

How do you prepare today for the health care of tomorrow?

New horizons

The executive briefings collection
September 2016 edition



The better the question. The better the answer. The better the world works.



Building a better
working world

To our clients and other friends



Jacques Mulder
EY Global Health
Sector Leader

“We engage with the wicked problems in health because we recognize that health is an asset and that we have a responsibility to help people everywhere live healthier and more productive lives. This is a pursuit inextricably linked with EY’s purpose: to build a better working world.”

Welcome to *New horizons*! In response to your feedback, we are pleased to introduce a new executive briefing format to make reading and discussing health trends quicker and easier. In this edition, we focus on several issues that have the potential, each in its unique way, to disrupt how health care is reimagined and delivered. I hope you enjoy this new, digital-friendly collection of health sector insights.

Health, more than any other sector, has a human face. We see it when we look in the mirror and at the people in our own lives. At EY, this belief motivates us to examine closely the drivers that are reshaping how the world thinks about – and approaches – health:

- 1. Spending:** Unsustainable levels of spending on health care, alongside the shift to value-based care and population health management, drive the search for the most effective and affordable solutions.
- 2. Technology:** Emerging technologies empower health consumers and shift the locus of control in their direction. This is already disrupting the delivery of care and will lead to a complete reimagining of health and health care.
- 3. Mindset:** Worldwide, attitudes toward health are changing: people are viewing access to care as a right, while governments recognize that the overall wellness of a population is an economic asset that requires well-planned investment.

The topics we discuss in *New horizons*, including data analytics, cybersecurity, patient centricity and the search for sustainable solutions for chronic diseases, address these challenges and are responses to these drivers. I hope you find the articles thought provoking and useful in thinking about how your organization can meet the challenges over the horizon.

New horizons is part of EY’s contribution to redefining health as a holistic pursuit – an all-encompassing, daily and lifelong engagement with wellness, not just of concern when an illness arises. It reflects our passion and relentless focus on the work we do with members across the health ecosystem as we live EY’s purpose to build a better working world by making a healthy working world.

I look forward to joining you in discussions on these and other topics. In the meantime, please visit [Health Reimagined](#) for our latest insights.



1.

Focusing on wellness: giving the world a shot at controlling diabetes

Worldwide, the growing problem of expanding waistlines is exploding health care costs. Western diet, populations shifting to urban environments and lack of exercise are decreasing quality of life, straining resources, and contributing to rising body weights and incidence of diabetes.

Obesity and impaired glucose tolerance (a form of prediabetes) are two of the five metabolic risk factors that increase the likelihood of developing a number of chronic diseases. Three of these lifestyle-related causes of death, heart disease, diabetes and stroke, account for 28% of deaths globally every year.^{1,1}

Like our waistlines, diabetes is spreading. In 2012, 86 million people in the United States aged 20 years or older had prediabetes, up 9% from 2010.^{1,2} For working age adults, the prevalence of global diabetes will increase 37% by 2040.^{1,3} Among seniors, who already account for a majority of health care spending, prevalence will increase by a whopping 113%.^{1,4} An estimated 12% of global health expenditure is currently spent on diabetes. Worldwide, GDP losses due to diabetes, including the direct and indirect costs, are estimated to be US\$1.7 trillion between 2011 and 2030.^{1,5}

Intervention – preferably early and, when it involves treatment, comprehensive – is essential to reduce the risk of developing diabetes and prevent complications. The factors that modify risk – family history, ethnicity, history of gestational diabetes and high birth weight,^{1,6, 1,7} – must be taken into account. Treatment may include regular monitoring, medication, lifestyle interventions, exercise and smoking cessation. Treatment requires medical personnel to provide education, develop realistic “around the pill” treatment plans and regularly engage with health consumers.



1. | Focusing on wellness: giving the world a shot at controlling diabetes

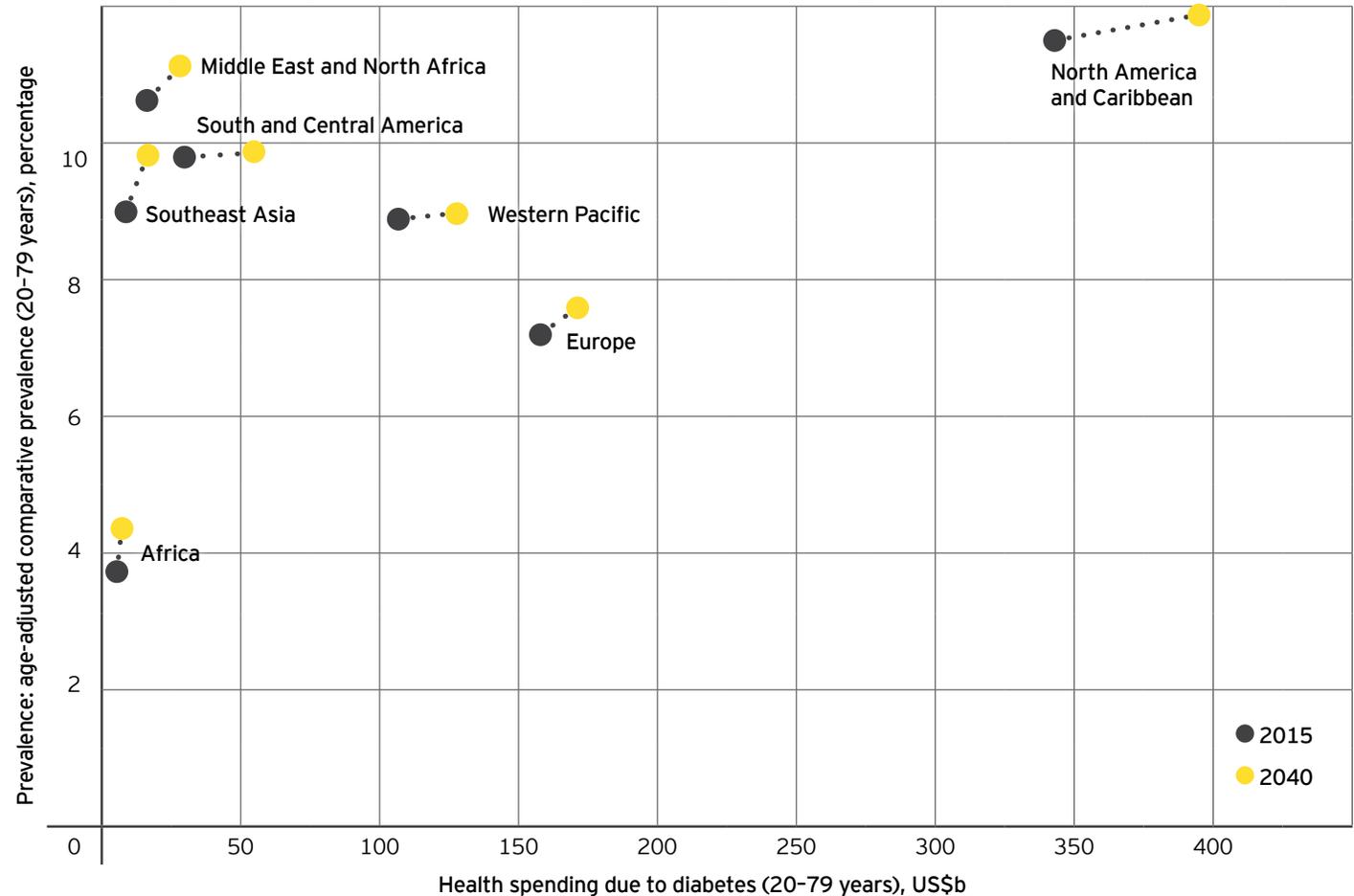
To address this human crisis and bring costs to sustainable levels, cross-domain solutions that enable new models of wellness and care are needed. Innovation in just one area, whether it be technology, analytics, payment models, government regulation or care delivery models, is not enough. Cooperative efforts are needed to develop scalable technologies and make them widely available, align stakeholder incentives for data sharing, build environments that support healthy lifestyles, and reshape the way consumers think about their health. This requires a firm understanding of local health markets, the diverse sectors and new entrants contributing to and disrupting it, and a truly global perspective.

Insight

Technology will enable smarter cities and smarter choices ...

People-environment interactions are bidirectional and dynamic; to take advantage of this relationship, communities are being designed to support lifelong wellness. Globally, people with diabetes are generally clustered in urban areas. Better artificial intelligence, cheap, ubiquitous sensors, and cloud or fog computing create new possibilities for creating environments that support healthy behaviors.

Figure 1.1:
Diabetes-related health spending, 2015 vs. 2040 ^{1,11}





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In the near future, algorithms that combine data from citywide pollution sensors, weather conditions and medical records can forecast the best times for outdoor activities and automatically schedule appointments and errands during that time. This could prevent severe asthma attacks in children and keep adults with COPD active and engaged with their care providers.

As cities grow smarter, switching between (and paying for) driverless cars, mass transit and manual transport (walking, bike shares) may become seamless. Combing data from electronic health records and sensor-enabled activity trackers, health payers may soon use data-driven, well-timed incentives to nudge healthy behaviors, such as walking a few blocks to a bus stop or biking. Such small changes, made across a lifetime, can mean the difference between active, healthy aging and a middle to late life filled with chronic diseases.

