Chapter 24

Prospects for change

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Abstract: This chapter addresses the prospects for change in health care delivery. The focus is on value – high quality, affordable care for everyone. We consider three domains that participate in the flow of value and the nature of the interfaces among these domains. We also discuss strategic priorities that should align in various ways with these domains. Finally, we address the business transformations needed to enable the provision of value by enterprises that are viable and successful.

1. Introduction

Most people think that the health care system in the United States is broken and that we need to get about the business of fixing it. The truth is that “the system” cannot be fixed because it does not exist in the sense that it was never engineered to provide quality, affordable health care to everyone. This chapter considers the prospects for an engineered system that will provide these benefits.

There has never been a vision or systematic design for health care in this country. Historically, physicians – as independent business owners – hung out their shingles and provided care to patients. Little thought was given to how these providers would relate to one another or to ancillary health care entities, such as medical supply and insurance companies. We should not be surprised, then, with the outputs of our “non-system”: lack of insurance, widely variable outcomes, inconsistent service and low safety results – and all this at very high overall cost.

It is clear that tweaks to our home-grown approach will not work. Instead, we need to step back and design a true system of health care. Engineering clearly plays a crucial role in this process. Several universities – including Georgia Tech, University of Wisconsin – Madison, and Purdue – have begun to offer engineering programs in health care delivery science. Physicians, nurses, and engineers must become partners to design interdependent systems that will measure and produce what we want from our health care delivery system – the best outcomes, safety, and service for all citizens at the lowest possible costs. In other words, value.

2. Health care by design

A simple series of patient-centered questions can help us begin to outline the health care system of the future.

1. The first question: Who wants to be admitted to a hospital tomorrow – even if it’s the best hospital in the world?
2. The second question: Who would like to be sick tomorrow?
3. The last question: Who wants to be a patient, someone who long suffers and endures?

About 99 percent of people answer no to these three questions. The implications of these answers are profound, and require a new approach and design for a new health system. For instance, if we all want to stay out of hospitals for as long as possible – to stay healthy – then should we view a hospitalization as a possible failure of the system?

This short exercise points to the goal of a new health care system: health. The delivery system should strive to keep individuals as healthy and high-functioning as possible, and provide quality, affordable health care services if they do get sick – in short high value health care.

3. Provider responsibilities

The central responsibility for providers is to create a learning health care system [12]. Figure 1 summarizes the key components of a learning health care system.

To create healthy populations, health care professionals must share information across time and space. Leaders in health care must create an environment within and among organizations in which it is natural to share successes and what we have learned from failures. For instance, when a hospital in one area of the United States finds a way to reduce the risk of administering a medication or eliminate a complication of surgery, would it not be appropriate for every other hospital to learn of this quickly? This is how we can quickly raise the quality (outcomes, safety, and service) – by creating a health care system that is a learning organization [5].

Information is key to providing safe and effecting ongoing care, and is mandatory if we are to generate knowledge. New information and knowledge will develop at ever-increasing speeds during the next few
years – biotechnological discoveries in genomics, proteomics, immunology, pharmacogenomics, vaccines, micromonitoring and electrical stimulation are a few examples. Therefore the role of Information Technology (IT) becomes clear, and is paramount to enable a functioning learning system for health care. Information technology is the key tool that underpins all components in Fig. 1. We must use information technology to assemble an individual’s relevant data and the most up-to-date treatment recommendations, and use them to make evidence-based medical decisions. Right now, some integrated medical practices and commercial companies are building computer systems that provide point-of-service information with push technology to improve medical decision making for patients.

The learning organization concept provides the framework for a new health care system, the output of which should be quality, affordable care for all. To generate this product, providers must focus on four elements: value, integration/coordination, individualized medicine and the science of health care delivery.

3.1. Value

The sole purpose of a learning organization concept for health care is to produce high-value health care – high quality, affordable care. A proposed definition of value is to measure these parameters and express them in the following equation: Value equals Quality divided by Cost Over Time, or \( V = \frac{Q}{C} \).

Quality (Q) – the numerator – includes clinical outcomes, safety and patient-reported satisfaction.

- Examples of outcome measures for hospital care, procedures and chronic conditions: hospital admissions, emergency department visits, unplanned readmissions, mortality rates, post-operative complications, days absent from school or work, measures of organ function and Short Form health survey scores
- Examples of safety measures: central line infection rates, medication errors, post-operative complications
- Examples of patient satisfaction: National Research Corporation’s Healthcare Market Guide

Performance measurement information is currently available through a variety of respected sources, including the Agency for Healthcare Research and Quality, Ambulatory Care Quality Alliance, National Quality Foundation, Leap Frog, AQA Alliance, University HealthSystem Consortium, Medicare Provider Analysis and Review, and the Commonwealth Fund.

