

## PERSPECTIVE

# Using the Knowledge Base of Health Services Research to Redefine Health Care Systems

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This Perspective discusses 12 key facts derived from 50 years of health services research and argues that this knowledge base can stimulate innovative thinking about how to make health care systems safer, more efficient, more cost effective, and more patient centered, even as they respond to the needs of diverse communities.

**KEY WORDS:** health services research; health status; RAND Health Insurance Experiment; quality of care; social determinants of health.

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## THE KNOWLEDGE BASE OF HEALTH SERVICES RESEARCH

Health policies in the United States must be compatible with both the basic facts about health and health care, and with the nation's value system. Achieving compatibility can be challenging because individual differences in values may be played out in policy debates. We can use evidence-based truths to build a framework for structuring the national conversation about health care. Ultimately, the defining questions are not, for example, whether high deductible health plans have the intended effect, which prescription drugs should be covered in benefit plans, or why people should use health maintenance organizations. Rather, the central question is how can we change health care systems to achieve the best outcomes.

Evidence stemming from health services research should help us identify the policy option(s) that have the greatest likelihood of achieving our national priorities, given stated constraints. The table (Table 1) highlights 12 key facts that health services research has produced over the last five decades. Such a list could include other facts. But these 12 facts have had a profound influence on the science of medicine and on health services research itself.

## KEY FACTS EMERGING FROM FIFTY YEARS OF HEALTH SERVICES RESEARCH

1. Health status can be measured.
2. Free care does not make people healthier—but they use more care, including care that's useful and care that's not.
3. When people have to pay more out-of-pocket, they proportionally reduce the amount of care they use—both necessary and unnecessary care.
4. How physicians are paid influences how they practice.
5. Quality of care can be measured.
6. Quality of care varies dramatically by where one lives, by socio-economic status, in some cases by hospital or doctor.
7. The appropriateness of care can be determined.
8. Geography is a powerful predictor of health service use.
9. Integrated care for depression improves outcomes.
10. Physicians and patients need smart tools to support health decision-making.
11. The U.S. health care system is wasteful, but one person's waste is another's income.
12. The most powerful determinants of health are socio-economic.

### 1. HEALTH STATUS CAN BE MEASURED

The most important scientific development in the last 50 years in the field of health services research is the ability to measure health status.

Health is now known to comprise mental, physical, social, and physiological components. Measures that are reliable and valid have been developed in each of these areas. For instance, mental health scales cover the range from severe depression to elation. Scales that measure physical functioning range from the inability to walk to the ability to run a mile. Measures of social health range from relative isolation to having multiple friends and organizational contacts. Measures of physiological health assess the current function and reserve of virtually all of the organs in the body, and can do so before any degradation in organ function produces overt signs or symptoms.

Measures for all components of health have been tested in general populations and in subgroups, e.g., individuals with specific diseases such as epilepsy or kidney failure.<sup>1,2</sup>

The development of health status measures has changed the kinds of questions that can be answered reliably. In 1965, one could determine if a new drug increased or decreased life

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expectancy, but not if the drug reduced symptoms from depression, increased a patient's ability to walk, or slowed degradation of organ capacity.

But a quiet revolution has occurred in what is now considered the outcome of a modern health care system. No longer is it enough to reduce age-adjusted death rates. Rather, the question has become: Will this invention, innovation, drug, or payment approach affect how far people can run, how happy they are, or even their future health in terms of preserving organ capacity?

Because we have valid health measures, we can assign value to health as something more than an additional year of life. For example, we can measure the quality of a year of life for a nursing home resident with mild dementia compared with quality of life for a community-dwelling individual with the same condition.

The development of health measures has also raised questions that society may be uncomfortable addressing. For instance, is it worth providing a treatment to someone whose health status will improve only half as much as when the treatment is given to another person? How should quality of life and health status figure into the decision of who gets what care?<sup>3</sup>

On the other hand, being able to measure health status has opened enormous opportunities that modern medicine has only just begun to exploit. Of these, the most significant is the ability to routinely measure the health of a population or the health of a panel of patients who are enrolled in a medical group. That measure of health can inform decisions about what services should be provided for a population of patients and help determine if the health objective was achieved. Health status measures could initiate any medical history, physical examination, or community assessment; changes in them could trigger diagnostic workups, clinical interventions, or community actions.