Insight

... but only if it rapidly moves beyond early adopters

Rapid adoption of technologies across socioeconomic groups is crucial for improving chronic disease outcomes (e.g., diabetes and obesity), curbing costs and addressing existing health disparities.

For the last decade, diabetes prevalence has been rising most rapidly in low and middle income countries.^{1,8} People are leaving rural areas for urban office jobs, exacerbating the growing prevalence of diabetes in places such as India, Southeast Asia and parts of Africa. Observational studies indicate that sitting for long periods of time can double risk of type 2 diabetes and cardiovascular disease.^{1,9} Designing workspaces and workdays around opportunities for physical movement can improve workers' health, concentration and performance.

The future of health is envisioned to be consumer-centric, around the clock and wellness focused (see [Health Reimagined](#)). But even in a relatively wealthy country like the United States, 73% of people don't own an activity tracking device of any kind.^{1,10} The key to circumventing the next digital divide, and addressing health disparities, is to make rapid adoption possible for even economically challenged populations. Bringing telemedicine and inexpensive sensors to countries with low diagnosis rates would improve quality of life and reduce overall costs through early treatment. Rapidly disseminating affordable technologies could enable low and middle income countries to address the explosion of metabolic disease drivers, improve diagnosis rates, contain costs and keep their workforce healthy without slowing growth.

Insight

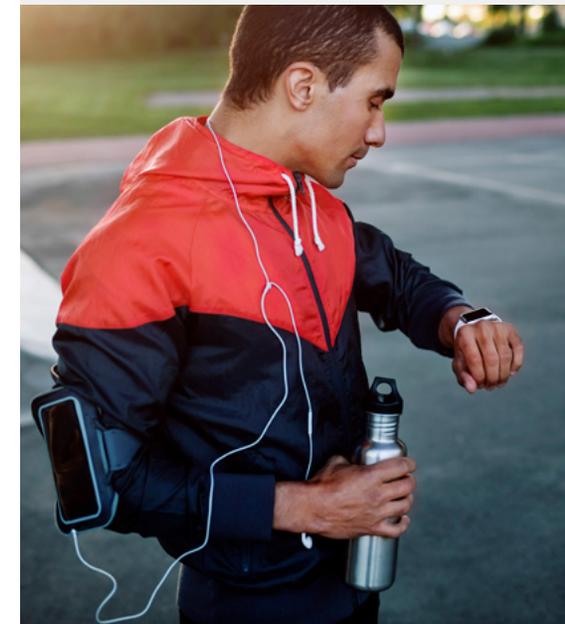
Sweeten the deal for sharing

Misaligned incentives for payers, providers and consumers hinder the management of diseases like obesity and diabetes. Payers in countries with private insurance are reluctant to fund programs whose down-the-road benefits may be realized by a competitor: most people do not have the same insurer for their entire life (especially when they change jobs). Even in countries with a central payer, immediate-term cost pressures can crowd out funding for effective behavioral interventions. Providers have traditionally been rewarded for services or, more recently, disease outcomes, rather than overall health. Consumers may need additional incentives to provide the kind of data that enables individualized, holistic care plans. This is particularly true of older adults, who are more likely to report having privacy concerns.

Central, permission-based databases of user and provider-generated health information can give algorithms the data needed to become better predictors and enablers of health while preventing the erection of silos that impede progress. Open access to health data, in the form of abstracted records, will let payers generate the data to support the most efficacious practices.

Wander while you work

At some companies UnitedHealthcare insures, employees are being paid to engage in healthy behaviors. A free activity monitor and a mobile phone app help them meet daily activity goals by taking regular exercise breaks throughout the day. This proactive approach to fitness is designed to keep healthy people active, avoiding the long-term costs of lifestyle-related chronic diseases.





1. | Focusing on wellness: giving the world a shot at controlling diabetes

Building incentives around good outcomes, something all agree is a worthy goal, will contain costs and encourage a 24/7 healthy mindset for all stakeholders.

Key to reaching this goal is ensuring data integrity, a problem that is compounded when data are abstracted and de-identified (see Getting true value from big data).

Insight

Healthy bodies need healthier fuel

For much of the world, the availability of healthy food is tied to economic status: the more money a person has, the greater the access to healthy options. Western diets, overflowing with caloric possibilities, are heavily meat and saturated fat-based, increasing the risk for early death, Parkinson's and Alzheimer's disease.^{1,12} Fresh fruits and vegetables, the base on which most governmental food pyramids are built, receive considerably less monetary support (i.e., subsidies) than crops used as animal feed or ingredients for heavily processed food.^{1,13} The narrow window of ripeness for such foods also makes them difficult to transport and store cheaply.

There are enormous opportunities to bring technology and big data approaches to global food production and supply chain, to shape policies that encourage sensible eating habits, to address resource-intensive

food production and to increase access to healthy food worldwide. Eating behaviors can be nudged with data-informed changes to the types of food available, by creating small barriers to access and changing how portions are presented. Meat protein, which is resource intensive to produce, untenable to farm in some areas and ethically fraught for some, is today being successfully grown in the lab.^{1,14}

3-D printing technologies can create palatable, healthy meals from raw materials that are easy to transport and store.^{1,15} Increasing access to quality, palatable foods helps shift people away from a lifetime of dietary mistakes whose end result is often glucose intolerance or diabetes.

Health is more than disease-focused health care: it is a patient-centric, on-demand, around-the-clock endeavor. Wellness, prevention and care have to be scalable but also tailored to the particular market: cultural issues, ethnicity and regional differences in resources will all determine whether a particular model is successful. What is certain is that the sooner new solutions are employed, the greater the impact – on people, costs and the world's well-being.

Chips instead of an apple? There is a tax for that ...

Mexico has implemented a tax on calorie-dense, nonessential foods and sugary drinks that has reduced consumption in low and medium income households. The expectation is that reduced consumption

of these “empty calories” will reduce weight gain and diabetes incidence. Such taxes have not met with success in all cases; this highlights the need to find the most appropriate stick (and carrot).





2.

M&A trends in health: change is inevitable

A seismic, once-in-a-lifetime market shift in health delivery and payment models requires every organization in the industry to rethink its business model, structure and mode of operation. Reimbursement based on outcomes, as opposed to fee for service, is pushing providers to broaden their scope of care across a fragmented system. The growing ability to diagnose, monitor and treat chronic diseases – leading to more effective treatments and shorter recovery times – offers an opportunity to maximize outcomes while eliminating ineffective or wasteful modes of treatment. The bar is set much, much higher for tracking outcomes, which requires sophisticated tools, people and infrastructure. The landscape is complex and competitive, the challenges are daunting, and traditional models of delivery are inadequate for today's standard of care, documentation and billing.

What is the answer for many health organizations? One option to reduce enterprise risk may be to join forces with another organization through an acquisition, merger, alliance or partnership. Health companies are increasingly looking at M&A, alliances and joint ventures to expand their geographic footprint and to have more input into the continuum of care – all to gain the scope and scale of services and infrastructure capabilities needed to compete or even survive.



Current and expected activity

A majority of health executives remain positive about the economy overall, with 79% seeing it as either stable or improving, according to *EY 14th annual Capital Confidence Barometer*. Health executives also remain positive about deal fundamentals, with almost two-thirds seeing a positive trend for acquisition opportunities. This is due, in large part, to the fragmented nature of the health industry, which increases risk as

providers are delivering only a fraction of the care, yet reimbursement is tied to the overall outcome.

In fact, health transformation is driving a record level of M&A activity and alliances, and the growth is expected to continue. Above and beyond the pending mega-mergers among insurers, the *EY Capital Confidence Barometer* also found that health executives anticipate the trend of increased M&A activity to remain well above historical health sector

averages. Overall, 56% of respondents indicated that they expect to actively pursue acquisitions in the next 12 months.^{2,2} This represents the second highest percentage since late 2010. Almost two-thirds of health respondents indicated that they have three or more deals in their pipeline.

Further, a variety of deal structures are being explored. Where a merger or acquisition may not be the right fit, health companies are increasingly looking at alliances and joint ventures to expand their geographic footprint and have more input into the continuum of care. In fact, with 50% of respondents planning to enter into alliances with other companies or competitors, health organizations are vastly outpacing their global counterparts (40%) in other industries in this area.^{2,3} Given the transformative nature of today's health sector, leaders see alliances as an opportunity to manage risk, improve the quality of care and lower costs.

Insight

Start with the end, and follow three key steps

The first steps for any organization are to a) determine its desired strategic outcome or market positioning, b) identify the gaps or risk areas within current offerings or capabilities, and c) look to the financial and operational metrics to help guide which structures are optimal. "Knowing these three things will clarify the goal, provide focus on the key issues driving a structural change and help uncover the possible pathways forward," says Gregg Slager, EY Global Health Transaction Advisory Services Leader. "However, figuring out the best approach is like a playing a three-dimensional chess game. You need to examine all the variables simultaneously, including possible organizations to align with, the strategic next step, and the best organizational and financial structure for all parties."

