is an interrelated set of patient medical circumstances — such as breast cancer, diabetes, inflammatory bowel disease, asthma, or congestive heart failure — that is best addressed in an integrated way. The definition of a medical condition includes the most common co-occurrences or associated conditions. Care for the medical condition of diabetes, for example, must integrate not only the activities directly related to diabetes, but also such conditions as vascular disease, retinal disease, renal disease, and hypertension, among others. Value (both outcomes and cost) should be measured for all this care, rather than for a single specialist or intervention.[1]

For primary and preventive care, value should be measured for defined patient groups with similar needs. (Such a patient population is primary care's analogue to the medical condition in specialty care.) Patient populations requiring different bundles of primary and preventive care services might include, for example, healthy children, healthy adults, patients with a single chronic disease, frail elderly people, and patients with multiple chronic conditions. Each patient group has unique needs and requires inherently different primary care services which are best delivered by different teams, and potentially in different settings and facilities. One of the major problems in primary care has been the attempt to meet disparate customer needs with a common practice structure, which makes it difficult, if not impossible, to achieve the highest value for every patient.

Care for a medical condition (or a patient population) usually involves multiple specialties and numerous interventions. Value for the patient is created not by any one intervention or specialty, but by the combined efforts of all of them. (The specialties involved in care for a medical condition may vary among patient populations. Hence, different institutions with differing patient populations may define the scope of medical conditions somewhat differently.) Accountability for value should be shared among the providers (clinicians, practices, departments, and institutions) involved. Thus, rather than "focused factories" concentrating on narrow sets of interventions, we need integrated practice units accountable for the total care for a medical condition and its complications.

In care for a medical condition, then, value for the patient is created by providers' combined efforts over the full cycle of care — not at any one point in time or in a short episode of care. Patient outcomes will depend on a sequence of interventions often involving different sites and types of care — outpatient care, inpatient care, office visits, tests, rehabilitation, counseling, medications, procedures, and so on. The benefits of any one intervention for ultimate outcomes will depend on the effectiveness of other interventions throughout the care cycle. The relevant cost of care for determining value is the cost of the full set of interventions taken together.

Because care activities are interdependent, value for patients is often revealed only over time and manifested in longer-term outcomes such as sustainable recovery, need for ongoing interventions, or occurrences of treatment-induced illnesses.[9] The only way to accurately measure value, then, is to track individual patient outcomes and costs longitudinally over the full care cycle.

Since most provider units participate in the care for multiple medical conditions, this means that value must be measured for each one. For patients with multiple medical conditions, such as an older patient with congestive heart failure, diabetes, and breast cancer, value should be measured for each condition, with the presence of other medical conditions used for risk adjustment (see below). This approach allows for relevant comparisons of each patient's results, including comparisons of providers' ability to care for patients with complex conditions.

Although outcomes and costs should be measured for the care of each medical condition or primary care patient population, current organizational structure and information systems make it challenging to measure (and deliver) value. Thus, most providers fail to do so. Providers tend to measure only the portion of an intervention or care cycle that they directly control or what is easily measured, rather than what matters for outcomes. For example, current measures often cover a single department (too narrow to be relevant to patients) or outcomes for a hospital as a whole, such as infection rates (too broad to be relevant to patients). Or providers measure what is billed, even though current reimbursement is for individual services or short episodes. (For these reasons, the use of claims data in outcome measurement can be misleading unless it aggregates claims at the medical condition level.) Similarly, costs are measured for departments or billing units, rather than for the full care cycle (see below). Faulty organizational structure also helps to explain why physicians fail to accept joint responsibility for outcomes, blaming lack of control over "outside" actors involved in care (even those in the same hospital) and lack of control over patients' compliance.

If practice structures were realigned around medical conditions and covered the full care cycle, joint responsibility for outcomes would become the rule, and measurement at the medical condition level would become far easier. Organizations covering the full care cycle would also have the resources and patient access needed to take responsibility for patients' compliance. The cost of measuring long-term outcomes would also fall dramatically due to sustained contact with the patient.

**Measuring Value**

Measuring the value of care delivery for a medical condition or patient population starts with health outcomes. (I use examples largely from specialty care for diseases, but the same principles also apply to measuring value in providing primary and preventive care for a distinct patient group.) Outcomes are then compared with the total costs of achieving them over the full cycle of care.

The chain of causality leading to outcomes is illustrated in the figure. Patients present for care with some *initial* or *pre-existing conditions*. Initial conditions can affect both the treatment plan chosen and the likelihood or degree of success. Outcomes need to be adjusted for initial conditions to allow fair comparisons across patient populations and across time.

The next step in the causality chain is *processes* of care, or the services or interventions delivered. Processes, as Donabedian noted, are different from outcomes.[10] Processes should reflect medical knowledge and the patient's initial conditions. They may be correlated with outcomes but are one step removed from outcomes. Outcomes are the actual health *results* achieved.

*Structure*, a concept introduced by Donabedian, involves factors that can influence or enable processes, such as facilities, staff, and equipment. Structure is defined by the U.S. Agency for Healthcare Research and Quality (AHRQ) as features of organizations or clinicians that are relevant to their capacity to provide health care.[11] Structure is one step removed from processes and two or more steps removed from outcomes.

Traditional structure measures have consisted largely of relatively discrete factors, such as certification of staff and the availability of particular equipment or facilities. Recently, new ways of understanding structure have been introduced that focus more on organizational units, multidisciplinary teams, and care-integration mechanisms. These concepts suggest new measures of structure, such as the presence of true multidisciplinary teams, co-location of team members, and others.[1,12]

In between processes and outcomes are *health indicators.* Indicators are biologic measures in patients that are predictors of outcomes, such as glycated hemoglobin levels measuring blood-sugar control in patients with diabetes. Indicators can be highly correlated with actual outcomes over time, such as the incidence of acute episodes and complications.[13] Indicators also have the advantage of being measurable earlier and potentially more easily than actual outcomes, which may be revealed only over time.

An additional component of the chain of causality determining outcomes, which is all but unmeasured today, is *patient compliance*. Health outcomes are inevitably co-produced by the patient and the care team. There is compelling evidence that patients' compliance with treatments (e.g., adherence to medication), preparations for treatment (e.g., weight control, muscle strengthening), rehabilitation, and recommended disease-prevention measures have a major influence on outcomes. Yet there is a glaring absence of systematic measurement of patients' compliance in virtually every health care system.

The final step in the chain of causality is *outcomes* themselves, which are the actual results of care. As noted earlier, there is not just one outcome but a set of outcomes for any medical condition (or patient group receiving primary and preventive care services). Defining the set of outcomes, and the appropriate measures of each one, is the subject of a companion article.[5]

Where does patient satisfaction fit into the structure shown in the figure? There has been growing attention to patient satisfaction in health care, with patient surveys becoming the rule in most organizations. This is certainly a step in the right direction for value measurement.

However, patient satisfaction has multiple meanings in value measurement, with greatly different significance for value. It can refer to satisfaction with care processes. This is the focus of most patient surveys, which cover hospitality, amenities, friendliness, and other aspects of the service experience. Though the service experience can be important to good outcomes, it is not itself a health outcome. The risk of such an approach is that focusing measurement solely on friendliness, convenience, and

amenities, rather than outcomes, can distract providers and patients from value improvement.

However, patient-satisfaction measurement can also be a vehicle for measuring both patient compliance and, most important, health outcomes as perceived by the patient. Surveying patients on outcomes is often essential to understanding functional status, pain, anxiety, and other factors that the patient is best equipped to judge and for which biologic or other markers may be unavailable.

There is an encouraging trend toward incorporating regular patient-outcome surveys into measurement systems. Many leading providers are now integrating such surveys directly into the care process — a crucial step not only in improving measurement but in using measurement to drive continuous improvement.

What Is Quality?

Quality in health care should refer to patient outcomes, as I have noted. Quality relative to cost then determines value. However, the word quality has assumed various meanings and is widely misused, even abused.[14]

Today, quality most often means adherence to evidence-based guidelines. Of the comprehensive collection of "quality" measures found in the National Quality Measures Clearinghouse, for example, the overwhelming majority are process measures.[15] (Even the National Quality Forum, a federally designated organization for identifying and endorsing quality measures, reviews process measures not on the basis of merit but according to the procedural approach with which they were created.) Many third-party vendors have grown up to support "quality" measurement in health care, but the vast majority of them are focused not on outcomes or even patient compliance, but on basic process measures and patient-satisfaction surveys covering the service experience.

There has also been a tendency to equate quality with safety. Safety performance is an outcome, and the spread of safety initiatives is laudable and has produced genuine improvements for patients. However, safety is just one aspect of quality and one type of outcome. Focusing on safety, rather than on overall outcomes, can lead to incremental process improvements affecting safety, rather than restructuring of the overall delivery of care.