## 2. FREE CARE INCREASES HEALTH SERVICE USE, BUT DOES NOT IMPROVE HEALTH

The clearest example of the use of health status measures is the *RAND Health Insurance Experiment (HIE)*.<sup>4</sup> Conducted in the 1960s and 1970s, the HIE was designed to understand the relationship between an individual's health and how much the individual paid out-of-pocket for health care. Health measures were developed to illuminate this relationship.

Because the HIE enrolled people in communities that represented the U.S. population, the health measures had to be generally applicable, and a significant part of the HIE budget was spent developing them. They are now used around the world by governments, insurance companies, physicians, and the public to measure and improve care delivered in a variety of settings.

The HIE demonstrated that the amount patients pay out-of-pocket for care influences how much care they seek. In the experiment, people who had free care used about one-third

more care than individuals who had some kind of co-payment. In contrast, those who paid for a share of their care reduced use of all types of services. Averaged across all levels of coinsurance, participants with cost sharing made one to two fewer physician visits annually and had 20 % fewer hospitalizations than those with free care. Declines were similar for other types of services, including dental visits, prescriptions, and mental health treatment.

The larger the co-payment, the greater the reduction in use, and highly effective and less effective services were reduced in roughly equal proportions.

However, more care did not lead to better health. Those who had substantial co-payments or deductibles before they received care had similar health after they had been enrolled in the experiment for 5 years.<sup>5</sup>

These results were met with incredulity. Wouldn't people be healthier if they went to the doctor more often? The answer was no.

After the HIE results were released, study scientists devoted considerable effort to defending the health measures. Fortunately, because the science underpinning the measures was sound, it was relatively straightforward to demonstrate that the conclusions about the health effects of free care were valid.

## 3. PATIENT CO-PAYMENTS STRONGLY INFLUENCE HEALTH CARE USE

Since the Health Insurance Experiment, we have learned a great deal more about how patient co-payments affect health and health care use. In response to co-payments, patients decrease use of effective and ineffective care at about the same rate. For some groups, this decrease can have health consequences. For example, when confronted with a small increase in co-payment, some Americans decreased the drugs they took to prevent or control heart disease, asthma, and stroke by about one-third, even though they were employed and on every reasonable parameter could afford to pay the slightly higher price for the drug.<sup>6</sup> For such individuals, decreasing service use may degrade health.

However, for the average American, higher co-payments and lower health care use might not decrease health. The extra care used when care is free may actually produce more harm than good. For instance, when care is free, inappropriate antibiotic use increases for conditions that are clearly viral in nature.<sup>4</sup>

## 4. HOW PHYSICIANS ARE PAID INFLUENCES HOW THEY PRACTICE

It should not be surprising that how physicians are paid influences their behavior. There are three standard ways of paying physicians: fee-for-service, capitation, or salary. Each affects how physicians practice.

In fee-for-service, providers are reimbursed for each service rendered. As a result, they have financial incentives to provide more services, even if some have questionable value.<sup>7,8</sup>

When doctors are paid on a capitated basis, they tend to increase the number of patients in their practice and compensate for the increased patient workload by decreasing the amount of time they spend with each patient and providing fewer services.<sup>9</sup> They also have no direct financial incentive to keep their practice open on evenings or weekends.

Physicians who are salaried provide fewer services, see fewer patients, and spend more time with each patient, unless someone else controls their appointment book.<sup>10</sup>

Over the last decade, both the public and private sectors have experimented with other payment approaches. All of them include incentives of various kinds that link how much physicians are paid to how well they perform on dimensions of cost or quality—or both—that can be measured. For example, value-based purchasing (VBP) gives financial incentives to providers who deliver “value” in health care, where value means both the outcomes of care and the costs of delivering it. Other VBP models currently being tested include accountable care organizations and bundled payment programs that target both cost and quality.

In January 2015, the Department of Health and Human Services announced its goal to have 85 % of all Medicare fee-for-service payments tied to quality or value by 2016, and 90 % by 2018. In addition, it aims to have 30 % of Medicare payments tied to quality or value through alternative payment models by the end of 2016 and 50 % of payments by the end of 2018. The alternative payment models include accountable care organizations and bundled payment.<sup>11</sup>

Performance-based incentives models such as value-based payment systems are relatively new to the health care system. Designing them is a complex undertaking and how the system is designed will determine the likelihood of its success.<sup>12</sup> New performance measures will be needed to monitor the models’ effects.<sup>13</sup>

None of these payment approaches, standard or new, is inherently evil or cost reducing. What is clear is that the payment method influences physician behavior. To foster a health system that produces value, quality measures should be put in place that balance both underuse and overuse of services resulting from how we pay physicians. Just as patients faced with paying for care out-of-pocket find it difficult to distinguish between care that is effective or ineffective, physicians sometimes find it difficult to reduce services that are marginally effective or ineffective versus those things that are necessary for maintaining or improving health.