For instance, if a physician group wants to stay focused on patient care rather than tracking or technology, its strategy might be to find a larger physician group with a more robust infrastructure to either acquire or partner with. An orthopedic practice might acquire or develop an alliance with a physical therapy group as a way to ensure it has more control over outcomes of surgeries, such as knee or hip replacements.

Figure 2.1: **Global Capital Confidence Barometer: key health findings** ^{2,1}



Comparison is between health executives and other global respondents.



Insight

Key motivators for change

“With the steady move toward value-based care, there continues to be convergence among health care sectors and further development of a continuum of care within health care companies,” said Gregory Park, Senior Managing Director, US Healthcare Investment Banking, Ernst & Young Capital Advisors, LLC. “Parties that have historically been separate, such as managed care and providers – or subsectors within the provider universe – are coming together in different ways.”

While there are many strategies and motivations, a few themes emerge that point toward strategic reasons behind M&A activity. Bolstered by cheap financing and spurred by the opportunities that big data might offer, these include:

1. The evolution toward value-based reimbursement from volume-based payments – forcing a focus on the full spectrum of care.

Organizations seek to better manage risk if they are paid based on patient outcomes, yet provide only part of the continuum of care. Further, these reimbursement models require more results tracking, and health organizations need to effectively adopt and employ digital technology and analytics.

2. The move toward consumer-directed health care – adding an incentive for technology and wearables.

To ride the rising tide of consumerism, organizations must incentivize customers to use new technologies and services and share the resulting data.

3. The traditional consolidation drivers of increasing market presence and reducing costs – to reduce the cost of care and increase efficiency.

Cost pressures are intense, and organizations must continually improve operational efficiency and effectiveness while also reducing overall and per capita costs.

4. The shift from inpatient to outpatient care – to reduce the cost of care and increase efficiency.

Hospitals are challenged to carry on the traditional mode of inpatient care. As reimbursements drop for inpatient services, many are spurred to focus on other avenues for growth, particularly outpatient services. Outpatient care is often delivered at lower cost sites, and outpatient volumes have accelerated at a faster pace than inpatient admissions over the past five years. This scenario is advantageous to larger health services providers with more developed outpatient networks, especially when compared with single facilities or smaller hospitals. The cost factor is driving

established hospital operators to seek M&A opportunities outside of the scope of the traditional acute care hospital, such as buying smaller community hospitals to develop regional networks or setting up acute care outpatient surgical sites.

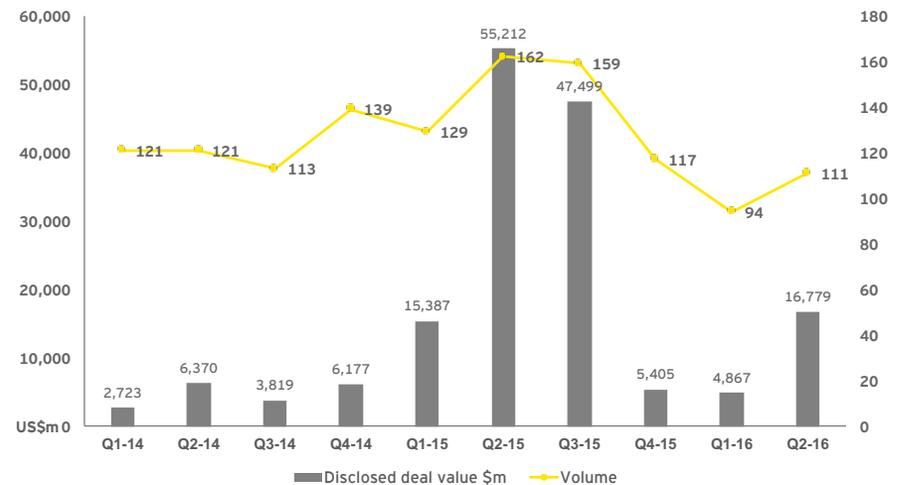
5. Scale up or consolidate – to better spread the cost of overhead and to offer a wider range of services along the care spectrum.

Driven in part by health reform, cost pressures on health providers encourage an increase in scale, and the reporting

requirements demand a more complex and robust technology infrastructure. Here, larger players will have an advantage, with more overhead dollars to fund IT and clinical systems, improve purchasing contracts, negotiate better deals with large commercial insurers and enhance organizational capabilities. Effects we see in the market include:

- ▶ Larger hospital and managed care operators acquiring smaller hospitals, taking advantage of the scale and scope to further reduce their cost per patient.

Figure 2.2: US health care services deals per quarter ^{2.4}





The same is true for managed care operators (MCOs), which continue to pursue strategic acquisitions as actively as regulatory approval allows. Last year produced the proposed megamergers of Aetna-Humana and Anthem-Cigna (pending government approval), and large regional MCOs, such as Kaiser Permanente and other MCOs, are bulking up through acquisitions.

- ▶ **Regional consolidation of hospital operators**, to achieve scale and scope to drive down the cost per patient. One example is Detroit-based Henry Ford Health System's acquisition of Allegiance Health, a dominant provider in Jackson, Michigan.
- ▶ **"Super physician" practice groups**, combining to form behemoth practices to achieve scale and market concentration. An example is the recent merger of equals between Envision Healthcare and Amsurg, creating a large physician group.

6. A focus on technology, tools and digital devices – to track required outcomes and leverage analytics to increase operational and patient effectiveness.

Health care-related information technology continues to grow, in part buoyed by government policies and requirements. Although lagging other industries, health organizations are increasingly adopting IT

solutions to help simplify and streamline their operations, and technology is often a big factor in M&A activity and decision-making. Hospitals, health organizations, individuals or small practices unable (or unwilling) to provide the required capital outlay for electronic health record (EHR) systems are seeking to bridge the gap, either through partnerships, mergers or acquiring technology companies outright. Those with robust EHRs are looking to boost their scale as a way to maximize value from those investments. And all are focused on technology as a tool to help find efficiencies in operational processes, enhance clinical decision support systems for providers and bolster patient engagement (by encouraging patients to access and use portals, for example). Hospitals are also starting to link their EHR data directly to administrative and billings functions, not only to streamline and automate the revenue cycle but also to gather data for analysis of operational and care flows and ready their organizations for value-based reimbursement.

7. Move toward investment in less risky segments of health – to count on better, more stable reimbursement.

Health organizations, especially those privately owned or funded by private equity investors, are diversifying their services and acquiring providers in niche segments in an effort to smooth or manage overall risk.

Niche organizations sought for acquisition or alliances are attractive because of the lower reimbursement risk and include:

- ▶ **Physiotherapy** – Physicians with orthopedic practices and others are looking to purchase or partner with these organizations to improve the outcomes of orthopedic and other procedures and/or reduce the incidence of surgeries.
- ▶ **Behavioral care** – This large, often overlooked market is facing growing support, as both the regulatory and legislative sides seek to provide better mental health coverage for adult Medicaid beneficiaries. These moves bode favorably for behavioral care providers.
- ▶ **Home health and hospice** – Demographics, patient preference and meaningful cost advantages suggest more growth in the home health and hospice arena, as the percentage of Americans 65+ is expected to grow from 13% to 20% of the population by 2030.^{2,5} Industry analysts also point out that those focusing on quality are likely to benefit as the Centers for Medicare & Medicaid Services continues to move toward outcome-based reimbursement.
- ▶ **Ancillary health care services** – This includes revenue cycle management businesses, independent specialty providers (such as neonatal, anesthesia,

teleradiology, maternal-fetal and pediatric physician services) and independent medical examiners.

- ▶ **Niche segments** – These include dental care, dermatology and veterinary services, all of which are off the radar for most traditional health organizations.

Insight

What to watch for next

US deal activity in the sector is still strong, and Park expects 2016 to be a "top 5" year for M&A in health. "We are in the midst of a tectonic shift in patient care, delivery and payments, and from a big-picture perspective, the deal boom is far from over," Park said. Although companies are adopting all forms of new structures and partnerships, Park expects more consolidation on a local basis, enhancing an already significant middle market. "Expect a continuing relocation from Wall Street to Main Street in health M&A, as companies combat shrinking reimbursement, cut costs and, ultimately, pass those savings down to the consumer." Park's final observation is to expect more portfolio pruning, "Drafting behind the life sciences sector, we expect continued divestitures from historically M&A-oriented companies, as service, delivery and reimbursement models continue to be refined."

3.

Putting people at the center of health analytics

Today's artificial intelligence (AI) technologies are, well, not that intelligent on their own. Although AI tools are progressing at an incredible rate, the real power emerges when the data analytics augment human decision-making rather than replace it. The analytics alone are just not smart enough to derive true insight. Identifying health trends means pairing AI and analytics with supervised, human learning.

Imagine a future world where the analytics look at a patient's specific gender, age, lifestyle, medical history, family background and geography and indicate a high risk of diabetes. To prevent the full onset of the disease, the patient uses a wearable app to regularly monitor blood glucose levels. When it rises, the device sends the physician a text, the physician makes a decision around the medication needed, and the patient is alerted to take a specific amount of oral medicine to reduce the amount of sugar made by the liver. Diabetes averted.