The quality movement in health care is welcomed and overdue. But today's confusion over quality is deterring more fundamental outcome measurement.

**Value Measurement in Practice**

Value measurement in health care today is limited and highly imperfect. There is limited or nonexistent outcome measurement in the United States and other countries, with a few notable exceptions. Most physicians lack critical information such as their own rates of hospital readmissions, or data on when their patients returned to work. Not only is outcome data lacking, but understanding of the true costs of care is virtually absent. Most physicians do not know the full costs of caring for their patients — the information needed for real efficiency improvement.

Today, measurement focuses overwhelmingly on care processes. For example, in 2010, of the 78 Healthcare Effectiveness Data and Information Set (HEDIS) measures, the most widely used quality-measurement system, all but 5 are clearly process measures. Of these five, one is a health indicator and three are patient surveys of the care

experience. Only one could be described as an outcome measure: specifically, the count of potentially harmful drug–disease interactions in elderly patients. Even this is not a true outcome, which would be actual harmful interactions, but a proxy. Compliance with evidence-based guidelines is often seen as an end in itself, without the need to measure outcomes. (For example, compliance with guidelines is sometimes used as the basis for pay-for-performance systems, rather than actual patient health results.) Processes are sometimes confused or confounded not only with outcomes, but with structural measures as well.

The focus on processes is perhaps not surprising. Tracking process compliance is a tempting shortcut, because processes are often less controversial and much easier to measure than outcomes.[16] They can be measured in the short term, in contrast to outcomes which are often only revealed over time. And achieving a high score on process measurement is far easier than actually improving outcomes themselves.

Also, process accountability is attractive to providers because processes are relatively easy to control internally, without the need for coordination or integration with other departments or provider entities. Existing organizational units in health care delivery, which are overwhelmingly departmental or intervention-based, can readily measure their processes. Outcomes, in contrast, are affected by multiple units, with attribution often difficult in the current siloed delivery structure. What is measured today, then, reflects current organizational structure and billing practices.

Why is process measurement alone inadequate, and sometimes even counterproductive? Protocols, guidelines, and practice standards are only partial predictors of outcomes. They are invariably incomplete and omit important influences on the outcome and efficiency of care.[17] Guidelines also fail to cover the full cycle of care and are not fully tailored to individual patient circumstances. Standardized processes do not guarantee standardized outcomes, since providers following identical guidelines achieve different results.

Basing measurement solely on adherence to guidelines also runs the risk of slowing innovation and fostering only incremental improvements. Agreeing on guidelines is inevitably slow and political. Medicine is constantly being refined, and guidelines can lag best practice or, conversely, place undue attention on processes that have yet to be validated with a sufficient body of evidence. For example, the best practice treatment of postmenopausal women with estrogen has changed several times in the past decade alone, as new evidence has become available about the risks and benefits of the treatment for particular patient subpopulations.

Focusing on adherence to guidelines without also measuring patient compliance can further obscure the link between processes and outcomes. Lack of patient-compliance measurement has also tended to absolve providers (and health plans) from taking responsibility for compliance as an integral part of care delivery and has led to value-destructive practices such as high copayments for essential drugs.

Measures of structure are even farther removed than process measures from true outcomes. Structure affects processes and outcomes, but indirectly. The correlation between traditional structure measures and outcomes is limited at best.

Health indicators are useful measures of interim progress, and the search for reliable indicators should continue. Although indicators may be correlated with outcomes, they are not a substitute for measuring actual outcomes. Glycated hemoglobin

is a particularly good indicator, but other common indicators, such as cholesterol levels, are less reliable. Also, there are rarely available indicators of all relevant outcomes for a given medical condition. Measuring value, then, requires measuring actual outcomes over time.

Process measurement is useful and should continue. Every provider should aim to adhere to evidence-based guidelines as appropriate and should track the best available health indicators. Codifying processes and tracking adherence can also foster the teamwork and integration needed to truly improve outcomes. Existing process-measurement efforts need to be supplemented with systemic measurement of patients' compliance with care, to fully understand the link between processes and outcomes.

However, process measurement should largely be an internal effort. All good organizations should track their processes and work in order to improve them. However, adherence to guidelines is too low a standard for health care providers and should not be the primary means of external measurement and reporting of quality and value. Process measurement, though a natural step in the progression of measurement, should not become a sticking point or even a justification for not moving to outcome measurement.

The State of Outcome Measurement

In any complex system, attempting to control behavior without measuring results will tend to limit progress to incremental improvement. There is no substitute for measuring actual outcomes. Without a feedback loop involving the outcomes achieved, providers are denied the information they need to learn and to improve.

Outcome measurement at the medical condition level, then, is indispensable to driving rapid improvements in health care value. Efforts at outcome measurement are improving,[5,18] but most current efforts manifest several common problems. They are either too narrow or too broad. Measurement focuses on individual providers, specialists, or interventions and covers short episodes (too narrow), telling an incomplete story about overall outcomes. Or measurement focuses on partial outcomes tied to a few discrete interventions instead of overall outcomes.

An equally serious problem, as noted above, is the measurement of department- or hospital-wide outcomes, such as overall infection rates or drug-dispensing errors, even though such outcomes vary substantially by medical condition. Finally, some efforts utilize a few outcome dimensions for a few isolated medical conditions as proxies for overall provider performance in treating all medical conditions. This practice is misleading and even irresponsible.

Practitioners in many medical specialties bemoan the difficulty of identifying outcome measures, but that is often because they are looking too narrowly within the care cycle or are limited by convention. Radiologists focus on the accuracy of reading a scan, for example, rather than whether the scan contributed to better outcomes or efficiency in subsequent care. Cancer specialists are trained to focus solely on survival rates, overlooking crucial functional measures in which major improvements vital to the patient are possible.

Finally, outcome measurement has been limited because the cost of gathering longitudinal patient results is unnecessarily high due to current fragmented organizational structures and practice patterns. This problem is made worse by the lack of EMR systems that facilitate the capture of outcome measures and their compilation.

**Cost Measurement in Health Care**

Cost is among the most pressing issues in health care, and serious efforts to control costs have been under way for decades. At one level, there are endless cost data at all levels of the system. However, as an ongoing project with Robert Kaplan makes clear, we actually know very little about cost from the perspective of examining the value delivered for patients. Different actors mean different things by the word cost. Costs are routinely confused with charges, or what is billed. And most important, current cost-measurement approaches have not only obscured the understanding of cost but also led to cost-containment efforts that are incremental, ineffective, and sometimes counterproductive.

Understanding of cost in health care delivery suffers from two major problems. The first is a cost-aggregation problem. Today, health care organizations measure and accumulate costs for departments, physician specialties, discrete service areas, and line items (e.g. supplies or drugs). As with outcome measurement, this practice reflects the way that care delivery is currently organized and billed for. Today each unit or department is typically seen as a separate revenue or cost center. Proper cost measurement is challenging because of the fragmentation of entities involved in care. Entities such as rehabilitation units and counseling units are all but ignored in cost analyses. Costs borne in outpatient settings, particularly within primary care practices are often not counted.

Past efforts at cost reduction reflect the way costs are accumulated. The focus has been on incremental steps and quick fixes. Payers have haggled over reimbursement rates, which are not the true underlying costs. There are efforts to raise the efficiency of individual interventions rather than examine whether there is the right group of interventions. Considering drugs as a separate cost, for example, only obscures the overall value of care and can lead to misplaced efforts to reduce pharmaceutical spending, rather than more holistic approaches to improving efficiency over the full cycle of care. The net result has been marginal savings at best, and sometimes even higher costs.

To truly understand costs, they must be aggregated around the patient rather than for discrete services, just as is the case with outcomes. It is the total costs of providing care for the patient's medical condition (or bundle of primary and preventive care services), not the cost of any individual service or intervention, that matters for value. If all the costs involved in a patient's care for a medical condition — inpatient, outpatient, rehabilitation, drugs, physician services, equipment, facilities — are brought together, it is then possible to compare the costs with the outcomes achieved. Proper cost aggregation around the patient will allow us to distinguish charges and costs, understand the components of cost, and reveal the sources of cost differences. Armed with this information, providers are in a position to pursue structural cost reduction through such steps as reallocating spending across types of services, eliminating non-value-added services, speeding up cycle time, better utilizing capacity, performing services at a more cost effective location, attracting patients whom the institution has a comparative advantage in treating efficiently, and so on.

Today, most physicians and provider organizations do not even know the total cost of caring for a particular patient or group of patients over the full cycle of care.