## 5. QUALITY OF CARE CAN BE MEASURED

In the mid-1960s, Donabedian developed a conceptual framework that remains the dominant paradigm for assessing quality of health care. It specified three measurement dimensions: structure, process, and outcome.<sup>14</sup> In practice, quality is measured along all of these dimensions, but each has inherent limitations.

Structure refers to the innate characteristics of health care providers, the health system, or hospitals. For example,

structural characteristics could include whether the doctor was male or female, or graduated from a foreign or U.S. medical school.

A process measure relates to what independent professionals did to and for patients. Was a blood culture ordered for a person who just presented with pneumonia? Was the potassium monitored in a person who presented in a diabetic coma?

Outcomes were either the general health status measures discussed above, or they might be disease-specific, such as school days lost from symptoms of asthma, or number of epileptic seizures.

Initially, it was hoped that structural measures would reflect the quality of care provided by a doctor, hospital, or health system. Unfortunately, research demonstrated that structural characteristics predicted very little of the variation in quality of care as assessed by either care processes or patient outcomes. For example, graduates of foreign medical schools provided the same level of quality as the graduates of the top U.S. medical schools.<sup>15</sup> Just having a sterile operating room would not guarantee that a patient didn’t get a post-operative infection or die because the operation was not performed well. Consequently, researchers explored use of process measures and outcome measures to assess quality.

It was hoped that if correctly assessed, processes would lead to desired outcomes and could be used as the basis for quality measurement. For example, if a patient had a heart attack for which hospitalization in an intensive care unit should be recommended, the relationship between the process of being hospitalized and the outcome of getting better should be correlated and meaningful.

Unfortunately, the relationship between providing scientifically justified medical care and health outcomes is not foolproof.<sup>16,17</sup> Many people will get better without the treatments that science suggests should be provided. And some patients will actually be harmed if they receive the “right” treatment.

In general, process assessments pose a higher bar for quality than do outcome assessments. For example, a review of the scientific literature, integrated with expert opinion, generated a list of services and treatments that all pregnant women should receive, or at least be offered. But virtually no pregnant woman in the United States has ever received, or been offered, everything on that list.<sup>18</sup> So by this measure, the quality of care for virtually all pregnant women in the United States would be poor.

However, if one judged quality of care on the basis of health outcomes, such as death of either the infant or the mother, the quality assessment would be much higher: poor outcomes of pregnancy are exceedingly rare—fewer than six in 1,000 infants die at birth.

Quality has also been assessed by considering outcomes of care. For example, cardiac surgeons working in a number of states have produced reports that link the likelihood of living or dying after a coronary artery bypass operation to specific doctors and hospitals.<sup>19,20</sup> Models have been developed to risk-adjust outcomes depending on the condition of patients on whom the surgeon operates.

Structural, process, and outcomes measures all have limitations. However, there is one dimension of quality measurement about which there is little controversy: Quality of care varies.

## 6. QUALITY OF CARE VARIES

The quality of care that patients receive varies substantially. However, everybody is in a similar boat in terms of the basic level of variation. Specifically, the difference between the quality of care that the average American should receive and the level he or she actually receives is much larger than the difference between the quality of care provided to any two Americans who differ on the basis of poverty, race, gender, or place of residence.<sup>21,22</sup> In fact, the most comprehensive study of quality of care in the United States found that, on average, Americans receive recommended care only 55 % of the time, regardless of type of insurance, income, or location.<sup>21,22</sup>

Many physicians and hospitals have reputations for providing good care, and there are certainly differences between and among hospitals and doctors. However, the concept of a good doctor or a good hospital that does everything well is basically a myth. For example, hospitals that excel at treating heart failure are not necessarily good at treating patients with heart attacks.<sup>23</sup> Physicians who successfully control a diabetic's blood glucose level may not be successful in controlling the patient's hypertension or cholesterol.