What does it take to get to this reality? We are partway there, with the capabilities of technology, wearable apps and data growing exponentially each year. But the key is the crucial interaction and "dialogue" between the data, technology and people. This reality requires an active level of human judgment and decision-making, informed by the analytics.

Perhaps the best example of the gap that needs to be filled is represented by Google Flu Trends. When it first appeared, its ability to spot flu outbreaks weeks ahead of traditional methods, by analyzing search engine queries about symptoms, was hailed as a breakthrough. But for the 2013 flu season, the tool's predictions were widely off the mark. Why?



The algorithm didn't distinguish between someone who had the symptoms and someone who was merely asking about the symptoms. With such a vast amount of data, the volume of false data became so great as to render the findings almost meaningless.

The volume of the world's health data is projected to balloon to **2.3 zettabytes** (2.3 trillion billion gigabytes) by 2020 – growing 48% per year and outpacing the growth of big data overall.

True data disruption requires human interpretation

We are facing an explosion of data, coming from every corner of the health industry across the globe, from a dizzying array of sources – audio, video, geospatial, telemetric and sensor data, electronic health records, payer claims data and real-time information generated by mobile health technologies. Computing power is now available at dramatically reduced costs, adding enormous new capabilities to the equation and making analytics more financially feasible.

How does this add up to true disruption? As with the Google Flu Trends example, the sheer unprecedented volume and affordable accessibility of data are not in itself a disruptive force. What is disruptive – and even revolutionary – is the ability to put the data together, creating linkages among and between large data sets and data types to truly uncover patterns, trends and insights heretofore unseen.

The right combination of smart algorithms and people could help reduce or even eliminate chronic diseases. It could help reduce cases of post-operative infection to a vanishing point. And it could point with confidence toward medicines and treatments that dramatically increase the efficacy among specific populations of people.

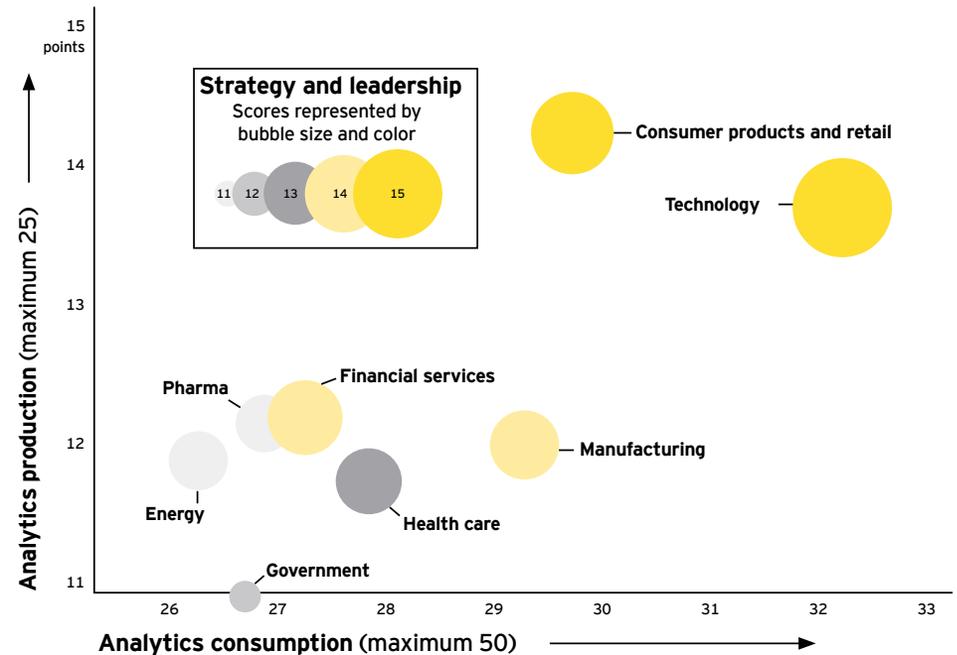
The key? According to Chris Mazzei, EY Global Chief Analytics Officer, it is strategy, leadership and people. "This disruption from advances in technology and advanced analytics offers a profound opportunity for the health industry," says Mazzei. "If organizations truly put data and analytics at the center of their operations, the collective power of the data could utterly transform health care – and save lives. But getting there will not be easy. It is usually more difficult to transform a large, mature organization than it is to build something completely new."

The starting point

Let's start with where the health industry is now compared with other industries. The chart below shows health care close to the middle, with room to grow in terms of both analytics production and consumption. Combined with the almost incomprehensible

projections for growth in health data to 2.3 zettabytes (2.3 trillion billion gigabytes) by 2020, working fast – and working now – to find the right combination of human decision-making with smart algorithms is both an opportunity and a mandate.

Figure 3.1:
The data and analytics impact axis ^{3.1}





Insight

The road ahead begins with your destination

Before you begin any journey, it's important to know where you're going. The end purpose of data and analytics is to advance the health outcomes and experiences for patients and to provide organizations with new insights to make better operational decisions. Analytics requires having good data, but the value only comes with the behavioral alignment required to "consume" the results – moving from collection to insights to action. These insights could help with:

- ▶ **Organizational decision-making** to better understand the patients, outcomes, delivery mechanisms, services offered and operational structures, and service positioning and operations
- ▶ **Individual decision-making**, enabling and empowering employees at all levels and locations throughout the organization to improve the results for the organization and for patient outcomes and experiences
- ▶ **Decisions on the collective**, which in the health arena means profound insights into treating chronic disease and the potential for precision, customized medicine

Insight

Three steps toward powerful data insights

Insights are most valuable when they are the result of data that is accurate and carefully curated, generated by human-supervised algorithms and part of a clear process that defines how analyses are used to inform decisions. Many health organizations are struggling to transform into analytics-driven enterprises and derive value from their data analytics. How do organizations move from current to future state as quickly as possible? It requires a focus on three things:

1. **A strategy:** Without a strategic approach providing high-level guidance, analytics efforts are rudderless. "We see many organizations that have spun up initiatives and are spending a lot of money, yet don't necessarily have a clear point of view on how value will be delivered," says Mazzei.
2. **A good structure:** "In the earlier stages of analytics, organizations tend to have disparate, siloed efforts dotted all over the place, without much control, and with potential duplication and inefficiency," says John Hopes, EY Global Business Modelling Leader. "One part of the organization may produce great

Case study: Intermountain Healthcare

Intermountain Healthcare has been using analytics for decades, improving operations, driving better health care outcomes and making a difference in patients' lives. Today, Intermountain empowers doctors to make data-informed choices that benefit patients and improve business results. The keys to success?

1. **Keep data at the heart of the organization:** Most of its clinical programs have their own data teams, ensuring that Intermountain's data and analytics experts stay very close to business problems, asking and answering better questions to drive results.
2. **Create "learning loops" to streamline operations:** These provide immediate feedback results to the data team. In cardiology, for instance, every time doctors treat a heart attack, data on the operation is shared with the treatment team as part of a rapid improvement process. By developing consistent, repeatable processes, this feedback helped reduce the median treatment time from 90 to 57 minutes.
3. **Use data to ask smarter, better questions:** Intermountain created an environment where any employee can ask for analytics support. Getting everyone on board for data success required:
 - ▶ **Hands-on training in a data-orientated culture:** At Intermountain, this meant improving doctors' knowledge of data and analytics processes and encouraging staff to act on the findings.
 - ▶ **Letting data speak for itself:** Intermountain does not force those who disagree with analytical findings to fall into line. By letting the data speak for itself, the organization is instead able to build loyalty to analytics processes and increase adoption of more efficient approaches.
 - ▶ **Adding incentives to drive positive behaviors:** Intermountain's approach acknowledges the importance of aligning incentives with desired behaviors. It is launching a new insurance product that will make physicians and Intermountain jointly responsible for health care efficiency. Doctors who adopt more efficient methods will earn more income, and Intermountain thinks this incentive will help them focus on data-driven decision-making.



insights, but they will not be leveraged elsewhere.”

3. **People:** “Data and analytics are as much an art as they are a science. A successful data and analytics environment doesn’t depend on technology alone to deliver the right insights at the right time,” says Mazzei. “It requires a human capital strategy, with leadership coming from the top, and with employees at all levels buying into the effort.”

Insight

The people are the center

Data and analytics could move health organizations in entirely new, innovative directions, change operational infrastructures, have a profound impact on chronic disease and patient outcomes, and change the way organizations think about health and patient care, opening new opportunities and providing new and powerful insights. However, these insights will only become a reality if people are at the center of the equation, curating the data, managing the algorithms and finding ways to translate the insights into practical use.

EY’s Mazzei believes organizations need to put more focus on understanding the current state of their return on analytics

investment: what is working and what the barriers are to improving. “It’s the combination of people, process and technology that converge to create value,” he says. “And, often, the bottleneck is not data, technology or even advanced analytics skill sets. It’s a question of, once we have the insights from the analytics, what are we doing with those insights? That last mile is often the most difficult.”

Realizing business value in data and analytics depends on getting the human element right. Strategy is only as good as its execution, and successful execution of insights from analytics happens individual by individual. Ultimately, data and analytics will drive most health care decision-making and augment – but not replace – human judgment. EY’s Mazzei says, “At the end of the day, most analytics uses still require a human being to do something different, such as change a business process or decision they would have otherwise made.”