Cost (C) – the denominator – encompasses the cost of care over time (not per line item of service). Regional Medicare spending data from Medicare itself or from the Dartmouth Atlas of Healthcare could provide the information necessary to round out the equation.

Using these data, we can create a publicly displayed “value score” for different medical institutions. The value score would offer clearer information on many aspects of a medical provider’s care. If one institution can diagnose and treat a patient with $10,000 worth of tests while another, for the same result, costs $15,000, there is a clear value gap. Armed with concrete data, people could choose a high-value facility over a place that charges more but delivers less. Health care providers would then begin to compete on the elements that matter most – outcomes, safety, service and cost. Providers with worse outcomes, less-satisfied patients and higher costs would lose patients, which would spur them to improve the factors that are lowering value.

3.2. Integrated, coordinated care

As our society ages, more people are living with multiple complex, chronic conditions such as diabetes and heart failure. They need an integrated, coordinated approach to their health care. Often, however,
a wife or adult child takes on the complex task of coordinating care for an ailing relative, perhaps from thousands of miles away.

The new health care system should foster integrated, coordinated care for all patients. Integration – which focuses on the way that providers interact and organize themselves in order to create value for patients – is sorely lacking in American health care, in part because of the entrepreneurial spirit in which medicine is rooted. Care coordination, such as the efficient organization of patient visits, tests and procedures, should be a natural outgrowth of well-integrated care.

Moving forward, physicians, nurses, and other providers can organize themselves in a variety of ways – group practices, integrated networks of independent providers, physician hospital organizations or “virtual” groups – to better integrate and coordinate care. The point is to develop mechanisms to coordinate care among medical and surgical specialists so that patients have access to teams of providers who can effectively and efficiently meet their needs [4].

3.3. Individualized medicine

The emerging science of Individualized Medicine (IM) holds promise to drive high-value care by growing medical knowledge to facilitate prediction of disease risk, prevention, precise diagnosis, and tailored treatment and follow-up for genetically similar groups and ultimately, a single person.

For example, we used to think all breast cancer was alike. We now know that there are more than 100 types of breast cancer that can be genetically identified, and we offer combinations of eight to 10 different treatments right now. Ten years from now we may have 100 different treatments that will be specific for each woman’s genetic make-up.

As the science of IM develops, trial-and-error in medical practice will be replaced by more precise diagnosis and evidence-based treatments based upon genetic and proteomic characteristics. In a *Boston Globe* editorial, Francis S. Collins, M.D., Ph.D., who led the Human Genome Project, envisions a time when patients will have their genomes sequenced for $1,000 or less, possibly through microchip or other innovative DNA sequencing technology. “That information can then be used to guide prescribing patterns and develop a lifelong plan of health maintenance customized to our unique genetic profiles,” he writes [2].

IM has tremendous potential to increase the value of health care by allowing medical professionals to get it right the first time – better predicting disease risk, preventing disease development and managing disease treatment more efficiently – thereby keeping people healthier and active longer, improving outcomes, shortening hospital stays and decreasing long-term health care expenditures [3].

3.4. Science of health care delivery

Health care delivery science uses systems engineering principles to analyze outcomes and processes of care with the goal of improving quality and reducing costs.

Consider an example of this principle from a Mayo Clinic benefactor, who founded the Cutter Insect Repellant Company. He noted that when he started Cutter, the product contained 0.001 percent of the active ingredient DEET, which was dissolved in a hydrocarbon solvent. This solvent – which delivered the active ingredient – was expensive and toxic. People didn’t like it because it was oily and irritated the skin. So while most of his competitors were doing basic research to improve the active ingredient, the Cutter entrepreneur set out to change the “delivery system” – the method by which the user received the active ingredient. After all, the delivery system was the most expensive and toxic component of the product. The company formed a team to set about solving the delivery system problem. Within several
months, the team had completed the task. Using a new delivery method, Cutter was able to reduce their internal costs, completely eliminate the toxicity, and lower the price for their product. This is a real example of an engineering approach that increased value by focusing on the delivery system. This example illustrates how engineering thinking can improve the delivery of health care?

If we can apply the full scope of engineering sciences to the science of health care delivery, we will learn how to bring teams of people together to solve problems with the way health care is currently provided. Using the aviation industry as an example, just imagine the improvements in safety that could be accomplished by applying human-factors analysis and classification systems to medical errors, medication errors and procedural complications [13].