Because clinicians do not produce a consistently reliable product across all measures of quality, quality must be measured in a comprehensive way so that providers trying to improve their performance don't ignore important aspects of caregiving or game the system. In education, the game is called "teaching to the test." For example, if the only criteria of quality to be used are whether a woman received a Pap smear at an appropriate time and a man with hypertension had his blood pressure measured at least once per year, most facilities and/or providers would respond by improving care as measured by those markers so that they look "better." As a result, quality of care delivered across all patients in all diseases will be distorted.

Fortunately, we have many well-tested comprehensive quality of care measures that can help prevent this distortion.<sup>24,25</sup> However, challenges remain to develop measures for other aspects of care. The most important deficiency might be measures of how well a doctor collects historical data about patient symptoms and the mechanisms the physician uses to turn that information into a diagnosis.<sup>26</sup>

## 7. THE APPROPRIATENESS OF CARE CAN BE DETERMINED

The RAND Health Insurance Experiment showed that more care did not translate into better health. Understanding this counterintuitive finding required developing ways to measure how much a given treatment or service contributed to better health. Specifically, the challenge was to determine, based on a patient's medical history, whether or not the care rendered to that patient was appropriate, equivocal, or inappropriate.

Appropriateness is an indication of the potential benefit of a specific treatment or service. In *appropriate* care, the potential health benefit from a medical service exceeds its health risks as assessed by the physician and the patient. In *equivocal* care, the health risks of care are equal to potential health benefit. In *inappropriate* care, potential risks exceed potential benefit.

Development of appropriateness measures depended on the development of evidence-based medicine in the 1980s. Methods ranging from the use of expert judgment to quasi-experimental designs to randomized, controlled trials were developed to causally relate treatment to health outcomes. Based on this kind of evidence, it could be determined if a particular treatment was appropriate, equivocal, or inappropriate for a patient with specific characteristics.

In addition, a new field called meta-analysis emerged in which scientific principles were identified to synthesize the results of multiple studies, making it possible, for example, to combine results from ten clinical trials on the same subject conducted in ten different countries by ten different investigators. Meta-analysis can strengthen the confidence one might have about the effect of a treatment or procedure, compared with confidence based on a single study.

One prominent method developed to operationalize the appropriateness concept is the RAND-UCLA appropriateness method.<sup>27</sup> It combines the best available scientific evidence with the collective judgment of experts to yield a statement regarding the appropriateness of performing a procedure at the level of specific patient symptoms, medical history, and test results. Scenarios are produced that represent actual patients; panels of experts judge the treatment the patients receive as appropriate, equivocal, or inappropriate. These judgments can, in turn, be applied to patients either prospectively or retrospectively to determine whether care that was being planned, or had been given, was appropriate.

Since the RAND-UCLA appropriateness method was developed in the 1980s, it has been used in thousands of studies.<sup>28</sup> The collective results are astonishing: A substantial part (perhaps one-third) of care given to populations around the world is equivocal or inappropriate—independent of whether care was provided in a single-payer or a fee-for-service system; whether patients had high co-payments or none; or whether physicians, hospitals, or patients were subject to whatever other health policies come to mind.<sup>29–32</sup>

Clearly factors other than appropriateness influence the health care services that one receives. Perhaps the most powerful of these is geography.

## 8. GEOGRAPHY IS A STRONG PREDICTOR OF HEALTH SERVICE USE

Geographic variation is an accepted phenomenon in nature. The climate at the top of Mount McKinley is different from the

desert climate surrounding Palm Springs. But few expected that modern medicine would also display large geographic differences in what services were provided to a patient. However, in fact, where one lives is a very powerful determinant of the kind and amount of medical care received. For example, very early work showed that losing one's tonsils was strongly influenced by which hospital residents of Vermont lived near.<sup>33</sup> The variation did not reflect the prevalence of tonsil disease.

Tonsils are not an isolated example. The likelihood of receiving coronary artery bypass surgery, carotid endarterectomy, or many other high-tech diagnostic or therapeutic interventions varied twofold to threefold, depending on whether a patient lived in Philadelphia or San Francisco.<sup>34</sup> The difference could not be explained by prevalence of the relevant condition in that area. Why would people with the same risk factors for cardiovascular disease have rates of coronary artery bypass surgery that varied threefold depending on the U.S. city in which they live?

In addition, studies consistently showed that people who lived in regions where a given procedure was performed frequently didn't necessarily receive that procedure more inappropriately. In fact, the relationship between appropriate care and volume of care was weak at best and in some cases, nonexistent.<sup>31,35</sup> Over-use and under-use of a procedure existed simultaneously in the same geographic areas.