Leading practices in all industries

A few common themes emerge among the best in all industries, which could be leveraged in health:

- ▶ **Consider analytics central to business strategy:** Executives in the top 10% of enterprises report that they are already seeing tangible business results from their analytics efforts and a noticeable shift in their ability to meet competitive challenges.
- ▶ **Designate leaders to guide the initiatives:** The vision to energize and sustain data and analytics activities needs to come from the top levels of the organization. Organizations are also identifying and embedding data and analytics leaders throughout the enterprise.
- ▶ **Have (or get busy building) advanced data management capabilities – the tools and the people:** A better-oiled analytics technology infrastructure means having a well-established portfolio of analytics tools and technology services and well-defined competencies. It is people who are at the core of every initiative, supplying the skill sets to gather and analyze data and create analytics-based business insights.
- ▶ **Align the entire organization around analytics:** The value of analytics comes from the behavioral alignment required to move from insights to action to value. This often requires a profound change management effort to advance an analytics vision and develop an analytics-driven culture. While there is not one perfect model, it is advisable to have a central team, with analytics delivery resources close to the business units and functions.
- ▶ **Get talent from the outside and inside:** Leading practices suggest a combination of hiring analytics and data experts and growing and training talent internally. Two critical elements of this are to ensure that the new structure is rewarding for the organization and employees and it creates employee autonomy. Empowering employees to pursue analytical thinking, use analytics tools as they see appropriate and have the leeway to act on the insights gained through their findings is the “last mile” toward realizing true value of data and analytics.
- ▶ **Act on analytics insights at all times:** The key is to start with the end user in mind. The business problem or opportunity needs to be identified, and appropriate analytics solutions need to be developed to help users make decisions. Analytics becomes a natural extension of ongoing activity embedded into jobs, providing employees latitude to act on analytics opportunities and insights.



4.

Participatory health: a world of alternatives for consumers and health players

Despite feeling ok, you have learned that you have a significant risk of developing a chronic disease. Perhaps one that affected your mother or father.

Today, this means a bunch of pamphlets from your doctor and online searches that frequently reveal conflicting, or questionable, information. But as health care is transformed – by cost pressures, changing demographics and technological advancement – traditional delivery models are being upended.

Tomorrow, instead of a trip to the doctor for a consultation (if you are lucky), standardized information most relevant to those newly diagnosed with your condition is sent right to your smart device. An app guides you through a questionnaire and provides the data to the artificial intelligence (AI) handling your case. Once completed, you allow the AI access to your secure medical record and sensor data from your watch, clothing, home, and local, public environmental sensors. The AI develops a customized lifestyle management plan, putting you in control of your health. It also connects you to a worldwide community of people with your condition. Perhaps you allow the AI to adjust your calendar or shopping habits. Maybe you take virtual walks with someone on another continent, or share articles or product recommendations with those who have been managing this risk for some time. What is certain is that the health care system of tomorrow will be on-demand, connected and data driven.

Technology, increasing health consumerism and social media 2.0 are changing the way we think about wellness and care.

Welcome to health, reimagined.



Insight

Get ready to transform health care

Sustainable, accessible care is a global priority. Health spending, however, is on an unsustainable trajectory, and demand for care is rising. Several factors are forcing a change in the way we think about health and health care:

- ▶ **Rising demands, increasing costs:**
 - ▶ Globally, people are living longer, and expenditures on health care are greatest for those over 65.
 - ▶ Chronic lifestyle diseases are everywhere and are expensive to treat, particularly for those diagnosed at a young age.
 - ▶ Health consumption continues to grow as the middle class swells in emerging nations. Massive inequalities in access and outcomes remain.
- ▶ **Systemic forces resistant to change:**
 - ▶ Workforce shortages for conventional health care providers exacerbate inequalities and increase costs.
 - ▶ Siloed care delivery systems mean waste and variation in care with unproven value.
 - ▶ The demand and need for care is not strongly influenced by costs.

▶ **Policies shift risks and encourage new models:**

- ▶ Reimbursement has moved away from volume and is embracing outcomes.
- ▶ Organizations are finding new models of care that mitigate risks, control costs and maximize outcomes.
- ▶ Individuals have more financial responsibility and are more engaged in decisions about their care.

Insight

Patients will continue to participate more actively

At its core, participatory health describes a shift in the patient-provider relationship. Individuals take on greater responsibility and become the center of the action, curating and navigating their health and their care as an equal partner. Increasing mobility, ownership of smart devices and online platforms for social interaction and information exchange are changing global attitudes toward sharing and participation.

Individuals are shifting their focus to wellness rather than engaging only when they are ill. Key enablers are encouraging people to make positive care/lifestyle choices and to be engaged in, and accountable for, health. Providers and industry stakeholders are gaining a more complete view of consumers,

identifying opportunities to engage them at key decision points. The continuum is changing to be more elastic and personalized, fitting around the individual. If this is realized on a population-wide level, it will be possible to have a fundamentally different model of care delivered sustainably.

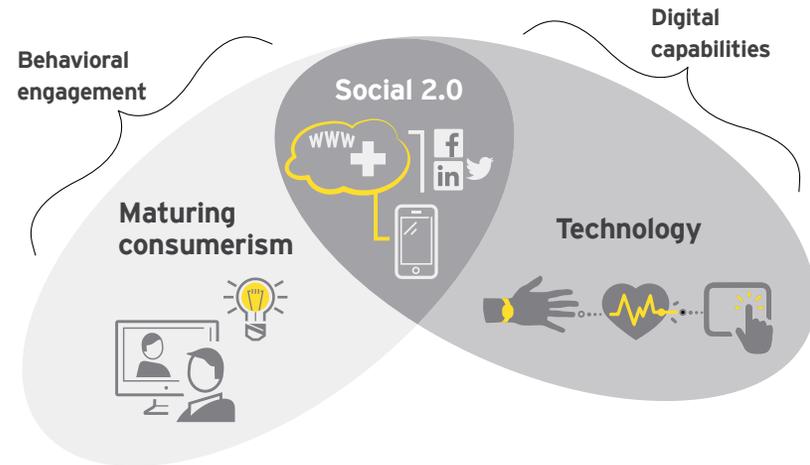
The shift away from today's concept of health and disease and the models of care delivery is supported by three big trends: maturing consumerism, social 2.0 and technology. These are the tools that will be used to build an integrated health ecosystem instead of a fractured collection of individual systems that silo data. This ecosystem will put health in the hands of the consumer.

Enablers of change

By 2020 ...

- ▶ Smartphone adoption in the developed world will reach 80% penetration, with 63% penetration in the developing world.^{4.1}
- ▶ Seventy percent of smartphones will have global broadband connections.^{4.2}
- ▶ Consumer-generated data will be 44x higher than in 2009.^{4.3}
- ▶ Three billion people will enter the middle class, mostly from the developing world.^{4.4}

Figure 4.1: Participatory health: key enablers





Insight

Mobile and web tools power patient participation

This iteration of social interaction is enabled by a dynamic virtual environment that connects people and reliable information in even larger networks, building on the platforms that exist today.

Mobile internet connectivity – always on, continuously updated, highly interactive – enables the virtual environment that underpins participatory health. Online platforms harness the power of the crowd, drive behavioral and social engagement, foster easy sharing of research and

consumer-generated data, and create influential communities of action.

Growing social and mobile penetration levels change relationships in health care. Patients and caregivers establish new networks and sources of information through online platforms, shaping the expectations and behavior of patients AND providers.

.....
In the United States, 53% of people are willing to share health data (61% for those under 35). Sharing and aggregation of health data will enable new levels of interactions between consumers and caregivers, providers, payers and manufacturers and enable the analytics that will drive personalized health.^{4,5}
.....

Cross-stakeholder interaction is fostered, leading to new forms of engagement between consumers and health industry players. For example, pharmaceutical companies are developing social listening skills to get closer to patients, to understand their experiences and unmet needs, and to monitor content for pharmacovigilance. Insurers use retail-like social business

strategies to form long-term relationships with members, as well as contests and gamification to change behaviors and increase engagement. Institutions use social networks to recruit for clinical trials and to source suggestions for future trials.

Insight

Always-on connectedness changes the dynamics

Health 2.0 will be ushered in by the next wave of digital innovation. Technologies designed around the individual provide a continuous record of health- supporting data. These data, in turn, empower consumers to make health-conscious choices, while giving providers and payers the information they need to tailor treatments and control costs.

Health care - anytime, anywhere

The near ubiquity of mobile penetration, even in the developing world, puts health in the hands of the consumer. Blockchain, a method of using a distributed database that enables secure transactions between parties – the innovation behind cryptocurrencies – gives everyone a portable record of all their information. This record allows consumers to share their health data where, when and with whom they decide, making transactions that involve payers and providers seamless.

