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The big-data revolution in US health care: Accelerating value and innovation

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Big data could transform the health-care sector, but the industry must undergo fundamental changes before stakeholders can capture its full value.

A big-data revolution is under way in health care. Start with the vastly increased supply of information. Over the last decade, pharmaceutical companies have been aggregating years of research and development data into medical databases, while payors and providers have digitized their patient records. Meanwhile, the US federal government and other public stakeholders have been opening their vast stores of health-care knowledge, including data from clinical trials and information on patients covered under public insurance programs. In parallel, recent technical advances have made it easier to collect and analyze information from multiple sources—a major benefit in health care, since data for a single patient may come from various payors, hospitals, laboratories, and physician offices.

Fiscal concerns, perhaps more than any other factor, are driving the demand for big-data applications. After more than 20 years of steady increases, health-care expenses now represent 17.6 percent of GDP—nearly \$600 billion more than the expected benchmark for a nation of the United States's size and wealth.¹ To discourage overutilization, many payors have shifted from fee-for-service compensation, which rewards physicians for treatment volume, to risk-sharing arrangements that prioritize outcomes. Under the new schemes, when treatments deliver the desired results, provider compensation may be less than before. Payors are also entering similar agreements with pharmaceutical companies and basing reimbursement on a drug's ability to improve patient health. In this new environment, health-care stakeholders have greater incentives to compile and exchange information.

While health-care costs may be paramount in big data's rise, clinical trends also play a role. Physicians have traditionally used their judgment when making treatment decisions, but in the last few years there has been a move toward evidence-based medicine, which involves

¹ This estimate is based on a measure developed by McKinsey, "estimated spending according to wealth," which is derived from a regression analysis of income and spending data from other countries in the Organisation of Economic Co-operation and Development. It allows us to estimate how much a given country would be expected to spend on health care based on per capita GDP.

systematically reviewing clinical data and making treatment decisions based on the best available information. Aggregating individual data sets into big-data algorithms often provides the most robust evidence, since nuances in subpopulations (such as the presence of patients with gluten allergies) may be so rare that they are not readily apparent in small samples.

Although the health-care industry has lagged behind sectors like retail and banking in the use of big data—partly because of concerns about patient confidentiality—it could soon catch up. First movers in the data sphere are already achieving positive results, which is prompting other stakeholders to take action, lest they be left behind. These developments are encouraging, but they also raise an important question: is the health-care industry prepared to capture big data's full potential, or are there roadblocks that will hamper its use?

A new value framework

Health-care stakeholders are well versed in capturing value and have developed many levers to assist with this goal. But traditional tools do not always take complete advantage of the insights that big data can provide. Unit-price discounts, for instance, are based primarily on contracting and negotiating leverage. And like most other well-established health-care value levers, they focus solely on reducing costs rather than improving patient outcomes. Although these tools will continue to play an important role, stakeholders will only benefit from big data if they take a more holistic, patient-centered approach to value, one that focuses equally on health-care spending and treatment outcomes. We have created five pathways to assist them in redefining value and identifying tools that are appropriate for the new era. They focus on the following concepts:

- **Right living.** Patients must be encouraged to play an active role in their own health by making the right choices about diet, exercise, preventive care, and other lifestyle factors.
- **Right care.** Patients must receive the most timely, appropriate treatment available. In addition to relying heavily on protocols, right care requires a coordinated approach, with all caregivers having access to the same information and working toward the same goal to avoid duplication of effort and suboptimal treatment strategies.
- **Right provider.** Any professionals who treat patients must have strong performance records and be capable of achieving the best outcomes. They should also be selected based on their skill sets and abilities rather than their job titles. For instance, nurses or physicians' assistants may perform many tasks that do not require a doctor.

- **Right value.** Providers and payors should continually look for ways to improve value while preserving or improving health-care quality. For example, they could develop a system in which provider reimbursement is tied to patient outcomes or undertake programs designed to eliminate wasteful spending.
- **Right innovation.** Stakeholders must focus on identifying new therapies and approaches to health-care delivery. They should also try to improve the innovation engines themselves—for instance, by advancing medicine and boosting R&D productivity.

The value pathways evolve as new data become available, fostering a feedback loop. The concept of right care, for instance, could change if new data suggest that the standard protocol for a particular disease does not produce optimal results. And a change in one pathway could spur changes in others, since they are interdependent. An investigation into right value, for example, could reveal that patients are most likely to suffer costly complications after an appendectomy if their physician performs few of these operations. This finding could influence opinions not only about value but about the right provider to perform an appendectomy.

The pathways in action

Some health-care leaders have already captured value from big data by focusing on the concepts outlined in our pathways or have set the groundwork for doing so. Consider a few examples:

- Kaiser Permanente has fully implemented a new computer system, HealthConnect, to ensure data exchange across all medical facilities and promote the use of electronic health records. The integrated system has improved outcomes in cardiovascular disease and achieved an estimated \$1 billion in savings from reduced office visits and lab tests.
- Blue Shield of California, in partnership with NantHealth, is improving health-care delivery and patient outcomes by developing an integrated technology system that will allow doctors, hospitals, and health plans to deliver evidence-based care that is more coordinated and personalized. This will help improve performance in a number of areas, including prevention and care coordination.
- AstraZeneca established a four-year partnership with WellPoint's data and analytics subsidiary, HealthCore, to conduct real-world studies to determine the most effective and economical treatments for some chronic illnesses and common diseases. AstraZeneca will use HealthCore data, together with its own clinical-trial data, to guide R&D investment decisions. The company is also in talks with payors about providing coverage for drugs already on the market, again using HealthCore data as evidence.