Here's a stunning example. Many years ago, the rate of coronary artery bypass surgery in the United States, especially in the Southern California area, was sevenfold the rate in the UK, especially in the Manchester area. The U.S. and UK systems of care were very different. Indeed, one could argue that in the United States, coronary artery bypass surgery is provided by essentially a non-system; the surgeries are performed by many different surgeons and paid for by many different kinds of insurance.

In contrast, in the Manchester region, a handful of surgeons did all the coronary artery bypass surgeries. The surgeons were salaried and practiced at one hospital, where all the bypass surgeries were performed. Care was centralized, and there was one payment system. If 30 to 40 % of coronary artery bypass surgery done in Southern California was inappropriate or equivocal, surely the proportion that would be equivocal or inappropriate should be close to zero in areas such as Manchester, which did one-seventh as many procedures.

A study that compared inappropriate use in these two areas produced astonishing results.<sup>36</sup> Even though in Manchester some people were put on long waiting lists for anatomically defined heart disease that could kill them before they had surgery, the level of inappropriate care was the same as in Southern California. Geographic variation did not explain appropriateness: when the total amount of care increased, the amount of care that was inappropriate increased in almost the same proportion as the increase in appropriate care.

Just as disturbing as geographical variation is the fact that appropriateness, like other measures of quality of care, cannot be predicted by structural measures. Board-certified physicians do not necessarily perform services within their specialty

more appropriately than physicians who are not board certified.<sup>37</sup> High-volume surgeons may get to their high-volume status by performing surgery on more appropriate people because they have a favorable referral base, or by operating on people who do not need the procedure at all.<sup>38</sup>

## 9. INTEGRATED CARE FOR DEPRESSION IMPROVES OUTCOMES

Depression is a chronic condition responsible for substantial reductions in health. However, it is often overlooked.<sup>39</sup> A contributing factor may be that mental health care in the United States has typically been "carved out"—separated from care of other chronic conditions in terms of both the process of care and insurance coverage.

The reasons for carving out behavioral health care are not immediately obvious. Some people believe stigmatized conditions such as mental health should be kept separate in terms of care and payment. Some believe treatment for mental health conditions is very different, and relatively ineffective, compared with treatment for medical conditions. Others believe that mental health conditions will be very expensive to treat and so should be managed differently.

The validity of any of these hypotheses is questionable. However, it is not questionable that depression is one of the leading causes of morbidity in the United States and around the world. People with chronic conditions get depressed.<sup>40</sup> People who are depressed do not perform well in their jobs, in their education, or in social interactions.<sup>41,42</sup> Lack of employment and poor education decrease wealth and degrade health status.

Effective treatments for depression are well documented, yet much major depression goes undiagnosed.<sup>43-46</sup> If we are serious about having a health system designed to improve health, we must be prepared to integrate detection and treatment of depression into care for physical conditions.<sup>47,48</sup> Getting care improves long term outcomes, especially for minorities, and produces major changes in wealth.<sup>49-51</sup>

## 10. PHYSICIANS AND PATIENTS NEED TOOLS TO SUPPORT DECISION-MAKING

Both physicians and patients face considerable challenges as they make decisions about care. They need smart decision support tools to help them.

When the number of tests was limited, it was reasonable to expect that a physician might conduct and interpret some of the tests in the office laboratory; and surely the physician would know the names of all possible tests to address a given clinical issue. However, there has been an exponential explosion in the number of diagnostic tests. By 2020, there are likely to be another 10,000 diagnostic tests on the market.

No human being can know and remember the names and characteristics of all existing tests and therapies (let alone the risks and benefits of each), decide which ones are effective, and determine the most cost-effective way of proceeding. Yet

assessments of knowledge and memory are still often used by medical schools, professional organizations, and state regulators to distinguish a “good doctor” from a “less good doctor.”

Physicians no longer fill out lab slips, write the name of the test to be performed, and perhaps even draw the blood for the test. Today, doctors are likely to have a paper or electronic ordering sheet that presents all possible tests, organized according to an organ system or problem. They can “check” all of them in a second, even if they do not understand the tests, and then ponder when the results come back whether any of the tests provided meaningful information.

This is a sub-optimal way of practicing medicine, but without easy-to-use help on a real-time basis, physicians have no other alternative. The same kind of shotgun approach will characterize the treatment process as doctors begin to pick their way through the use of medications. We are quickly reaching a point where the principal characteristic of the health care system will be information overload. The result will be chaos.