Data that systematizes serendipity

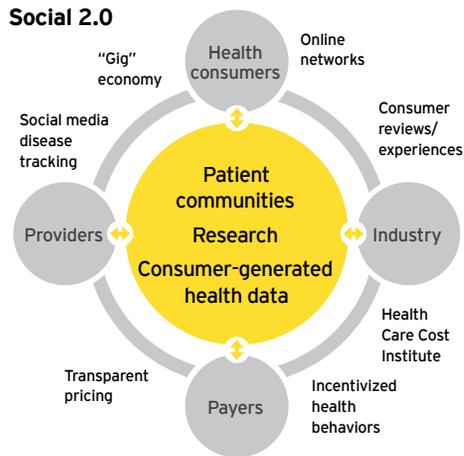
Wireless and broadband technology, cloud and fog computing, and cheap, reliable sensors underpin self-quantification, delivering information that drives prevention and care. Insights into communities – virtual or geographic – suggest improvements for public health and medicine, including disease surveillance, risk factor identification and epidemic monitoring. AI computer systems using machine learning algorithms study behavior patterns, genetic profiles, environmental factors and health outcomes to understand health drivers. They suggest interventions and behavioral nudges at key decision points, long before illness begins. Our focus shifts to maintaining wellness rather than treating disease.

New players and cross-sector partnering

New entrants upend traditional care and delivery models by avoiding them completely, supported by central platforms for storing and sharing health data and interoperability standards. Health solutions become tech-enabled, data-driven and outcome-focused. Alliances between payers and data collectors/aggregators allow for benefit management and price estimations. The behavioral sciences play a larger role: attention shifts to prevention, enabled by predictive analytics.

Figure 4.2:

Social 2.0





Insight

Patients are (smart) consumers too

Interest in self-driven health experiences is rising as technologies for data gathering and analytics empower consumers with insights. At the same time, consumers are assuming more financial risk by bearing more of the cost of their care. Expectations change, leading to the desire for a more retail-like health experience. This means greater cost transparency, benchmarked quality metrics, accountability for results and high-quality customer service. "Anywhere, anytime" prevails, as insights about self and about populations arise from intentional and unintentional data via the Internet of Things and Quantified Self environments.

At the end of 2014, 40% of total global connections were mobile broadband (3G and 4G). Increasing smartphone affordability and deeper network coverage will drive an increase to around 70% by 2020. ^{4.6}

In July 2015, EY conducted a nationally representative online survey of 1,761 randomly selected adult Australians age

18+ years. The data show that health consumers are posed to adopt digital technologies and assume a higher degree of involvement. From web access to health-related forms, to virtual interactions with providers, to using wearable technology and apps to gather and share data with doctors, consumers are set to take charge of their interactions with the health sector.

Opportunities for growth abound. The global digital health market, valued at \$77 million in 2015, is expected to grow at a CAGR of 21.0% during 2016 through 2022. The mHealth segment is projected to lead the pack at a CAGR of 34.0% during the forecast period. In the United States, only 27% of people polled in 2016 own a wearable device (although 78% of them would share the data it generates with their physician).

Moreover, only 25% of those surveyed have a single self-service portal for their health information. At present, the demand for consumer-driven technologies still outpaces solutions. As more entrants enter the fray, the gap is closing.

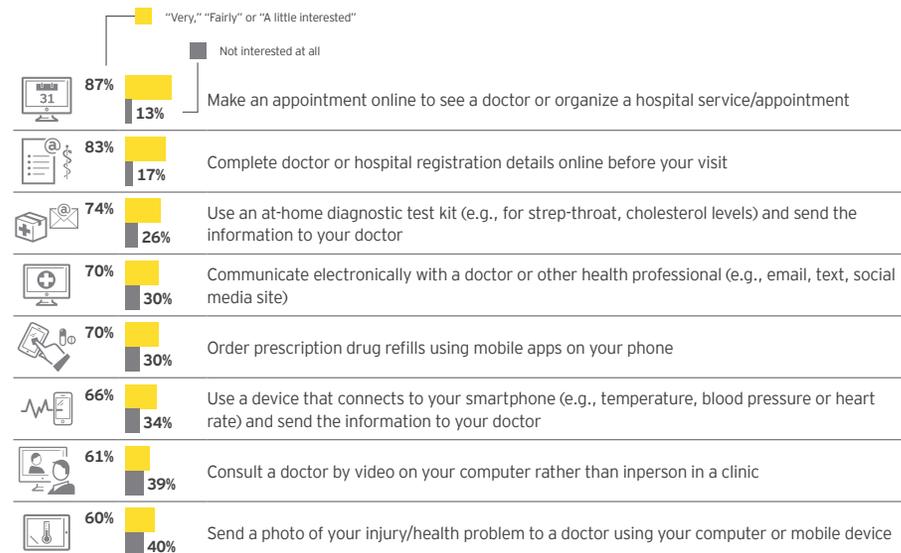
The participatory health paradigm: changing what is possible in health care

Uptake of health-enabling technologies is picking up pace and moving beyond wealthy markets and early adopters. Mobile clinics with wireless sensors are increasing access to care in Africa. Machine learning algorithms are being applied to pattern detection in radiology, cancer genetics and macular degeneration. Large, cross-sectional longitudinal studies that link health, genetic and environmental information are underway in many countries. New entrants are diving in and creating new models of care.

Dave Roberts, EY Asia-Pacific Health Leader, summarizes it this way: "Opportunities emerge at the intersection of consumerism, technology and markets for those willing to explore beyond their traditional boundaries. To do this, strategy agendas – whether they be global, regional or local – will require assessing how far and in what direction to reach."

Figure 4.3:
Future interest in using digital technologies ^{4.7}

If these services were available in the future, how interested might you be in using them? (Please rate each item)





5.

The black market for medical data

In the dark corners of the internet, medical records are a hot commodity, with millions of peoples' medical records up for sale, drawing a far higher price than credit cards. Health organizations already facing tough cybersecurity challenges are scrambling to put the systems in place to rapidly detect and prevent attacks on this data, and they are learning lessons from other industries along the way.

Why are medical records a target?

Medical records have more personal information, contain personally identifiable information that is harder to change and offer thieves and hackers more options. In some cases, it's about stealing a person's identity – and then sticking them with the bill for fraudulently obtained health care. In others, it's about opening a new line of credit, and, in some cases, hacked medical records are used for blackmail and extortion. As a consequence, the information can sell for as much as the bitcoin equivalent of \$60 per record, whereas social security numbers are a mere \$15 and stolen credit cards sell for just \$1 to \$3.

The perimeter is eroding

The rise of digital health care is part of the reason for the spike in threats, as more third parties enter the health supply chain. Both offer more attack points and more susceptibility to human engineering attacks, such as phishing. Developers of new digital self-care and patient-wellness apps, for instance, as well as other business associates, are often from non-health backgrounds and are unlikely to understand compliance with regulations (e.g., HIPAA). As a consequence, in some cases, these new points of entry are less suspecting or secure.

But the increased awareness of medical records' value on the black market is the driver.



The danger is real, and it puts patients at risk. As many as 80 million customers of the nation's second-largest health insurance organization, Anthem Inc., had their account information stolen in 15 months, from January 2014 into March 2015. More than 113 million medical records were hacked in 2015 alone, according to data compiled by Health and Human Services. Adding it all up, this represents some 47% of Americans who have had their medical records hacked in the past 12 months, according to a report from the Institute for Critical Infrastructure Technology, a cybersecurity think tank. A dangerous by-product of the theft is that important information on the patient's medical record is often deleted after being stolen, such as an allergy to penicillin, or new entries are added.

Know the enemy – who are the attackers?

The thieves are an increasingly diversified collection of specialized bad actors. Yes, there is still a thriving black market for hackers seeking a relatively quick cash transaction. But the more worrisome threat comes from new professional buyers who are aggregating data and mining it, indicating larger scale ambitions, such as market manipulation. These players (such as nation states and organized crime syndicates) are very different from the common traders. Many of these cyber attackers are sophisticated,

well-funded, global and nimble in leveraging technology and executing attacks.

What are the key challenges?

It's simple enough to cancel a credit card, but to change a social security or Medicare ID number is no easy feat. Banks have taken some major steps to crack down on identity theft. But hospitals, which have only recently transitioned from paper-based to digital systems, have far fewer security protections in place. The interconnected nature of the health ecosystem means a breach can have a ripple effect up and down the supply chain. The growing number of access points within the supply chain increases the risk of being breached. This is a risk that affects all players in the health ecosystem. As an example, for something as simple as a blood pressure monitor, the points of risk include the manufacturer of the medical device, the physician, the electronic health record systems used and the insurance organization reimbursing the physician or patient. All are at risk, and all play a role in keeping the infrastructure secure.

In ransomware cases, the thief holds the entity's data hostage in exchange for a ransom payment. Although technically not a black market threat where the thief resells the data, health organizations must catch up – fast – and use leading class techniques from

Risk vs. risk

For a medical device organization with web-connected and/or sensor-enabled devices, attackers could interfere with device operation, taking out a pacemaker or a levels-sensitive medication-distribution system. If attackers hack the sensor that monitors drug levels, they can alter the dose, with potentially deadly results for the patient. Or perhaps they will attack earlier in the supply chain through a parts supplier or at the point of manufacture. All it takes is for one sensor in the plant to be hacked so that it feeds inaccurate data into the manufacturing process, and the product could turn out to be defective in ways not discovered until it's on the market. Manufacturing plants were not constructed with cybersecurity in mind, but they are becoming increasingly connected and automated, which makes them increasingly vulnerable.