There has been no reason to know. Yet when teams have understood these costs, my experience has been that major opportunities for cost reduction are often readily apparent. Aggregating the total cost of care for a given medical condition (or a patient group receiving primary and preventive care) also reveals cost variations across patients, individual providers, sites, and organizations in addressing the same problem.[19] Examination of such variations yields powerful insights that may point the way toward cost reduction. For example, the full reimbursement for a total joint replacement in Germany or Sweden is approximately $8,500, including all physicians' and technical fees and excluding only outpatient rehabilitation. The comparable figure for the United States is on the order of $30,000 or more.

In aggregating costs around patients and medical conditions, however, we confront the second problem in current cost measurement, which is a cost-allocation problem. Many, even most, of the costs of health care delivery are shared costs, involving shared resources such as physicians, staff, facilities, equipment, and overhead functions involved in care for multiple patients. Even costs that are directly attributable to a patient, such as drugs or supplies, often involve shared resources, such as units involved in inventory management, handling, and setup (e.g., the pharmacy). Today, these costs are normally calculated as the average cost over all patients for an intervention or department, such as an hourly charge for the operating room. However, individual patients with different conditions and circumstances can utilize the capacity of such shared resources quite differently.

The cost accounting challenge is to allocate the shared costs to individual patients on the basis of each patient's actual use of the resources involved, not the average use. This is a challenge tailor-made for activity-based costing methods that are well established in other industries but have rarely been applied in health care delivery.[20,21] Their application here will reveal major insights into the true capacity costs of physicians, staff, and facilities and the size of variations across patients and medical conditions. Properly allocated costs will also make the understanding of total patient cost discussed earlier far more accurate and revealing.

Although work on applying new cost accounting methods to health care is just beginning, some important findings are already apparent. Much health care is delivered in over-resourced facilities. Routine care, for example, is delivered in expensive hospital settings. Expensive space and equipment is underutilized, because facilities are often idle and much equipment is present but rarely used. Skilled physicians and staff spend much of their time on activities that do not make good use of their expertise and training. The current organization around specialties and services leads to redundant administrative costs, unnecessary and expensive delays in diagnosis and treatment, and more unproductive time for physicians. There is excess inventory of many supplies, medical devices, and other items and weak inventory management. And most physicians and administrators are simply unaware of the costs of caring for patients, much less the total cost of care for particular medical conditions.

There are considerable grounds for optimism that costs in health care can be substantially reduced without sacrificing positive patient outcomes. In fact, cost reduction will often be associated with better outcomes. The introduction of modern cost accounting in health care may prove to be the same type of breakthrough that it was in other industries decades ago.

Finally, a longer term opportunity arises from the fact that value ultimately depends not just on costs borne inside the health care system but also on costs of poor health borne by others, including patients. Costs borne by patients and their families in supplementing their care should be part of the overall value equation. Costs currently borne by patients' employers, such as lost work time and sick days, should also be captured in assessing the value of care.

**Value and Reimbursement**

The value-based health care principles discussed here have major implications for reimbursement. The unit of reimbursement should be aligned with the unit of value. Hence, reimbursement must shift from fees for individual services or capitation for any service needed to bundled reimbursement for the care of medical conditions, including all physician fees, services, facilities, and drugs required over the care cycle. Reimbursement should cover a period that matches the care cycle. For chronic conditions, bundled payments should cover total care for extended periods of a year or more. Aligning reimbursement with value in this way rewards providers for efficiency in achieving good outcomes while creating accountability for substandard care.

Reimbursement should vary with patients' initial conditions. In today's system, prices for care of patients with complex conditions often do not adequately compensate providers. (Such underpayment also appears to be a problem in several other national systems, such as Britain's.) This inadequate reimbursement biases providers toward excluding or dumping such patients and can lead to overly broad service lines as providers seek to offer services in every medical area targeting more "profitable" patients, rather than focusing on areas of excellence.

Bundled reimbursement is beginning to spread, a welcome development.[1] However, bundled reimbursement requires every actor in the system to understand its role in achieving outcomes and to measure all the costs involved in delivering those outcomes. Improvements in outcomes and cost measurement will greatly ease the shift to bundled reimbursement and produce a major benefit in terms of value improvement.

**Summary**

In this article, I have defined value in health care delivery, its components, and how it should be measured. Value must become the overarching goal of any health care system. Measuring value and improving value must become the driving force for every system participant.

Today, in the United States and in health care systems around the world, value is measured incompletely, if at all. The absence of comprehensive and rigorous outcome and cost measurement is arguably the biggest weakness standing in the way of health care improvement. The fact that value is not measured means that the most powerful tool for care improvement is lacking. The fact that health care delivery is not organized around value works against excellent care and drives up cost. The fact that reimbursement is not aligned with value cripples the process of innovation while rendering the profit motive a destructive force rather than a value driver.

Proper measurement of outcomes and cost is the single most powerful lever for improving health care delivery. Although current measurement efforts are highly imperfect, at least the process of measurement has begun. Current organizational

structures, practice standards, and reimbursement create obstacles to value measurement, but there are promising efforts under way to overcome them. Health plans, providers, employers, and government policy can all contribute to making the measurement of value in health care a reality. If all actors in health care were to embrace value as the central goal and measure value universally, the resulting improvements in health care delivery would be enormous.

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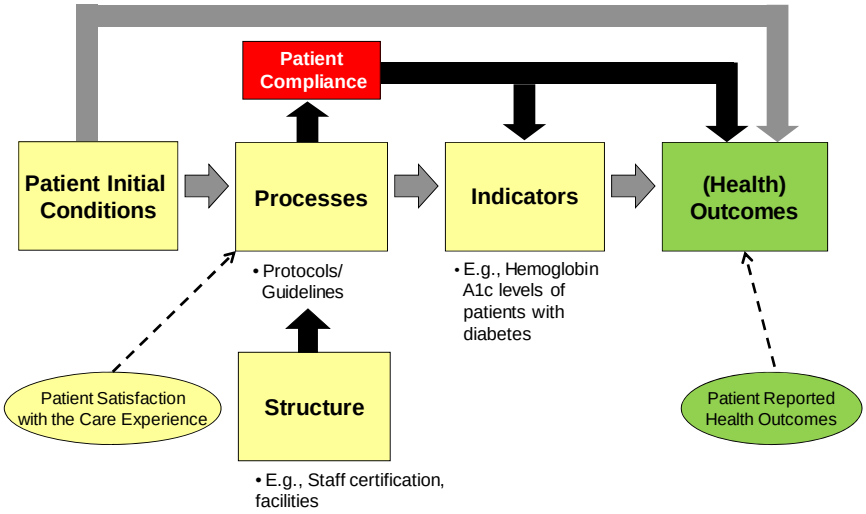
## Measuring Value in Health Care



# Supplementary Appendix 2

This appendix has been provided by the author to give readers additional information about his work.

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## MEASURING HEALTH OUTCOMES: THE OUTCOME HIERARCHY

Michael E. Porter, Ph.D.

Achieving good patient health outcomes is the fundamental purpose of health care. Measuring, reporting, and comparing outcomes is perhaps the most important step toward unlocking rapid outcome improvement and making good choices about reducing costs. Outcomes are the true measures of quality in health care. Understanding the outcomes achieved is also critical to ensuring that cost reduction is value enhancing.[1-3] Thus, outcome measurement is perhaps the single most powerful tool in revamping the health care system. Yet systematic and rigorous outcome measurement remains rare or nonexistent in most settings.

There are a growing number of examples of comprehensive outcome measurement that provide evidence of its feasibility and impact. At the national level, Sweden and Denmark are the clear leaders in establishing national quality registries covering many conditions.[4] In the United States, federal legislation has mandated universal outcome measurement and reporting by all providers in organ transplantation,[5] in vitro fertilization,[6] and dialysis care. At the provider level, the most advanced large-scale efforts are occurring in two German hospital groups and at some U.S. providers.[4] Examination of these efforts leads to some clear conclusions. First, in each case, outcome measurement has proven to be practical and economically feasible. Second, accepted risk adjustment has been developed and implemented. Finally, measurement initially revealed major variation in outcomes in each case, but led to striking outcome improvement and narrowing of variation across providers over time.

The feasibility and impact of comprehensive outcome measurement is no longer in doubt. However, the current state of outcome measurement leaves much to be desired. There is no consensus on what constitutes an outcome, and the distinctions among care processes, biologic indicators, and outcomes remain unclear in practice. Outcome measurement tends to focus on the immediate results of particular procedures or interventions, rather than the overall success of the full care cycle for medical conditions or primary and preventive care. Even the best efforts are often limited to one or a small number of outcomes, frequently those that are most easily tracked. Measured outcomes often fail to capture dimensions that are highly important to patients. Finally, many outcome measurement efforts are ad hoc and not comparable across providers.