4. Government responsibilities

Within a reformed health care system, the government has two responsibilities: insurance for all and payment reform that rewards value.

4.1. Insurance for all

Tens of millions of Americans are uninsured or underinsured and frequently don’t seek the care they need because they cannot afford it. Conversely, lack of insurance creates significant economic problems for health care providers and employers. The American Hospital Association [1] reports that hospitals provided $34 billion in uncompensated care to the uninsured and underinsured in 2007. And many companies – finding it difficult to compete globally when faced with paying billions of dollars to insure employees, retirees and dependents – are reducing or eliminating health insurance coverage.

For both humanitarian and economic reasons, we must guarantee that all Americans have access to health insurance, regardless of their ability to pay.

The current private health insurance system must be reformed to align with a proposal from Len Nichols and John Bertko [8] of the New America Foundation:

- Require Americans to purchase health insurance
- Provide sliding-scale subsidies to help those in need to buy the insurance
- Prohibit pre-existing condition exclusions
- Define a minimum health benefit package or actuarial equivalent
- Adjust risk-levels among enrollees

Within the context of a reformed insurance system, the government could create a simple coordinating mechanism for individuals to select a basic private insurance plan from several options – perhaps modeled after the Federal Employees Health Benefit Plan (FEHBP).

4.2. Pay for value

Politicians typically tell us that the United States is not getting what it pays for in health care. The reality is that we are – we are getting more tests, procedures and hospitalizations because the sicker the patient is, the more money providers make. There is a huge variation in Medicare spending for similar patients with similar outcomes in different parts of the country [6]. Those who do more – such as ordering more tests and procedures, for example – earn more money, even if those tests do not improve the patient’s outcome.
These trends should not be surprising – they are the inevitable results of the laws of economics in a fee-for-service environment. Legislators must focus energy on creating new ways to provide fair payment to doctors and hospitals that offer high-quality, lower-cost care. The Medicare program is the lever that Congress can use to start us along this path.

Meaningful change – meaningful improvement in health care – will require that we overhaul how we pay for health care by financially rewarding providers who give patients the value that they expect and deserve – good outcomes and compassionate, coordinated care at a reasonable price over time. (See the section on “value.”) Using standard performance data, we can create and base portions of payment on a simple “value score” for clinics and hospitals. Over time, we believe that basing payment on value scores will put downward pressure on the cost curve by rewarding high-quality, efficient providers with payment increases over the standard Medicare rate. When a portion of their payments are based upon value, doctors and hospitals will begin to seriously weigh the benefit of ordering more tests because additional medical spending that does not improve outcomes reduces overall value – and consequently would reduce their Medicare reimbursement.

We propose that Congress set a three-year deadline for creating and implementing new Medicare payment methods. To align the payment system with value, we recommend that Congress clearly delegate responsibility and authority to establish new Medicare payment methods to either the Secretary for Health and Human Services (who could form an advisory board, if desired) or a quasi-independent commission. The idea is to create a longer-term, problem-solving function that is outside of yet reports progress to and is accountable for results to the US government. Other issues – such as administrative simplification, safety reporting and medical-evidence dissemination – could also be under this board’s purview.

5. Re-engineering to create a health care system

System engineers – who study complex interdependent functions and help them work together more effectively and efficiently – need to lend their expertise to health care design, specifically focusing on creating a learning health care system that generates value. Although no intentionally designed health care system exists in the United States, we can start the discussion of how to design a system by focusing on the three dominant domains of activity in the current milieu – see Fig. 2.

5.1. The knowledge domain

The knowledge domain is where research and development is done. In this domain, we find research institutions, academic medical centers, drug and device manufacturers, funding agencies such as the National Institutes of Health and regulatory agencies such as the Food and Drug Administration. There is some connectivity within this domain – scientists from different centers collaborate on projects; device manufacturers work with researchers to design and test products. For the most part, however, these working relationships form randomly.

5.2. The care-Delivery domain

The second domain is where the patient receives health care services. The patient should be at the center of all efforts here, where care is coordinated. People who work in this domain must provide coordinated, integrated, high-value care that is effective, efficient, timely, safe, equitable and patient
centered. All incentives within health care must be aimed at this “target” domain, where health and value are generated for patients.

The majority of health care providers operate as islands within this domain. As a general rule, there are few connections between and among the providers here. Granted, there are pockets of collaboration that occur in spite of current barriers. In a newly designed system, inter-institutional collaboration should be a natural output of the system.