Medicine is just now beginning to transition from paper records to electronic medical records. Adding decision aids and guides to these systems will help doctors purchase more effective and better value-based care on behalf of their patients, and help compensate for the shortcomings of human memory.<sup>52</sup>

## 11. ONE PERSON'S WASTE IS ANOTHER'S INCOME

There are three major types of waste in U.S. medicine: administrative waste, waste associated with duplicating tests, and waste associated with procedures that have equivocal or no health benefits.<sup>53</sup>

It is quite possible that by 2025, the amount of money spent in the back office of hospitals and physicians will fall dramatically as a seamless system is implemented to authorize treatments, process payment, and match patients to their doctors and health plans. It is conceivable that when patients visit a doctor, they will swipe a card and the doctor would be paid immediately after the visit. Patients would also immediately pay the portion of the cost for which they are responsible. This type of integration would eliminate many administrative positions in the health industry.

If electronic medical records reflected all the care that was provided to a patient in any setting and if test results were available, regardless of when or where they were performed, the need to duplicate tests would drop significantly. In addition, having previous test results available might change a patient's treatment. For example, if the patient's previous electrocardiograms (EKGs) were accessible when he or she visited the emergency department, and the same abnormality seen in the emergency department was present on the EKG a year earlier, then what was done to and for the patient might be very different than if the physician did not have the result of previous EKGs. Thus, the availability of information in real

time might improve decisions and generate enormous savings without affecting the patient's health.

Savings would also result if tests and drugs that have equivocal value could be eliminated. Using investments in operating rooms, scanners, magnetic resonance imaging (MRI) machines, and laboratory equipment more efficiently would save a great deal of money.

It has proven difficult to actually outsource medical care to other countries. That said, one might envision a nursing home benefit for Americans that could be used only in Mexico because the value of nursing home care there was far higher than care rendered in U.S. nursing homes. Perhaps elective surgery would be covered only if the operation was performed in Thailand, Singapore, or India, because even factoring in the cost of transporting patients to these countries, the value of doing the surgery in those countries was higher than doing it in the United States.

However, eliminating waste by implementing any one of the changes just described will eliminate jobs somewhere else in the health care industry. As has been the case in other industries, policies will need to be developed to help people who lose their jobs because their jobs have been eliminated in pursuit of waste reduction. They will need assistance to become employed and productive.

## 12. SOCIAL FACTORS ARE POWERFUL DETERMINANTS OF HEALTH

In the last 50 years, we have learned that closing the health disparities gap between groups defined by income or ethnicity or neighborhood will require attention to the social determinants of health model.<sup>54</sup> Medical care represents only about 20 % of what accounts for population health, yet gets a disproportionate amount of attention. But social determinants of health such as wealth, education, and employment have a more powerful effect on the future health status of the population.<sup>55–58</sup>

Eliminating health disparities entails addressing all of the issues that affect health. For instance, violence in a community leads to depression, post-traumatic stress, and low achievement in school. Providing health insurance to children in such communities might eliminate some of these symptoms and improve the children's health status, but addressing the root cause of the disparities requires curtailing the amount of violence. Indeed, it might be the case that investing in community policing and better schools will do more to improve health than providing better health insurance benefits.

The distribution of health and use of health care resources in a population is highly skewed. A few percent of people have severe chronic disease, have suffered a cataclysmic acute event such as massive trauma, or are born very prematurely. Over the course of a year, these individuals consume the dominant share of health care resources. For example, in any given year, less than 5 % of the population may use 50 % of all

dollars spent on health care, while 50 % of the population uses only 3 %.<sup>59</sup>

Thus, severe chronic or acute disease contributes both to poor health status in the population and to very high health expenditures. To reduce disparities in health status and control costs, we will need to treat patients more efficiently to prevent the occurrence of the acute or chronic conditions that move patients to the top 5 % of the cost distribution. This might mean preventing a gunshot wound that paralyzes an individual, triggering an extraordinarily expensive lifetime of medical care costs, or controlling obesity to reduce the prevalence of diabetes that produces a similar trajectory of high costs and reduced health status.

The fact that the health status and cost distributions are both skewed means that efforts to control costs, improve health status, and reduce disparities in health status should focus on using root cause analysis to reduce the number of individuals who have multiple chronic conditions, who suffer a cataclysmic acute event, or who are born very prematurely.