This article offers an overall framework for outcome measurement to guide the development of the full set of outcomes for any medical condition. It introduces the outcome measures hierarchy as a tool for identifying the appropriate set of outcome dimensions, specific metrics, and associated risk factors. It explores the relationships among different outcome dimensions, their weighting by patients, and the relationship of outcomes to the cost of care. I examine the process by which outcomes improve over

time as well as the evolution of risk factors. Finally, the article examines the benefits and costs of standardized or monetized outcomes across medical conditions. The detailed steps involved in creating and implementing an outcome measurement system are developed further in another article.

**The Unit of Outcome Measurement**

Outcomes are the results of care in terms of patients' health over time. They are distinct from care processes or interventions designed to achieve the results, and from biologic indicators that are predictors of results. However, discomfort, timelines, and complications of care are outcomes, not process measures, because they relate directly to the health status of the patient.[1] Patient satisfaction with care is a process measure, not an outcome. Patient satisfaction with health is an outcome measure.

In any field, quality should be measured from the customer's perspective, not the supplier's. In health care, outcomes should be centered on the patient, not the individual units or specialties involved in care. For specialty care, outcomes should be measured for each medical condition or set of interrelated patient medical circumstances, such as asthma, diabetes, congestive heart failure, or breast cancer. A medical condition includes common complications, coexisting conditions, or co-occurring conditions. Each medical condition will have a different set of outcomes. For primary and preventive care, outcomes should be measured for defined patient populations with similar health circumstances, such as healthy adults, disabled elderly people, or adults with defined sets of chronic conditions.

Outcomes should be measured for each medical condition covering the full cycle of care, including acute care, related complications, rehabilitation, and reoccurrences. It is the overall results that matter, not the outcome of an individual intervention or specialty (too narrow), or a single visit or care episode (too short). If a surgical procedure is performed perfectly but a patient's subsequent rehabilitation fails, for example, the outcome is poor. For chronic conditions and primary and preventive care, outcomes should be measured for periods long enough to reveal the sustainability of health and the incidence of complications and need for additional care.

Generalized outcomes, such as overall hospital or departmental infection rates, mortality rates, medication errors, or surgical complications, are too broad to permit proper evaluation of a provider's care in a way that is relevant to patients. Such generalized outcomes also obscure the causal connections between specific care processes and outcomes, since results are heavily influenced by many different actors and the specific mix of medical conditions for which care is provided.

Health care's current organizational structure and information systems make it challenging to properly measure outcomes. Thus, most providers fail to do so. Providers tend to measure only what they directly control in a particular intervention and what is easily measured, rather than what matters for outcomes. Providers also measure outcomes for the interventions and treatment they bill for, rather than outcomes relevant for the patient. Outcomes are measured for departments or billing units, rather than for the full care cycle over which value is determined. Much outcome work is currently driven by medical specialty expert or consensus panels, not by multidisciplinary groups for medical conditions. Faulty organizational structure also helps explain why physicians fail to accept joint responsibility for outcomes, defending this by their lack of control

over "outside" actors involved in care (even those in the same hospital) as well as over patient compliance.

The first step in outcome measurement is to define and delineate the set of medical conditions to be examined (or the patient populations in primary care settings). Setting medical condition boundaries requires specifying the range of related diseases, coexisting conditions, and associated complications included, as well as the beginning and end of the care cycle.

For any medical condition (or patient population in primary care), defining the relevant outcomes to measure should follow several principles. First, outcomes should involve the health circumstances most relevant to patients. Second, the set of outcomes should cover both near-term and longer-term patient health, addressing a period long enough to encompass the ultimate results of care. For chronic conditions, ongoing and sustained measurement is necessary. Third, outcomes should cover the full range of services (and providers) that jointly determine the patient's results. Finally, outcome measurement should include sufficient measurement of risk factors or initial conditions to allow risk adjustment (see below).

**The Outcome Measures Hierarchy**

There are always multiple dimensions of quality for any product or service, and health care is no exception. For any medical condition or patient population, multiple outcomes collectively define success. The set of outcomes is invariably broad, ranging from immediate procedural outcomes, to longer-term functional status, to recovery time, to complications and recurrences. Survival is just one outcome, albeit an important one, as is the incidence of particular complications or medical errors. Medicine's complexity means that competing outcomes (e.g., near-term safety and long-term functionality) must often be weighed against each other.

The full set of outcomes for any medical condition can be arrayed in a three-tiered hierarchy (see Figure 1). The top tier of outcomes is generally the most important, with lower-tier outcomes reflecting a progression of results contingent on success at higher tiers.

Each tier of the hierarchy contains two broad levels, each of which involves one or more distinct outcome *dimensions*. Outcome dimensions capture specific aspects of patient health. These outcome dimensions are the critical dimensions of quality in health care. For each dimension, success is measured with one or more specific *measures* or *metrics*. Finally, for each measure there are often several choices in terms of the *timing* and *frequency* of when to measure it.

Tier 1 of the hierarchy is *patient health status achieved*, or for patients with some degenerative conditions, health status retained. The first level, survival, is of overriding importance to most patients. Survival (or mortality) can be measured over a range of periods appropriate to the medical condition. For cancer, 1-year and 5-year survival are common metrics. Maximizing the duration of survival may not always be the most important outcome, however, especially for older patients who may weight other outcomes more heavily. I discuss the weighting of outcomes below.

Effective outcome-measurement systems must move well beyond survival, because survival alone omits many factors of great significance to patients. (Note that survival is sometimes used as a proxy for the broader effectiveness of care.) Measuring

the full set of outcomes is also essential in order to reveal the connections between care processes or pathways and patient results.

The second level in Tier 1 is the *degree of health or recovery* achieved or retained. Regaining or preserving health is the ultimate purpose of most health care, with the exception of end-of-life or palliative services. Level two should capture the *peak* or *best steady-state* level of health achieved, defined according to the condition. Degree of health or recovery normally includes multiple dimensions such as freedom from disease and relevant aspects of functional status. For head and neck cancer, for example, level two outcomes include not only whether remission is achieved, but functional outcomes such as the ability to eat and speak normally, maintain appearance, and avoid depression.[7]

Tier 2 of the outcomes hierarchy is the *process of recovery*. Recovery, or the process of achieving the best steady-state level of health attainable, can be protracted and arduous. Reducing the duration, complexity, and discomfort of recovery, in a manner consistent with achieving good Tier 1 outcomes, constitutes another group of important patient results.

The first level in Tier 2 is the *time* required to achieve recovery and return to normal or best attainable function. This can be divided into the time needed to complete various phases of care, such as time to diagnosis, time to treatment plan, time to care initiation, and duration of treatment. Cycle time is an outcome with major importance to patients, not a secondary process measure. Reducing cycle time yields direct benefits to the patient in terms of reducing the burden of recovery and can also affect health status achieved and its sustainability. For example, rapid initiation of therapy and avoidance of interruptions in therapy are often major influencers of prognosis in patients with cancer; after a myocardial infarction, faster time to reperfusion can improve function and reduce complications. The relationship between cycle time and health status achieved is just one of many instances in which outcomes at one level in the hierarchy can affect outcomes at other levels (see below).

The second level in Tier 2 is the *disutility of the care process* in terms of missed diagnosis, failed treatment, anxiety, discomfort, ability to work or function normally while undergoing treatment, short-term complications, retreatment, and errors, together with their consequences. This level can cover a wide range of dimensions depending on the condition. Ineffective or inappropriate treatments that fail to improve health will show up here, as will medical errors and treatment complications that lead to interruptions in care. Disutility of care will frequently affect the timeline of care.

Tier 3 is the *sustainability of health.* Sustainability measures the degree of health maintained as well as the extent and timing of related recurrences and consequences. The first level in Tier 3 is recurrences of the original disease or associated longer-term complications. Measures of time to recurrence and the seriousness of recurrence would fall here. The second level in Tier 3 captures *new* health problems created as a *consequence of the treatment itself*, or care-induced illnesses. When recurrences or new illnesses occur, some higher-tier outcome dimensions such as survival, degree of recovery from the recurrence, and so on, will also apply to measuring the outcome of these recurrences or illnesses (see the dotted lines in Figure 1).

With some conditions, such as metastatic cancers, providers may have limited impact on survival or other Tier 1 outcomes, or survival rates may be uniformly high. In

these cases, providers can differentiate themselves on Tiers 2 and 3 by making care more timely, reducing discomfort, or limiting recurrences.