For a pharmaceutical organization, the threat is entirely different. For instance, cyber attackers may follow the development process of your new, high-profile drug to know when and how to interrupt your process. With your facilities all on networked controls, they could hack that and contaminate your testing environment. With your testing data all held on servers, they could attack your data farm and destroy or corrupt your data. Or perhaps you contracted with a third-party testing firm; cyber attackers could gain access through the relatively unsecured organization cell phone of a contractor's employee and move on to disrupt the testing environment through that breach.

Figure 5.1: **Attackers and their abilities/motivations** ^{5.1}

Adversary	Patient health		Patient records	
	Target (specific victims)	Untargeted (indiscriminate)	Target (specific victims)	Untargeted (indiscriminate)
Individual/small group				
Political groups/hackivists				
Organized crime				
Terrorism/terrorism org.				
Nation states				



other industries to stop theft at every point in the black market or ransomware value chain.

Insight

Compliance isn't enough: getting ahead of the threat is an enterprise-wide endeavor

To truly get ahead of the attackers, organizations need comprehensive strategies customized to their exact areas of risk. Although meeting the compliance guidelines is a starting point, a compliance mindset on cybersecurity won't be enough. Compliance is focused on the past, and regulations (in the subset of health industries where they address security) are usually based on the types of breaches that have already happened. And an IT solution won't be enough either. Health organizations need an all-encompassing framework to make smart, informed decisions to prioritize cybersecurity spending, build and instill a culture of security, and protect the assets most directly impacting the business strategy and objectives.

The key operating concept is the idea of an active defense: probing for, analyzing and neutralizing threats before they can acquire or damage a organization's critical assets. This requires understanding your organization's risk spectrum – over time and

at every step along the data collection path. The ultimate goals are to:

- ▶ Complicate an attacker's ability to achieve their objective
- ▶ Detect an attack before meaningful business is impacted
- ▶ Respond effectively and immediately to remediate an attack
- ▶ Educate your workforce to increase awareness, develop and maintain a security consciousness, and fend against phishing attacks

Insight

Know the value of your data – and start with the areas of highest risk

To allocate cybersecurity dollars wisely, organizations must learn the value of their information assets, updating it annually and at every point in the supply chain. The costs of security breaches in health are too expensive to ignore. A data breach could bring your entire business to a standstill, and a ransomware threat could lock down your data, making daily operations impossible. Yet not everything should be protected with equal rigor. The higher the value, the stronger your protection needs to be at those transaction points. The risk grows as you gain more data. The value of health data may increase over time; unlike

credit cards, PINs or passwords, health data does not change, and aggregating makes it more valuable (individual records and data sets from multiple individuals). For instance, data is more valuable (and needs higher protection) at the end of a clinical trial. Practices with full electronic health records programs in place are more at risk than those still evolving to electronic records.

Insight

Get a communications and response plan in place – now

Since we are talking about human health, cybersecurity is about protecting patients. You must be proactive and preemptive. Build a crisis management plan now and be ready to execute it at the first sign of a security incident. This plan needs to address:

- ▶ Customer response (and your organization's responsibility) to those harmed by an attack – with built-in points to address based on what was lost or disrupted in the breach
- ▶ Responses to others in the supply chain, stockholders and anyone else with a vested interest in your organization
- ▶ The spokesperson – and whether this will differ depending on the scale of the event

- ▶ The response and action plan (such as notifying government officials) if the attack is traced back to a nation-state, where political and market sensitivities are at play
- ▶ The response to a ransomware threat – with a differentiated strategy for varying levels of threat and a clear understanding of the demarcation for these levels (i.e., direct financial loss, reputation loss or legal repercussions with associated financial loss)

Insight

Your people are the front line of cybersecurity

Security must become the new mindset and the new backbone around which operational or delivery-of-care models are built. The tricky part is that this involves changing the mindset and behavior of people. In many cases, it's challenging for security experts to convince doctors and other health practitioners to alter their workflow to accommodate a risk mitigation effort. For instance, many doctors are reluctant to use dual-factor authentication, as it might slow down the process of treating a critical patient. In other cases, it is a matter of educating everyone in the chain of clinical care on the dire potential outcomes of a security breach and stressing the need for



watchful diligence in regular, daily health care tasks. Steps include:

- ▶ Educating your workforce to be on the lookout for spear-phishing attacks, those seemingly legitimate emails from a familiar individual or organization that are, in fact, fraudulent communications
- ▶ Changing employee reactions to cybersecurity from an annoyance to be avoided when possible to a fundamental part of achieving the organization's objectives
- ▶ Making sure your workforce education and security measures do not instill too much fear in your users
- ▶ Raising the overall awareness of all the operative stakeholders in your business – from every level of employee to every component of your supply chain

Leading practices

From the aviation industry

In a January 2016 report, the Air Traffic Control Association recommended that all aviation partners – airlines, pilots and airport authorities – work together to simulate and rehearse cyber attacks in an effort to get ahead of the threat. This approach includes:

- ▶ **Hardening of the systems**
Build in requirements for cybersecurity from the start with the system's development life cycle, making it an integral part of the development of a project management plan. Threats are easier to combat if governed from the onset.
- ▶ **Safe connectivity of the community**
Consider the operational impacts based on high-level threats and develop a cohesive response throughout the aviation industry, including aviation industry operations, airlines, airports, the Department of Defense (DOD) and general aviation. This includes increasing awareness of cyber threats, as well as a robust outline of cyber training, policies and procedures.

▶ Operational response

Integrate an aviation-wide incident response plan that includes a holistic view of the aviation airspace and impact to the airlines and airport services based on the loss of systems, as well as a response plan that integrates with existing Federal Aviation Administration, airlines, airports and DOD response plans.^{5.2}

From the financial services industry

For financial services organizations, the potential cyber risks associated with partners, vendors and other third parties topped the list of concerns in 2015. The industry is moving toward building security into every product, service, solution or software capability provided by a third party and testing it frequently. Financial services organizations are also building cyber "fusion centers" comprised of operations, IT and product development to better integrate teams around security and allow for more efficient and faster threat awareness and mitigation. Finally, financial services firms are protecting the most valuable, sensitive and regulated data by limiting its value. The use of tokenization, chip cards and other solutions, for instance, will increasingly render stolen debit card PINs useless to hackers.^{5.3}

From the utilities industry

- ▶ Share information externally. Companies need to engage with external parties, such as peer companies, government agencies, such as Homeland Security and the FBI, or sector-specific Information Sharing and Analysis Centers. By sharing information and leading practices, we can all improve our understanding of evolving threats, new tools and techniques. External awareness and collaboration are critically important.^{5.4}
- ▶ Establish a security mindset: security is everyone's job, and it's important that all employees understand both physical and cybersecurity risks. Just as important as how they go about their work is the willingness to speak up when they notice something suspicious. This could be someone behaving unusually at a work location, substation or plant; a device connected to a network that shouldn't be there; or an employee in a building they shouldn't be in. Employees need to be willing to "see something, say something."^{5.5}



6.

Getting true value from big data

Although big data is on the verge of becoming a meaningless catch phrase, the idea behind it is valid, promising and even necessary. The basic idea is to harness the unprecedented explosion in the volume, variety and velocity of health data (electronic health records, payer claims data, real-time information generated by mobile health technologies, etc.) to help solve the very real problems facing the industry.

A well-managed, more robust collective of data could be used to:

- ▶ Identify and reward the most effective health interventions, the critical foundation of the move to pay for performance
- ▶ Better understand how behavioral and environmental factors influence health outcomes, which is vital for stemming the rising tide of chronic disease costs
- ▶ Ultimately help achieve the magic bullet – predictive and prescriptive analytics

The health industry is on the path toward these outcomes, and while progress is stepwise versus exponential, organizations may benefit from learning a few key insights.



Insight

The value is in the collective – but first be sure your data is good

The potential of big data lies in connecting dots between and across different data streams, analyzing the larger data set for trends and patterns – by age, gender, illness type and a host of other factors – to begin solving the health issues posed by chronic disease. This means that the work truly begins with consolidating data, but not before you validate that the data you're using is good. How do you ensure quality data and accurate building of these data sets? We are seeing organizations face the following data challenges:

▶ **It's coming from everywhere.**

The fragmented and localized nature of health care delivery means a diffused delivery of data. Organizations are challenged to integrate imaging data, data pulled from narrative summaries (doctors' notes), ICD codes, sonograms, blood test values, pathology reports and other sources. This will get even murkier as we begin to see the consolidation of mobile health data from wearables, apps and devices including non-health data, such as spending patterns or credit history.

▶ **There is more of it.**

The advent of electronic records means that entities are dealing with much larger volumes of data, often in diverse and dissimilar formats and including structured and unstructured data. Just within the health space, the types and volumes of data are growing.