However, some organizations – integrated group practices, academic medical centers and virtual medical associations – operate as systems. These groups organize and coordinate care for their patient base. Examples include Geisinger Medical Center, Intermountain Health, Marshfield Clinic, Gunderson Clinic, Health Partners (Minneapolis), Partners Health (Boston), Scott White Clinic, Group Health of Puget Sound and Kaiser. These institutions demonstrate the possibilities of optimizing collaboration among providers in order to deliver better care to patients. Here’s another example: Staff at Mayo Health System – a network of 500 physicians, 18 hospitals and 65 delivery sites within a 200-mile radius of the main Mayo Clinic campus in Rochester, Minnesota – work together to provide patients with the right care at the right time and in the right setting.

5.3. The payer domain

Finally, we have the payer domain. This is the “group of groups” that pays for health care services. It includes individuals, private insurance companies, big and small employers, self-insured employers, the state and federal governments, the military and the Veterans Administration. In the near future, this domain must outline new rules for insuring all Americans and change incentives to drive high-value care.

From a provider’s perspective, this domain appears to be in a state of chaos at the moment. It is rare that any medical payments are linked to any logical measure of outcomes, safety, service or lower spending.
5.4. Interfaces between domains

Although there is much work to be done to improve function within these three domains, an urgent priority should be to focus attention at the interfaces, where value is seeping through the cracks. One of the major problems in this country is that no organization, person or group has managed what happens at these junctures. As indicated in Fig. 3, we continue to pay a huge price for our lack of attention.

For example, take a look at the interface between the knowledge and care-delivery domains. We have all kinds of great ideas coming out of the knowledge domain, in large part because of the huge investments that the government, benefactors and drug/device manufacturers make in science. Then those ideas hit the interface to care delivery, and what happens? A lot of waiting. The feedback loop – from bedside to bench – occurs fairly quickly, but the translation to care delivery is extremely slow.

On average, it takes about 17 years to translate a medical advancement into common practice. Even after the knowledge makes it through the interface, users apply it correctly only 50 percent of the time [7]. Instead, patients receive their doctors’ current state of knowledge – but certainly not what the whole system knows.

In addition, there is no rationality at the interface between the care delivery and payer domains. For example, providers may offer a potentially high-value service such as an e-consult, but the government-run insurance companies (Medicare, Medicaid) and most private insurance companies deny coverage because it falls outside of the traditional realm of the office visit. Given this situation, it is no surprise that providers quickly read the feedback loop and make sure they provide care for people in a way that
they can get paid – in the office, hospital, or worse yet, in the ER. (In fairness, some private insurers are beginning to collaborate with selected providers and experimenting with non-traditional care delivery.)

For those medical services that make it through the interface, there is little predictability about whether the payment will cover the cost. Private insurance companies rely on negotiated discounts as their predominant mechanism for establishing payments, while the government-run insurance companies set the fee with little or no negotiation with providers. The results are arbitrary. Some are underpaid, overpaid or denied, without a sensible or predictable rationale.

5.5. Aligning six strategic priorities within the three domains

There are six strategic priorities required to create a learning organization for health care that spans the domains and provide a starting point for managing interactions at the interfaces:

- Value
- Integrated, coordinated care
- Individualized medicine
- The science of health care delivery
- Pay for value
- Insurance for all

Figure 4 aligns these strategic priorities with the three domains. The nature of these strategic priorities and their relationships with the domains are as follows:

- Individualized Medicine research emanates from the knowledge domain and is translated for use into the care delivery domain to increase value for patients.
– The science of health care delivery is a key concept that acts at the interface between knowledge and application in the care delivery domain, but it also plays a significant role in improving value within the care delivery domain itself.

– Value generation and integrated, coordinated care are responsibilities of the care delivery domain.

– Paying for value is key to getting the interface between the care delivery domain and the payer domain to function correctly. In order to get high-value health care, we should be certain we are paying it.

– Within the payer domain, new rules for insuring all Americans must be established.

5.6. Managing at the interfaces: Opportunities for engineering

Today and into the future, engineers have significant opportunities to collaborate with providers, scientists, patients, businesses and payers to actively manage domain intersections with the goal of creating a high-value learning organization for U.S. health care. We need to apply system, financial, software and behavioral engineering principles to address a number of important questions, including:

– Within the knowledge domain, how can we speed knowledge creation and dissemination back and forth across the interface so patients always receive the best advice?

– Within the payer domain, how can we align incentives to encourage the provision of high-value care? How can we design incentives to encourage individuals to make healthy choices?

There are no straightforward answers to these complex questions, but we should begin the journey toward solutions. That’s why engineers must become an integral part of the health care team. America can no longer afford the high price associated with disorganization.