**Defining Specific Outcome Dimensions and Measures**

Each medical condition (or population of primary care patients) will have its own unique set of outcome measures. The importance of each tier, level, and dimension of outcomes will vary according to medical condition and sometimes according to the subgroup of patients. For most conditions, there will be multiple outcome dimensions at each level (with the possible exception of care-induced illness). The number of dimensions at each level will depend on the range of complications, the variety of treatment options, the duration of care, and so on. Broadly defined outcome concepts, such as functional status, must be subdivided into specific dimensions that are relevant to the condition. For example, rather than apply a generic activities of daily living assessment to all patients upon hospital discharge, the ability to eat and speak normally could be added to the measures tracked following head and neck cancer treatment.

Each outcome dimension may involve one or more specific measures and multiple periods. Survival is a single dimension, for example, but can be measured in a variety of ways and for several relevant periods. These choices will depend on the medical condition or patient population.

Selecting Outcome Dimensions

Figure 2 provides illustrative sets of outcome dimensions for breast cancer and acute knee osteoarthritis requiring replacement. These examples are not meant to be exhaustive, but to illustrate the structure for the comprehensive sets of outcome dimensions that are needed to fully describe patients' results — which most current measurement efforts fail to capture. No known organization systematically measures the entire outcome hierarchy for the medical conditions it addresses, though some are making good progress.

There are inevitably choices involved in selecting the set of outcome dimensions to measure. The most important criteria in making these choices should be importance to the patient, variability, frequency, and practicality. The outcome dimensions chosen should be important to the patient. Engaging patients and their families in defining this importance is an invaluable step, through focus groups, patient advisory councils, or other means. Outcome dimensions should be variable enough to require focus and improvement. Thus adverse outcomes chosen for measurement should occur often enough to justify the costs of measurement, though very rare outcomes must be measured if they are very important to the patient. The practicality of accurate measurement must also play a role in determining what to measure, as noted above. Controllability, or the provider's current ability to affect the outcome, should be secondary because the key purpose of outcome measurement is to document problems that need to be studied and addressed.

At their outset, outcome-measurement efforts should include at least one outcome dimension at each tier of the hierarchy, and ideally one at each level. As experience and data infrastructure grow, the number of dimensions (and measures) can be expanded over time.

Relating Outcomes to Processes

To identify the set of outcome dimensions, a useful approach is to chart the cycle of care for the medical condition being examined. The care delivery value chain (CDVC), shown in Figure 3 for breast cancer, is a tool for mapping the full set of activities or processes involved in care.[8] The CDVC highlights the full care cycle and all the involved entities or units. This full map of the care cycle allows a systematic identification of all the relevant outcome dimensions as well as when and where measurement should occur.

The CDVC not only helps to identify dimensions and measures, but also enables particular outcome dimensions to be linked to the specific processes of care from which they arise. The connections between the CDVC and outcomes, then, are important to guiding outcome improvement.

Selecting Particular Measures

To measure each outcome dimension, there are often a number of metrics or scales (e.g., the Medical Outcomes Study 36-Item Short-Form Health Survey [SF-36] or the Western Ontario and McMaster Universities Osteoarthritis Index [WOMAC]) that can be utilized. Some metrics, such as the EuroQol Group 5-Dimension Self-Report Questionnaire (EQ-5D) scale to measure health-related quality of life, are generic metrics that can be used for multiple medical conditions. Other measures or scales are tailored to disease classes (e.g., SF-36 for orthopedics) or to individual medical conditions.

The particular measures chosen for each outcome dimension should reflect a number of considerations. First, measures should be selected that best capture the particular outcome from the perspective of the patient and medical science. Getting the measure right can have consequences. In in vitro fertilization (IVF), initial measurement focused on birth rates per IVF cycle, but this practice led to the implantation of numerous embryos and to a high number of multiple births (with a higher probability of complications). Over time, focus has shifted to birth rates per embryo implanted, and multiple births (especially triplet rates) have become a prominent outcome as well. The focus on measurement has played a major role in reducing triplet rates from 7 to 8% historically to less than 2%.

A second consideration in choosing measures is that, other things being equal, the selection of standard and tested measures will improve validity and enable comparison across providers. Third, measures should minimize ambiguity and judgment in scoring or interpreting, to ensure accuracy and consistency. Fourth, patient surveys should be utilized to measure outcomes such as functional status and discomfort that reflect patients' realities and are difficult for outside parties to measure. Here, standardized scales such as the SF-36 or the Beck Depression Index are preferable when available. Compromises will often be necessary in measure selection, but the measures chosen can be improved over time.

Many outcome measures can be tracked at various times in the cycle of care or cover periods of varying durations. For example, as noted above, the time to recovery can be disaggregated into the time to diagnosis and treatment plan, the time between diagnosis and treatment, and the elapsed time during treatment itself. Timing and duration should reflect relevance to patients as well as periods long enough to reveal results.

Practical considerations, such as the availability of data and cost of information gathering, will also play a role in the measures selected. For example, billing data are often more easily accessible than data from chart reviews or new data entry, and measures calculated from billing data can be the place to start as information systems are improved. Practical considerations may also influence the number and duration of measurement periods chosen. For most conditions, immediate complications are far easier to track than longer-term measures that require patient follow-up. Overall, however, the orientation should be on reducing the cost of capturing the right measures rather than limiting measures to those that are easy to obtain.

Developments in electronic medical records are already making outcomes far less costly to measure. Information technology infrastructure should be designed to facilitate the extraction of clinical data for measurement purposes, in addition to supporting the care delivery process.

**Relationships among Outcome Dimensions**

The relative importance of particular outcome dimensions can vary according to individual patient preferences, as noted above. For example, the ability to restore full physical activity may be especially important to an avid athlete or to someone whose employment involves physical labor.

Measurement of the hierarchy can reveal that levels are mutually dependent, as represented in the figures by the bidirectional arrows between levels. Progress at one level sometimes positively affects other levels, reflecting complementarities among outcome dimensions. For example, reducing complications or eliminating errors will not only reduce the disutility of care but speed up recovery.

Such complementarities among outcome dimensions reveal important leverage points for care improvement. For example, error reduction can have special significance beyond its direct Tier 2 benefits because errors may have cascading consequences for recovery, time, discomfort, and risk of recurrence. Error reduction, then, has been a strategic type of outcome improvement to focus on.

Cycle time is another particularly leveraged outcome dimension for value improvement. As discussed, cycle time is an outcome itself, reflecting the duration of anxiety, discomfort, and poor health for the patient. However, speeding up diagnosis and treatment (e.g., avoiding interruptions in care) and better managing complications and rehabilitation often have major benefits for the likelihood and degree of recovery as well as its sustainability, such as in cancer care. The value benefits (outcomes achieved per cost incurred) of cycle time are amplified by its impact on cost. Faster cycle time usually means that fewer resources are required to care for the patient. Cycle time, then, is an outcome dimension that every provider should measure and work to improve, though few have yet begun to do so. Avoidable complications are another important set of outcome dimensions with important complementarity and cost effects.

Measurement of the hierarchy can also make explicit the tradeoffs among outcome dimensions. For example, achieving more complete recovery may require more arduous or time-consuming treatment or confer a higher risk of complications. Mapping these outcome tradeoffs, and seeking ways to reduce them, is an essential part of the care innovation process.

In cases where there are tradeoffs among outcome dimensions, patients may place different weights on each level and dimension of the outcome hierarchy. The discomfort of treatment willingly endured may be affected, for example, by the degree of recovery possible. The long-term sustainability of recovery, such as 20-year implant survival for patients who undergo hip replacement, may matter less to older patients than the degree and speed of recovery. Or considerations of disfigurement may weigh heavily against the risk of recurrence — for example, when determining the amount of the breast to be resected from a patient with breast cancer.

Differences in the value patients place on individual outcome dimensions does not reduce the need to measure the full hierarchy but makes it more important to do so. Patients, their families, and their physicians, armed with information on a full set of outcomes, will be in a position to gain access to the treatments and providers that are best equipped to meet their particular needs.[9,10] This level of outcome information goes well beyond what is currently available or even contemplated by medical societies and health plans in terms of consumer engagement.

**Adjusting for Risk**

The outcomes that are achievable will depend to some degree on each patient's initial conditions, sometimes also termed risk factors. Measuring and adjusting for initial conditions is therefore a crucial step in interpreting, comparing, and improving outcomes. In the case of breast cancer, for example, relevant initial conditions include the stage of disease at the initiation of care, the type of cancer (e.g., tubular, medullary, lobular, etc.), estrogen and progesterone receptor status (positive or negative), sites of metastases, and psychological factors, among others. Patients' compliance with treatment can also be interpreted as a risk factor — another reason why measurement of patient compliance is essential.[1]

Risk adjustment is a complex topic, but I offer a number of strategic principles here. An illustrative set of initial conditions for breast cancer is shown in Figure 4. Initial conditions can affect all levels of the outcome hierarchy. Different initial conditions will often affect different outcome dimensions.