### SCIENCE AND TECHNOLOGY WILL INCREASE HEALTH CARE COSTS

In most industries in the United States, scientific advances have been associated with both higher quality and lower cost. Computers, cars, and a host of other products are now both less expensive and better quality. However, this is not often true for scientific advances in medicine.

A few years ago, RAND conducted a study to identify the most important health-related advances that might be produced by basic science in 2020 or 2030.<sup>60</sup> The best scientists in key fields were assembled, and the literature in the basic sciences and clinical science areas was reviewed. The hope was that this activity would identify disruptive changes produced by science and technology that would dramatically increase quality and dramatically lower costs.

An impressive list of potential advances was identified, ranging from a vaccine to prevent cancer to an anti-aging drug to devices to help a heart pump blood. Models were developed to determine how each advance would affect use, cost, and health if it became generally available.

The analysis suggested that some of the advances would be good buys, costing less than \$30,000 for each additional year of life they saved. Others were less good buys, costing hundreds of thousands of dollars—in some cases, millions of dollars—to save one year of life. Almost every one of these important advances, which the experts saw as likely in our future, increased rather than decreased the cost of medical care.

Based on this RAND study, the reasonable expectation for the foreseeable future should be that science and technology will make the cost problem in medical care more difficult to solve—not less. Given the increased pressure on cost from new technologies, the pressure to eliminate waste will increase rather

than decrease in the coming decades. Unfortunately, the scientific advances identified in the RAND work, although new and significant, were not sufficient to produce disruptive change that would both save money and improve quality of care.

In other industries, improving value has resulted from disruptive change. For example, consider the disruption in the steel industry when the method for producing steel changed radically. In the center of Bethlehem, Pennsylvania, is an abandoned steel plant, miles long and surrounded by barbed wire. It is a stark reminder of how changing technology affects both communities and individuals.

Examples of disruptive change in health care might be globalization of labor, making it possible for health care clinicians from other countries to offer care in the United States at a cost lower than care offered by U.S. based clinicians, or providing benefits to American citizens under the Medicaid program for long-term nursing home care that were valid only in Mexico.

We need disruptive and daring approaches to fixing the U.S. health care system. Disruptive innovations are risky, but we face immense problems in health and health care. Our solutions to them need to be commensurately big.

How can major advances in health services science contribute to improving the value received from health care and help to control cost? Here are some suggestions.

### HOW HEALTH SERVICES RESEARCH CAN FIX THE HEALTH CARE SYSTEM

***Integrate Health Status Measurement into the Health Care System.*** We know that health can be measured. So if producing health is the goal of a health system, then health must be measured. Otherwise, how can we assess what we are doing on either a clinical or policy level? There is broad consensus among policymakers and providers that health has physical, mental, social, and physiological components—some positive, some negative. But measuring health is not currently an integral part of any health system, anywhere in the world.

***Educate Consumers to Promote Wise Choices.*** An important finding from health services research is that when people have free care, they use more of it. However, free care does not make people healthier. We must educate both people who will receive free care and those who must cost-share about how to better use the health care system. If almost 18 % of US gross domestic product is being spent on health care today, increasing the value we get for health care dollars spent will require dramatically increasing people's understanding about how and when to use the health care system. When is an emergency department visit necessary? When is a wait-and-see approach the best option? What should people do to ensure that they receive only appropriate care from their physician? How about incentives to promote healthy behavior?

Education alone might not work and it will probably need to be coupled with incentives that are based on what we learn from the field of behavioral economics, but can we expect individuals to use health services wisely if they lack even basic knowledge about the issues raised in this Perspective? Can we expect clinicians and patients to have meaningful conversations about choice of therapy, quality, or value if the general population lacks such basic knowledge?

**Improve Quality Measurement.** Predicting whether a person will receive high quality care is almost impossible. However, science has now made it possible to measure many dimensions of quality. A comprehensive real-time system is needed to measure quality of care in order to prevent cost constraints from reducing quality and harming patients. Health care providers, consumers, and policy makers should use health services tools and methods to obtain answers to the following kinds of questions so that they can use the information to improve value.

Are more luxurious, more expensive hospitals likely to have fewer preventable deaths? Is an inexpensive physician likely to produce more deaths? Is a particular managed care organization, health maintenance organization, or accountable care organization a good buy? If a patient has diabetes or hypertension, should she receive a monthly report on her smart phone describing the quality of the care she is receiving?

No matter how one wants to change the health system to contain costs, information about health and quality must become far more prominent than it is today. It needs to be used to correct policies that have gone wrong; it should be used by patients and doctors on a real-time basis to improve care.