6. Business transformation

Thus far, we have focused on the transformation of healthcare delivery. Now we shift our attention to the business side of the equation. We expect healthcare businesses will transform in the process of transforming healthcare delivery, but which will be the chicken and which the egg? Fortunately, there is a rich history of enterprise transformation to draw upon [10].

Our studies of what drives fundamental change, how change is addressed, and what practices seem best – or worst – have led to a theory of enterprise transformation [9].

*Enterprise transformation is driven by experienced and/or anticipated value deficiencies that result in significantly redesigned and/or new work processes as determined by management’s decision making abilities, limitations, and inclinations, all in the context of the social networks of management in particular and the enterprise in general*

In light of our line of reasoning advanced earlier in this chapter, the types of health care value deficiencies are quite clear. From a business perspective, enterprises that do not remediate these healthcare deficiencies will experience business deficiencies in terms of lost revenue, profits, and share prices. Innovators will transform the work they do and how they do it. This will require that the managers of these enterprises make decisions, that many will argue are too risky, while also assuring that the social networks associated with the enterprise commit to the needed changes.

To move beyond this rather abstract argument, consider the transformation of the retail industry over the past six decades. After World War II, consumer product companies like Proctor & Gamble pretty
much dictated the choices consumers had and the prices of these choices. The highly fragmented retail industry (sound familiar?) had little leverage in this process.

Wal-Mart was founded in 1962. By the late 1970s and early 1980s, Wal-Mart was transforming the retail marketplace. They led the revolution in retail that resulted in a small number of big box retailers dominating via integrated supply chain management, vendor-managed inventory, etc. The result was the retailers controlling the game and consumer product companies marching to their tunes.

With the advent of the Internet in the late 1990s, consumers came to have easy access to information on prices, quality, reliability, service and availability. They know where the best deals are and seek value in terms of price, variety, convenience, and so on. The consumer is now in charge. Both the retailers and the consumer product companies have to chase the consumers.

As shown in Fig. 5, we see healthcare evolving in a similar manner. The current craft industry will adopt the best practices of integrated health systems like Cleveland Clinic, Geisinger Health System, Gundersen Lutheran, Intermountain, Kaiser, Marshfield Clinic, Mayo Clinic, Scott & White Healthcare, and Virginia Mason. In the process, thousands of independent providers will be reduced to perhaps 40–50 integrated systems across the US. This will result in dramatic cost savings as well as greatly enhanced quality of care.

This transformation will be driven by the inability of small providers to invest in the infrastructure and expertise to compete based on value. There will be many acquisitions and mergers. There also are likely to be alliances and federations to share services such as back office functions. The successful acquisitions, mergers, alliances, and federations will be those who can provide value – high quality, affordable care. Simply stitching together a number of poorly performing providers will only result in a large poorly performing provider.
In parallel with the above trend, but probably lagging a bit, will be the emergence of empowered consumers. Online resources such as personal electronic health records, personalized wellness and health advice (from vetted sources), and provider performance and cost information will empower consumers to make better decisions, possibly supported by their personal health advisor. Direct control of whatever mechanism they use to pay for healthcare will enable making these decisions. Providers will have no choice but provide the health equivalent of “everyday low prices” in the sense that consumers will know precisely what they should pay for what level of service. If these expectations are not met, they will go elsewhere.

Some health thought leaders have argued with the possible parallels between healthcare and retail. Our retort has been, “If retail operated like you operate, three months after you bought a toaster at Wal-Mart you would get 12 invoices from all the suppliers to the toaster manufacturer, many for things that you never would have imagined were in a toaster.” The point is that retail is a huge success story. Sure, healthcare is much more complicated than toasters; that’s why you will have a health advisor but not an appliance advisor.

7. Conclusions

This chapter has addressed the prospects for change in health care delivery. The focus was on value—high quality, affordable care for everyone. We considered three domains that participate in the flow of value and the nature of the interfaces among these domains. We also discussed strategic priorities that should align in various ways with these domains. Finally, we addressed the business transformations needed to enable the provision of value by enterprises that are viable and successful.

The resulting vision is both profound and compelling. It also involves enormous change by a wide variety of stakeholders, many of whom have made substantial investments in the business models that must be displaced [11]. The needed changes are likely to be quite disruptive. Fortunately, the worsening crisis in financing health care for an aging population with a steadily increasing prevalence of chronic disease will force fundamental change. This book has outlined a wealth of best practices and success stories. We know much of what is needed to engineer the system of healthcare delivery. We need to collectively embrace the many good ideas in this book and get going.

References


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