In order to evaluate outcomes for a medical condition, and especially to compare sets of outcomes over time or across providers, outcomes must be risk-adjusted or stratified by patient population based on the salient initial conditions. If initial conditions are not adjusted for, misleading conclusions can be drawn about the effectiveness of a treatment or provider that could mitigate the very purpose of outcome measurement. (An example of the risks of using outcome data without appropriate risk adjustment occurred when the state of Maine began to require drug-rehabilitation clinics to publish their outcomes. Subsequent studies have shown that the improvement in outcomes achieved in the years following the legislation were almost entirely attributable to clinics' turning away patients deemed likely to be problematic in order to increase their success rates.[11]) Several efforts to gather and report outcomes have failed due to inadequate risk adjustment, which has led to resistance and rejection by the medical community.[8] That said, there are a growing number of successful risk-adjustment approaches that confirm its feasibility and impact.

Adjusting for risk is not only necessary for measuring outcomes accurately, but also for improving them. Understanding the link between risk factors and specific patient health outcomes is critical for care decisions.

Finally, risk adjustment is not only important for making comparisons, but is also essential to mitigating the risk that providers or health plans will "cherry pick" healthier patients to improve measured outcomes. Inadequate risk-adjustment methods, as well as poor understanding of actual costs, are root causes of the underpayment of providers for handling patients with more complex conditions, both in the United States and elsewhere.[1] Flawed reimbursement for complex cases has many adverse consequences for value, ranging from inadequate care to excessive fragmentation of services as every provider is motivated to seek out "profitable" service lines and patient groups. Rigorous risk adjustment, coupled with corresponding reimbursement reform, will enable a move away from the current system of "profitable" and "unprofitable" interventions and patient populations and toward a system that encourages providers and health plans to focus on their areas of excellence.

Adjusting for initial conditions or risk normally involves two principal approaches. One is to stratify patient groups on the basis of the most important risk factors to allow outcomes for similar patients to be compared. This method is used in the area of in vitro fertilization, for example, where the Center for Disease Control reports birth rates according to maternal age cohorts and use of fresh or frozen embryos.

The other approach to risk adjustment is to utilize regression analysis to calculate expected outcomes, controlling for important patient risk factors. This allows average outcomes from different providers and periods to be adjusted for the patient mix or to be compared to expected outcomes for their particular patient populations. This method is utilized for outcome reporting in U.S. organ transplantation and in the Helios/AOK methodology in Germany focused on expected mortality for a wide array of medical conditions.[4]

Both stratification and risk adjustment depend on having sufficiently large patient populations to support statistically meaningful comparisons. To accumulate adequate numbers of patients, it may be necessary to aggregate patients over time or to examine outcomes for teams rather than for individual practitioners. In U.S. organ transplantation, for example, data are normally reported for 3-year periods. In in vitro fertilization, one of the weaknesses in the current reporting system is that results are reported only for patients in the most recent year, not over longer periods.

However, statistical power should not be the principal objective or driver of outcome measurement. The principal benefit of outcome measurement is to inform and stimulate practice improvement. The measurement and tracking of outcomes have major benefits even if the number of patients does not allow fine comparisons. In organ transplantation, for example, only a subset of centers has outcomes that are statistically better or worse than expected. However, all centers track their progress, and centers with weaker outcomes work actively to improve them. I will discuss the difference between outcome measurement and traditional clinical trials further below.

The challenge of risk measurement has often been used as an argument against outcome measurement. Although adjusting for risk is surely challenging in some cases and will never be perfect, there is ample evidence that doing so is feasible and that inappropriate comparisons among providers can be minimized.[12] Proven and accepted

risk-adjustment methods for complex fields already exist in the United States and several other countries. There is also no doubt that risk-stratification and adjustment methods will continue to improve with experience and that gaming of measurement will be mitigated over time.[8]

Risk Adjustment and Delivery Improvement

Even in its current imperfect state, risk adjustment is an essential tool for improving care delivery. Understanding and measuring patients' relevant initial conditions and their relationship to outcomes is indispensable to revealing new knowledge about medical conditions and their care.

The influence of initial conditions is partly inevitable — for example, the age of the mother appears to be a fundamental biologic influence on outcomes for in vitro fertilization.[13] However, the influence of patient circumstances is partly a reflection of the state of understanding of a medical condition and its treatment. As clinical knowledge improves, certain risk factors may no longer meaningfully affect the outcomes of care, even though they may continue to influence the care process.

In vitro fertilization illustrates this learning process. Here, the biologic influences of age have been shown to weigh more heavily on egg production than on the ability to have a successful pregnancy. Through the use of donor eggs and improved technology for freezing a woman's own eggs, for example, older mothers are increasingly able to give birth to healthy children. So the impact of a mother's age has changed in terms of risk adjustment for the medical condition of infertility.

As learning occurs, risk adjustment for some initial conditions will become less necessary or even unnecessary for outcome comparison as providers manage them better. At the same time, new risk factors can emerge as sophistication in understanding a disease and in care delivery increases. This process of understanding and dealing with risk factors, then, is fundamental to driving value improvement. Advances in knowledge will reveal new, and perhaps more fundamental, initial conditions, such as genetic makeup. Yet improvements in care delivery over time can transform even genetic makeup from a risk factor to be adjusted for in comparing outcomes to a patient attribute that determines the best approach to successful care. Without systematic measurement of outcomes and risk factors, however, outcome improvement is hit-or-miss. The process of outcome measurement and risk adjustment is not only or even principally about comparing providers, then, but about enabling innovation in care.

These considerations suggest that it is preferable to err on the side of measuring more initial conditions rather than less and to create an explicit process for gradually revising the set of initial conditions used for risk adjustment. Most of all, the number and breadth of risk-adjustment studies and associated data collection must expand in every area of medicine to accelerate the rate of learning about care delivery.

**The Outcomes Hierarchy and the Process of Value Improvement**

Value improvement starts with defining and measuring the total set of outcomes for a medical condition and determining the major risk factors. Innovation in care delivery comes not only from focusing on individual outcome dimensions, but harnessing complementarities among various aspects of quality and reducing tradeoffs among outcome dimensions.

In medicine, as in most fields, progress in improving outcomes and value will be iterative and evolving. The outcomes hierarchy emphasizes that the pace of progress can vary across levels, and also among outcomes at a given level. As survival rates get high, for example, attention can shift to the speed and discomfort of treatment. Once the degree of recovery reaches an acceptable level, focus can shift to reducing tradeoffs between recovery and the risk of complications or care-induced illness, as in cancer therapy. Measurement of the entire outcome hierarchy not only encourages such improvements, but makes them more systematic and transparent.

Measuring the full hierarchy not only highlights multiple quality dimensions for improvement, but also expands the areas in which providers can distinguish themselves. As noted earlier, providers may achieve parity on some dimensions and then have to look to other dimensions to distinguish themselves. Or providers can concentrate on certain outcome dimensions that are weighted heavily by particular groups of patients.

In order to drive innovations in care, outcomes should be measured continuously for every patient, not just retrospectively in the context of discrete studies or evaluations. Whenever possible, outcomes should be measured in the line of care and inform continuous learning. The current approach to outcome measurement is skewed toward retrospective clinical studies, usually focused on a single end point. This bias towards clinical study methods is one of the reasons that outcome measurement remains so limited, despite its overwhelming benefits.

Comprehensive outcome measurement will enable a new type of clinical research, which focuses on overall care instead of controlled experiments around single interventions. Patient care is inevitably multidimensional, and actual care requires simultaneous choices on multiple variables and among numerous options. Conventional statistical methods need to be supplemented by careful study by clinical teams of patient-specific successes and failures. This kind of analysis seeks to identify common problems that arise, to discern patterns, and to develop hypotheses that give rise to learning, innovation, and further study.

Outcome Improvement and Cost Reduction

A major challenge in any field is to improve efficiency, and this is especially urgent in health care. One of the most powerful tools for reducing costs is improving quality, and outcome measurement is fundamental to improving the efficiency of care. Measuring the full outcome hierarchy provides a powerful tool for cost improvement that has been all but absent in the field. Comprehensive measurement of outcomes provides the evidence that will finally permit evaluation of whether care is actually benefitting patients and which treatments are most effective for each medical condition.

Historically, the overwhelming attention in outcome measurement has been directed at Tier 1 (health status achieved), particularly survival or mortality rates. At Tier 1, achieving better outcomes may (though by no means always does) require higher expenditures, especially when a new and expensive treatment or technology represents the only effective therapy. Such cases have led many observers to claim that innovation and new technology drive up health care costs. However, broader measurement of Tier 1 outcomes, notably functional status, will often open up opportunities for cost reduction. Improving the ability to function independently or return to work has huge cost consequences for the system.