▶ **It's not clean and pristine.**

Although it may seem obvious, any data inconsistencies at the start could skew analyses and produce spurious findings all along the way. For instance, a duplicate record for one patient with two different name usages (such as Mary Jane Higgins and Mary J. Higgins) will skew any data set by counting this as two versus one. The impact of bad data is only compounded when combining data sets, and de-identified data only makes matters more complicated.

Organizations are slowly rising to the challenge, especially with the growing realization that data is a highly valued asset. Indeed, the business models of many new digital health start-ups are based on monetizing data. Leading practices to capture, clean and consolidate the data include:

- ▶ Using master data management to remove inconsistencies, which is possible now that organizations have to access

large volumes of information from multiple sources

- ▶ Carefully indexing and tagging the data to help ensure data quality is high
- ▶ Focusing on subpopulations – for instance, by identifying postal codes or metropolitan statistical areas where large percentages of individuals are at risk
- ▶ Setting up the structural relationships between different fields that provide context and allow for richer analysis

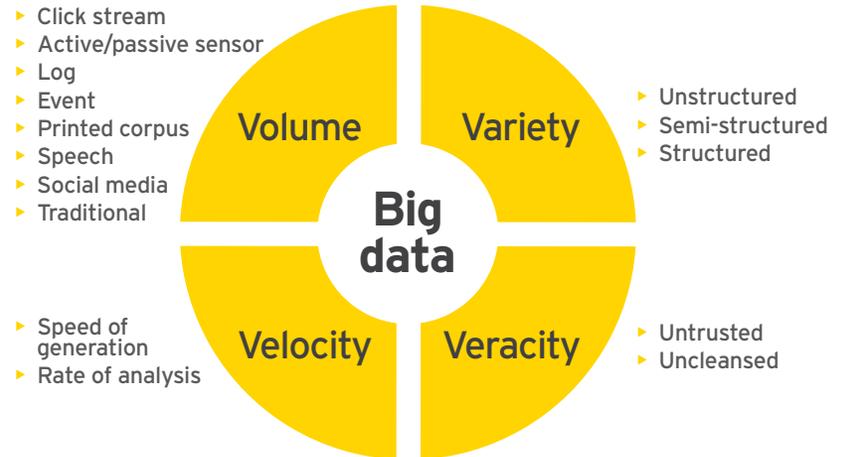
- ▶ Storing it in databases that are interoperable, allowing for data to be combined in a way that connections are transparent and flexible

In some cases, consortium-based data sharing or having a third party house the data is the best route. These third parties de-identify the data using readily available variables from different sources and add it to the central repository.

Existing and new challenges include:

- ▶ **Ongoing concerns about privacy and data uses** - In many markets, privacy regulations, such as HIPAA (Health

Figure 6.1:
The four V's ^{6.1}





Insurance Portability and Accountability Act), strictly limit data sharing or require health care entities to remove patient identifier information before data is shared. Despite de-identification, trust is often a key issue among patients. People want to know that their data is private and are beginning to question how the collective data will be used. While many consumers understand the potential for precision medicine, they are also concerned this could lead to differential fees for health services.

- ▶ **Balancing compliance with access to collective data** - Organizations often over-comply with privacy laws. While easing up to find the right balance, organizations still have a tendency to be overly conservative about sharing even de-identified information – and run the risk of de-identification to the point where combining data for meaningful analysis is impossible.
- ▶ **Managing new concerns about data sharing** - An emerging black market for collective data (see EY thought leadership piece, Navigating the bull black market) means that organizations are becoming even more circumspect about when and how they share data. This could slow analytics progress.

Insight

Findings are only as good as your analytics and algorithms

Even assuming the data is clean, big data doesn't analyze itself. In fact, it requires more care and human intervention than statistical analysis of smaller data sets. With vast volumes of data and large numbers of independent variables, the likelihood of finding spurious correlations increases sharply. Outliers can skew results, and algorithms, left unattended, can run wild. The solution to better analytics is to bring together the best of machine learning and human oversight. Today's analytical techniques use algorithms that:

- ▶ **Are designed by data scientists using large amounts of medical knowledge and context.** Algorithms have tremendous knowledge built into them about symptoms, disease progression, co-morbidities, drug interactions and more.
- ▶ **Aren't static.** Through the use of artificial intelligence and machine learning, algorithms now adjust over time, in response to new data and changing conditions. Human analysts run reality checks on algorithms as they evolve and can nip spurious findings in the bud.





Insight

Leveraging big data requires focus and flexibility

Health entities are operating in a space that is constantly in flux, as organizations enter and exit partnerships, work with new sources of data and respond to changes in information technology (IT) standards and capabilities. The question facing organizations is: how do you build a health analytics architecture that is both flexible and scalable? The major challenges include:

- ▶ **Slow rate of change is a huge barrier.** Health evolves at a glacial pace, with health IT investments often taking months or even years to implement. The world of data analytics moves much faster, following the rapid pace of change for technology standards and platforms. Given that health entities in many markets are also undergoing major reforms in their structures and operations, organizations run a very real risk that an IT project is obsolete by the time it is completed.
- ▶ **Analytics is not a core competency for health.** Data analytics requires complex skills, specialized knowledge and deep experience that many in health care lack.

How to proceed?

A strategic approach to health analytics involves three elements:

- ▶ **Accepting the new reality: analytics is a must-have for organizations** – Analytics capabilities are both necessary and ongoing. This is not just a one-time investment, and organizations need to be smart and strategic about what to build – to address what is needed now and what is around the corner.
- ▶ **Getting a clear focus** – Health organizations need an active data analytics plan and approach. This is a new effort for most in the industry. Further, since analytics requires complex skills and large investments, the best path is to identify and focus on capturing and analyzing data only for health functions that are true core competencies, not for every activity or procedure.
- ▶ **Building in flexibility** – To avoid the pitfalls of traditional long-term IT projects (risk of obsolescence before implementation), health organizations need a different model. A more nimble, scalable and responsive data analytics structure and approach are necessary to keep up with rapidly changing technology and an ever-changing business environment.

Questions to consider

Organizations are asking questions around big data, including:

Before I even start to think about answering larger questions, what could I do to ensure my data is good and reliable?

How do I build a health care analytics architecture that is both flexible and scalable?

What are the skill sets my organization needs to understand both the analytics and the medicine?

What are the top five patient outcomes we could positively impact with the right collective data sets?

How do we start now to build the right relationships and data sets to get there?

What fail-safe measures do we need to ensure our data is protected from a security breach?

What does the future look like for our organization if we could really answer the big questions with big data?

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Jacques is the Global and United States Health Sector Leader for EY. He leads teams around the globe helping clients strategically address the transformational forces shaping the health industry. He is responsible for growing the EY people, networks, and capabilities in the Health sector, and for developing industry-specific solutions and thought leadership. For over 20 years, Jacques has helped some of the world's leading companies undergo dramatic, strategic transformations and global expansions, overcoming critical market and business challenges and guiding them toward growth. In his various roles with EY, Jacques has developed service offerings to solve clients' growth issues, identified key emerging business models that work across convergent sectors, and brought ground-breaking innovations and strategies to top life sciences, health care and consumer product clients.



Jim Costanzo

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Jim Costanzo is the Global Health Advisory Service Line Leader for EY. He has over 32 years of experience in the health care and health insurance industries, working with several of the largest and most complex clients. He has worked on projects developing full lifecycle systems, capacity planning, operations and large scale business transformation for all aspects of health plan organizations. Jim has extensive experience managing the design, development and installation of the industry's leading managed health care packages, with aspects including claim adjudication, membership, billing, ID cards, coordination of benefits, provider, capitation, dental and explanation of benefits.



David Copley

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David Copley is the Global Health Assurance Leader for EY. He brings over 30 years of experience in the health care industry, working with integrated health care organizations, academic medical centers, physician groups, managed care and complex payment models, life sciences and other organizations. David's extensive experience includes helping health care organizations and emerging companies through various transactions, including initial public offerings (IPOs), tax-exempt bond offerings, mergers and acquisitions, and international expansion. He has served as coordinating partner for several public companies that have successfully implemented all aspects of Sarbanes-Oxley (SOX).



Gregg Slager

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Gregg Slager is the Global Health Transaction Advisory Services (TAS) Leader for EY. Gregg has over 25 years of experience advising companies on transactions, and has managed or participated in approximately 500 engagements for corporate and nonprofit acquirers, private equity clients and investor groups.

His focus area is financial and accounting due diligence, and he has experience working with virtually all types of health care organizations – including hospital systems and specialty hospitals, managed care organizations, physician practices, ambulatory surgery centers, long-term care facilities, home health, pharmacy benefits management, diagnostics, pharmaceutical manufacturers and other health care related entities.



Petr Medvedev

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Petr is Global Tax Leader of the Government, Public and Health Sector for EY. Petr has deep experience with both private and public sector issues, in traditional issues, as well as emerging issues such as location of intellectual property rights, legal treatment of cross-border medical data transfers, personal tax and social security liabilities of mobile personnel, etc. He has been practicing tax for more than 23 years, and led the EY Tax and Law practice in the CIS out of Moscow prior to moving to Global EY team. He holds a degree in Taxation and a Master's degree in Economics and is fluent in Russian, English and French.

Attribution

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