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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Disclosure forms provided by the author are available with the full text of this article at NEJM.org.

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