Moreover, improvements in Tier 2 (process of recovery) and Tier 3 (health sustainability) outcomes almost invariably lower cost. Faster cycle time, fewer complications, and fewer failed therapies, for example, will have huge costs consequences. Tier 2 and 3 improvements can also reduce the cost of improving Tier 1 outcomes, because of the complementarities previously noted. For example, speeding up cycle time can also lead to more complete recovery, as is the case in cancer. Opportunities for dramatic improvement in Tier 2 and 3 outcomes engender great optimism for future cost containment; these opportunities have been overlooked because outcomes at these levels have been largely unmeasured and ignored.

Over the past several decades, joint replacement, new cancer therapies, organ transplantation, and many other new therapies were developed. In parallel, advancements in testing and diagnostic methods have allowed previously hidden conditions to be discovered or revealed much earlier. This stage of innovation, involving the development of new therapies for previously untreatable conditions and the discovery of previously hidden conditions, will almost inevitably raise cost, at least initially.

Today, however, the opportunity is different. Advancements in medical science have led to therapies that address most medical conditions in some way, albeit imperfectly. There will continue to be new tests and therapies where there were none before. However, the more common opportunity will be to drive dramatic value improvement in existing diagnostics and therapies, as well as to develop new, higher-value therapies that address diseases at earlier stages or more fundamental levels. A new era of rapid improvement in value in health care is possible. Comprehensive outcome and cost measurement, together with supporting changes in care organization, reimbursement, and market competition, will be needed to unlock and drive such value-based innovation.

**Improving Value versus Rationing Care**

Measuring the outcome hierarchy for each medical condition (and patient population receiving primary and preventive care) is indispensable for informing outcome improvement, assessing the value of alternative treatment approaches, and finding ways to deliver better outcomes more efficiently. Comparative-effectiveness research, in its present form, is important but not sufficient. It focuses largely on single interventions in highly controlled settings and sometimes incorporates just a single outcome or narrow set of outcomes. The outcome hierarchy is an important foundation for broadening and enriching clinical and comparative-effectiveness research at the medical condition level, as I have discussed. There have been efforts to monetize outcomes for purposes of calculating a benefit–cost ratio for alternative treatments. However, many such efforts tend to focus only on survival, even though survival is always one of a broader set of outcomes that matter to patients. Even for survival, assigning a monetary value is fraught with complexity, not to mention ethical issues. Is job productivity or earning power really a sufficient way to compare the health benefits of care, for example? Monetizing other important outcomes in the hierarchy from a benefit standpoint is even more challenging. For example, how should we value restoring the appearance of a patient with cancer or preserving a patient's normal voice?

The use of quality-adjusted life-years (QALYs) or disability-adjusted life-years (DALYs) represents a broader approach to collapsing outcomes into a single measure.

Such measures embody a weighting of life expectancy based on quality of life. Quality of life is collapsed into a single number, determined using a variety of methods, despite the fact that it is inherently multidimensional and the relevant dimensions vary by medical condition.

At the medical condition level, we believe that there is little justification for shortcuts in measuring outcomes in driving value improvement. The full hierarchy of important outcomes needs to be measured and compared to cost. In evaluating alternative care delivery approaches, the task is to examine how the set of outcomes improves, and how improvement in the set of outcomes relates to cost. If one or more outcomes in the hierarchy improve while others remain stable, the set of outcomes improves. Value improves if outcomes improve at equal or lower cost, or if outcomes are stable at meaningfully lower cost.

There is no benefit to collapsing or suppressing outcome dimensions in making this evaluation at the medical condition level — quite the contrary. All parts of the outcome hierarchy are important to patients, and progress on each dimension is beneficial. Examinations of Tier 2 and Tier 3 outcomes, which are rarely considered in comparative-effectiveness studies, are powerful tools not only for outcome improvement but also cost reduction. There are certainly cases of tradeoffs — in which better outcomes occur only at much higher costs. However, there are virtually unlimited opportunities for improvement in the outcome hierarchy that do not involve such tradeoffs, and this is where attention in care improvement should be focused.

Monetization of outcomes and QALYs or DALYs are often used to compare the value of care across medical conditions. We know that for each medical condition, the set of relevant outcomes will be different. QALYs and DALYs focus just on those outcomes that can be readily standardized — again, survival and certain generic aspects of quality of life. Once again, the validity and comparability across conditions of these measures is highly questionable.

This effort to standardize and collapse outcomes to a single measure also suffers from a deeper problem. The whole approach assumes that the value of care for each medical condition is fixed and that care must be rationed. Optimizing within fixed constraints comes naturally to some economists but has proven shortsighted time and time again. In a field where outcomes are all but unmeasured, and where cost is poorly understood, there are major opportunities to improve outcome and value in the care for every medical condition. This is where the field should focus. Setting policies to enable and incentivize innovation should be our approach, rather than assuming that the value is fixed and focusing on choosing which patients should receive care. Given the major improvements in outcomes and efficiency observed in areas where there has been rigorous outcome measurement, there is every reason to hope that rationing will not be necessary except in extreme cases.

Health care is on a dangerous path if the primary rationale for outcome measurement is rationing of care rather than outcome and value improvement. Standardized outcome-measurement approaches will not well serve the needs of improving clinical practice, and they will disenfranchise providers. Turning to rationing without taking aggressive steps toward improving outcome and efficiency is a failure of policy — and will also prove unacceptable to patients and their families. Moreover, such policy will fail to be implemented when political realities intrude.

## Conclusion

Outcome measurement is the single most important tool to drive innovation in health care delivery. The feasibility, practicality, and impact of outcome measurement have been conclusively demonstrated. Every provider can begin to measure the outcomes hierarchy in the medical conditions it serves, and track its progress versus past performance. Outcome measurement can begin for a subset of medical conditions and expand over time as infrastructure and experience grow.

This article provides a framework for systematically identifying the full set of outcomes for each medical condition, exploring the relationships among them, and revealing risk factors. Today, numerous voluntary and mandatory programs track different measures for subsets of providers, payers, and patient populations. The challenge is to make outcome measurement ubiquitous and an integral part of health care delivery.

Over time, the goal should be to establish uniform national and international outcome-measurement standards and methods. The feasibility of such standards has been conclusively demonstrated. Rather than resting with today's consensus organizations or government entities that are caught up in politics, responsibility for outcome measurement standards should be delegated to a respected independent organization, such as a new affiliate of the Institute of Medicine. Measurement and reporting of outcomes should eventually become mandatory for every provider and health plan. Reporting by health plans of health outcomes for its members, according to medical condition and patient population, using data drawn from providers' reporting, will help to shift health plans' focus from short-term cost reduction to value improvement.

As comprehensive outcome measurement is being phased in, every provider should report experience (i.e., the volume of patients treated for each medical condition), along with the procedures and treatment approaches utilized. Experience reporting will begin to help patients, their doctors, and health plans find the providers with the expertise that meets their needs. It will also highlight the fragmentation of care across facilities and providers and inform a rationalization of service lines. The most important users of outcome measurement are providers, for whom comprehensive measurement will lead to substantial improvement.[5] The most important purpose of outcome measurement is improvement in care, not keeping score. Outcome measurement is also a powerful vehicle for bringing teams together and improving collaboration in a fragmented field. There is much evidence that the very act of measuring outcomes leads to substantial improvement. Public reporting of outcomes is not necessary in order to reap important benefits, and studies have revealed that confidential, internal reviews can motivate providers to improve their performance.[14] Public reporting must be phased in carefully to win provider confidence. However, eventual progression to public reporting will accelerate innovation by further motivating providers to improve and permitting all stakeholders to benefit fully from outcome information.

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Figure 1. The Outcome Measures Hierarchy.