**Update Information About Appropriateness of Care.** As a component of quality assessment, appropriateness of care must also be explicitly measured. Even “great care” given to the wrong patients (or at the wrong time) can cause more harm than good. Currently, we have no up-to-date information about the proportion of care that is less than appropriate. To estimate the proportion, we must rely on findings from studies done decades ago.

Medical leaders are calling for greater accountability, especially in appropriateness of care. Using the existing appropriateness method as a foundation, the medical profession could begin to build an updated system that would provide explicit assessments of appropriateness. As a point of departure, appropriateness criteria could be developed for 50 expensive, elective procedures or diagnostic tests.<sup>61</sup>

In summary, suppose we wanted to purchase a health insurance policy in a competitive health care system that would allow us to enroll in a plan with the following characteristics. We would be treated humanely. If we needed a health service, we would receive it from a team who provided excellent care. Only care that was appropriate was provided.

Fifty years ago, the science wasn't available to design such a plan. Now it is. Should somebody somewhere in the world

offer such a plan? In truth, we do not know whether such a plan exists, because we do not explicitly measure the three essential components: humaneness, excellence, and appropriateness.

**Eliminate the Effect of Geography.** Any policy that addresses the value of health care also needs to address how geography affects the amount and kind of care a person receives. For a policy to be viable over the long term, it needs to eliminate the relationship between where one lives and the amount of care received. Living in Boston versus Des Moines should not predict how many tests for diabetes one receives. Information on quality, appropriateness, and health needs to be made available on a geographic level so that geographic-specific policies can be implemented.

**Integrate Care for Mental Health Care.** Behavioral health services should not be “carved out” from other health services. Care for physical and mental health should not be provided in stove-piped delivery systems that rarely communicate. Perhaps policies should be evaluated on the extent to which they integrate care and information about mental health, such as depression and substance abuse, with traditional medical care, such as blood pressure control or diabetes monitoring.

**Understand the Social Determinants of Health.** The social determinants of health are extremely powerful.<sup>56,62</sup> The question is how should the systems and forces that influence health—for example, the medical system, the public health system, tax policies, and investments in public education—interact to improve health. Should policies try to eliminate the boundaries between these systems and promote an integrated approach to producing health? For instance, should all health professionals treating children require that a school report card be available at each visit, underscoring the message that the child's future health status is highly dependent upon educational achievement?<sup>57</sup> People who live in places with grid cities and grid streets walk more and have less obesity than those who live in cul-de-sacs.<sup>63,64</sup> Should doctors give patients that information so that they understand how environment can affect childhood obesity and respond, for example, by choosing places to live that facilitate walking to visit friends? Should physicians help patients acknowledge that the widespread availability of food hinders maintaining normal body weight and suggest that communities lobby to eliminate food from all establishments that are actually selling other products such as gas, hardware, or clothes? To promote population health, the roles of medical care, public health, and social determinants of health should be merged into one model.

**Foster Disruptive Change.** Achieving value and controlling costs will require disruptive change in the delivery of medical care. For example, how can we rapidly conduct experiments to determine the level of capability required to deliver many common services in medicine? Does one need a doctor to



remove a cataract...to fix a torn knee ligament...to advise patients how to lose weight? If the health care system is going to be reinvented and waste eliminated, then we need to decide quickly how to address such workforce issues.

Similarly, we need to determine how we can motivate industry to produce new devices and drugs that are cost saving and extend life for more than a few months. Can we change patent laws and intellectual property rights to facilitate the development of an industry that would produce a different set of products?

We can make almost any reasonable health policy work if we want. But it will require paying attention to key facts emerging from 50 years of health services research. The magnitude of the change required is so great that it is not sufficient to focus on the facts sequentially. It will not do to spend 10 years learning how to use health status measurement in clinical care, another 10 years to create a transparent comprehensive system of quality measurement, and yet another 10 years to develop a health system that uses its labor and financial resources efficiently.

We need comprehensive, disruptive change—not innovation at the margin. What ideas would society and physicians put on the table if they were allowed to be creative and set aside contravening regulatory constraints?

The health services research of tomorrow might look very different from that of today. Perhaps the ideas in this Perspective will provide a compass for tomorrow's researchers. Perhaps these thoughts could motivate youth—anywhere in the world—to use crowd sourcing, prizes, games, and social media to fundamentally change the relationship between people and their health care system.

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