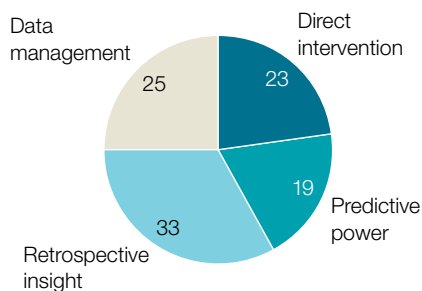
During a recent scan of the industry, we found that interest in big data is not confined to traditional players. Since 2010, more than 200 new businesses have developed innovative health-care applications. About 40 percent of these were aimed at direct health interventions or predictive capabilities. That's a powerful new frontier for health-data applications, which historically focused more on data management and retrospective data analysis (exhibit).

Some devices take patient monitoring to a new level. For instance, Asthmapolis has created a GPS-enabled tracker that records inhaler usage by asthmatics. The information is ported to a central database and used to identify individual, group, and population-based trends. The data are then merged with Centers for Disease Control and Prevention information about known asthma catalysts (such as high pollen counts in the Northeast or volcanic fog in Hawaii). Together, the information helps physicians develop personalized treatment plans and spot prevention opportunities.

Another company, Ginger.io, offers a mobile application in which patients with select conditions agree, in conjunction with their providers, to be tracked through their mobile phones and assisted with behavioral-health therapies. The app records data about calls, texts, geographic location, and even physical movements. Patients also respond to surveys delivered over their smartphones. The Ginger.io application integrates patient data with

Exhibit **Many innovative US health-care data applications move beyond retroactive reporting to interventions and predictive capabilities.**

US health-care data apps from top innovators,¹ by type of data/analytic capability, 2010–12, %
100% = 132



The apps analyzed cut across all of the US health-care system's **data-related value at stake**, estimated at **>\$300 billion**.²

Many use proprietary data generated through technologies such as GPS-enabled devices and mobile apps that capture daily activity or patient-reported outcomes.

¹ Drawn from top 100 submissions to Health Data Initiative Forum, 2010–11, and health technology companies receiving \$2 million or more in venture-capital funding, 2011–12; excludes ideas that did not involve big data.

² See *Big data: The next frontier for innovation, competition, and productivity*, McKinsey Global Institute (May 2011), on mckinsey.com.

Source: 2010–11 submissions to Health Data Initiative Forum; Rock Health; Standard & Poor's Capital IQ; McKinsey analysis

public research on behavioral health from the National Institutes of Health and other sources. The insights obtained can be revealing—for instance, a lack of movement or other activity could signal that a patient feels physically unwell, and irregular sleep patterns (revealed through late-night calls or texts) may signal that an anxiety attack is imminent.

Improvement at scale: What is the potential?

To determine the opportunity of the new value pathways, we evaluated a range of health-care initiatives and assessed their potential impact as total annual cost savings, holding outcomes constant, using a 2011 baseline. If these early successes were scaled up to create systemwide impact, we estimate that the pathways could account for \$300 billion to \$450 billion in reduced health-care spending, or 12 to 17 percent of the \$2.6 trillion baseline in US health-care costs.

Even a few simple interventions can have an enormous impact when scaled up. In the “right living” pathway, for instance, we estimate that aspirin use by those at risk for coronary heart disease, combined with early cholesterol screening and smoking cessation, could reduce the total cost of their care by more than \$30 billion. While these actions have been encouraged for some time, big data now enables faster identification of high-risk patients, more effective interventions, and closer monitoring.

Our estimate of \$300 billion to \$450 billion in reduced health-care spending could be conservative, as many insights and innovations are still ahead. We have yet to fully understand subpopulation efficacy of cancer therapies and the predictive indicators of relapse, for example, and we believe the big-data revolution will uncover many new learning opportunities in these areas.

A few caveats


Although we are optimistic about big data’s potential to transform health care, some structural issues may pose obstacles. The move away from fee-for-service care—already well under way—must continue. Similarly, traditional medical-management techniques must change, since they pit payors and providers against each other, framing benefit plans with respect to what is and is not covered rather than what is and is not most effective. And all stakeholders must recognize the value of big data and be willing to act on its insights, a fundamental mind-set shift for many and one that may prove difficult to achieve. Patients will not benefit from research on exercise, for example, if they persist in their sedentary lifestyles. And physicians may not improve patient outcomes if they refuse to follow treatment protocols based on big data and instead rely solely on their own judgment.

Privacy issues will continue to be a major concern. Although new computer programs can readily remove names and other personal information from records being transported into large databases, stakeholders across the industry must be vigilant and watch for potential problems as more information becomes public.

Finally, health care will need to learn from other data-driven revolutions. All too often, players have taken advantage of data transparency by pursuing objectives that create value only for themselves, and this could also occur in the health-care sector. For instance, owners of MRI machines, looking to amortize fixed costs across more patients, might choose to use big data only to identify underserved patients and disease areas. If they convincingly market their services, patients may receive unnecessary MRIs—a situation that would increase costs without necessarily improving outcomes.



Big-data initiatives have the potential to transform health care. Stakeholders that are committed to innovation, willing to build their capabilities, and open to a new view of value will likely be the first to reap the rewards of big data and help patients achieve better outcomes.

Download the full report, *The 'big data' revolution in healthcare: Accelerating value and innovation*, on mckinsey.com. 

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