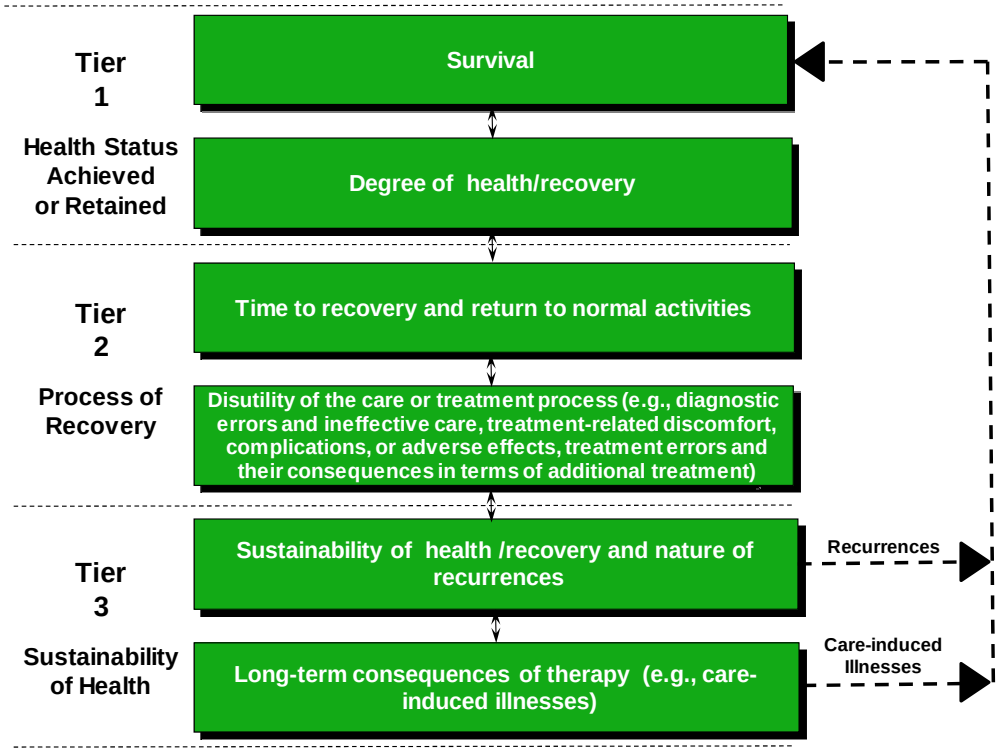

Figure 2. Illustrative Outcome Hierarchy for Breast Cancer and Knee Osteoarthritis.

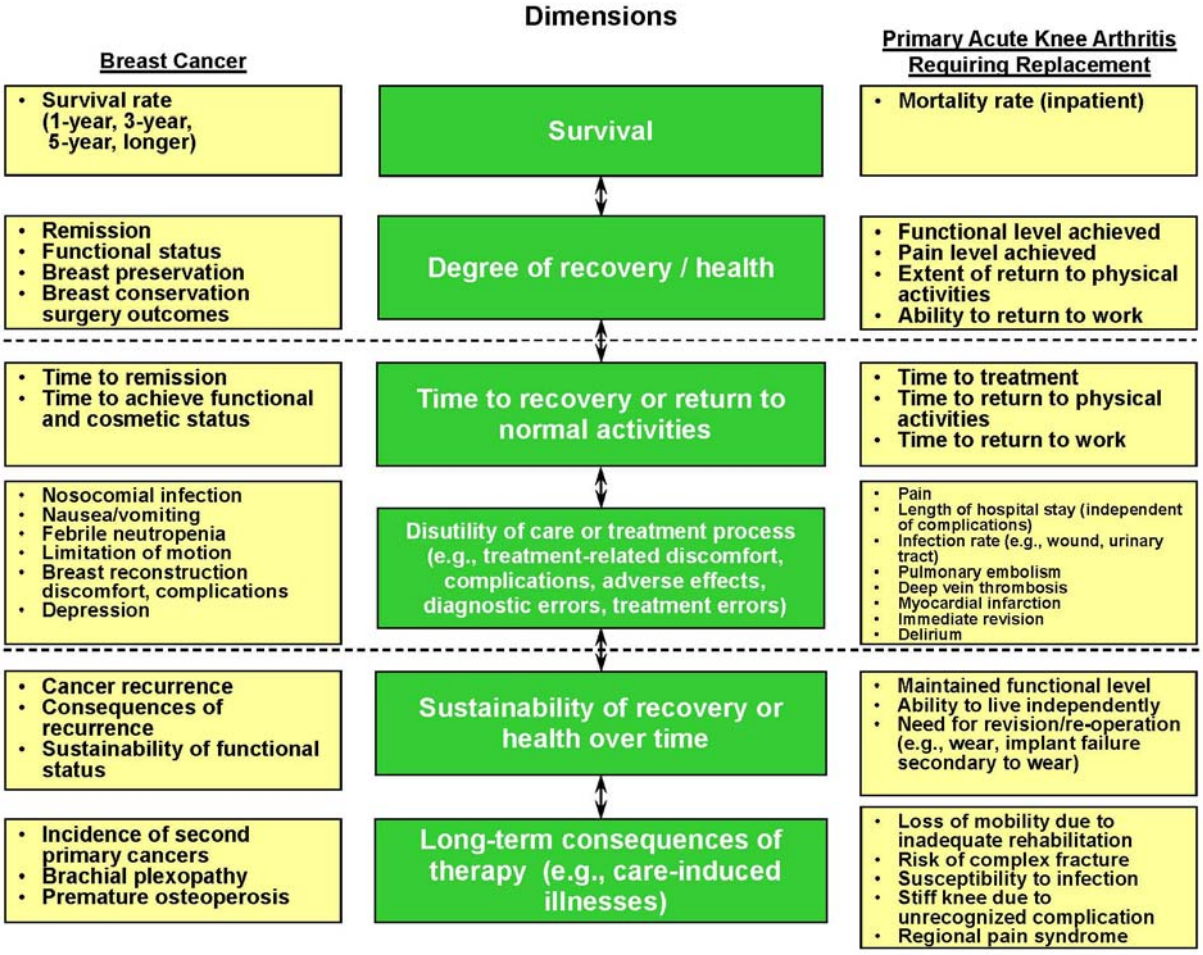

Figure 3. The Care Delivery Value Chain (Breast Cancer).

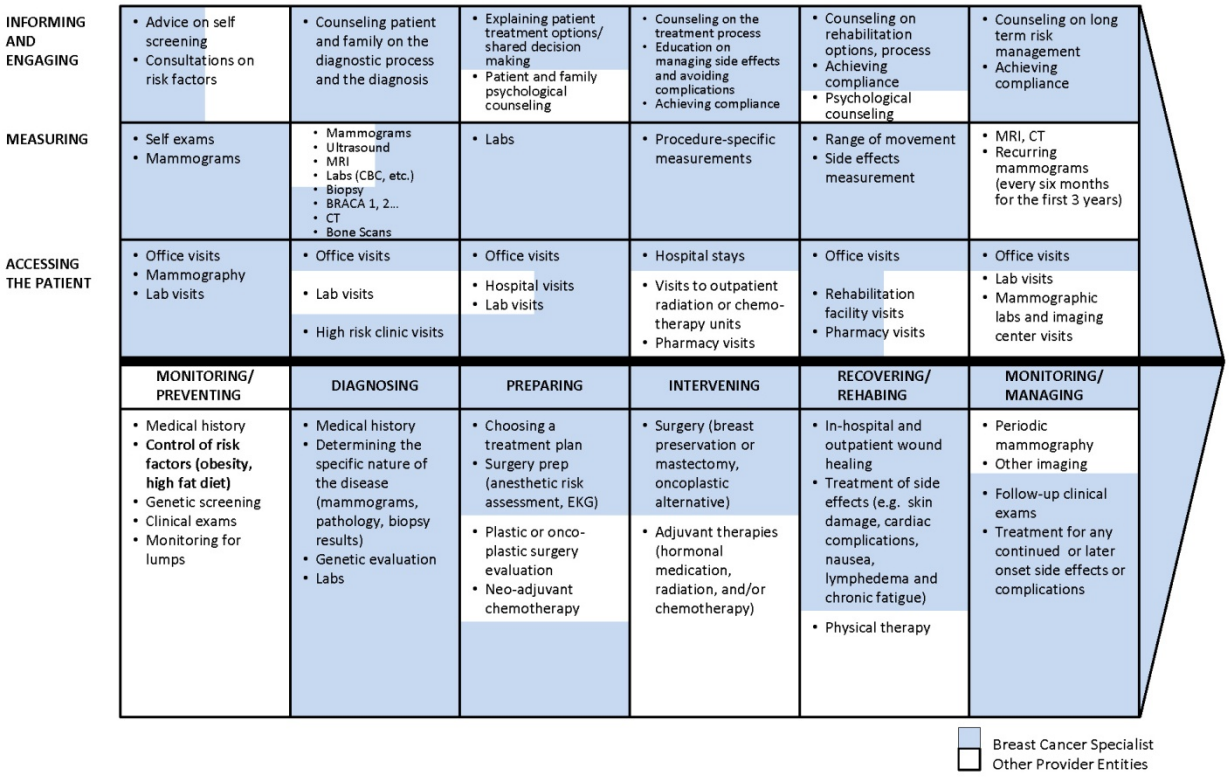


Figure 4. Illustrative Risk Factors for a Patient with Breast Cancer.

- Stage of disease
- Type of cancer (infiltrating ductal carcinoma, tubular, medullary, lobular, etc.)
- Estrogen and progesterone receptor status (positive or negative)
- Sites of metastases
- Previous treatments
- Age
- Menopausal status
- General health, including co-morbidities
- Psychological and social factors