



CHASING VALUE AS AI TRANSFORMS HEALTH CARE

By Alexander Aboshiha, Ryan Gallagher, and Lauren Gargan

BUSINESS LEADERS NO LONGER think about artificial intelligence in terms of future impact—they're seeing the impact today. AI is appearing in all corners of business, transforming the way companies operate. Health care is no exception.

Health care players are using AI to address significant inefficiencies and open up powerful new opportunities. These include everything from the delivery of remote health care services to the early diagnosis of disease and the hunt for new life-saving medicines. Today, the technology is incorporated into heart monitors, smart glucose pumps, and other recently FDA-approved diagnostic devices. Biopharma companies are already using AI to improve the efficiency of R&D; one notable example is through identification of better drug targets.

The ongoing rapid development of AI will trigger a major shift in the value pools across health care. This has serious implications not only for the industry's four major traditional sectors—biopharma, providers, payers, and medtech—but also for consum-

ers and technology companies. Boston Consulting Group has conducted an in-depth analysis of the potential impact of AI on health care, identifying two prospective scenarios for how value will shift among stakeholders. Under one scenario, much of the value unlocked by AI is retained by players in the four health care sectors and technology companies—while the second scenario sees much of the value flowing directly to consumers.

Health Care Enters the AI Age

AI is an amalgam of novel methods for gathering data (including machine vision, speech recognition, and natural language processing), new processing techniques (such as machine learning), and innovative interfaces with the real world (including speech generation and 3D navigation). While the term AI is often used to encompass a broad array of technologies, it should not be confused with traditional business intelligence or business analytics, both of which typically rely on structured data—applying classical statistics such as variances,

correlations, and regressions to produce insights for business. AI does more. It harnesses diverse and unstructured data sets and employs novel methods such as neural networks to adapt and learn.

AI is taking off in health care today for three reasons. First, in developed markets there is mounting pressure to contain or reduce health care costs and improve outcomes. Second, there has been an explosion in the availability of health care data, including genomics data, electronic medical records, and information from monitoring devices, such as pacemakers and wearables. Third, advances in software and hardware make it possible to harness that data in new, powerful ways.

As AI-driven innovations take off, they will allow providers to diagnose disease earlier with greater accuracy—and ultimately manage it more effectively. Such advances will be critical drivers that help deliver the best patient outcomes at the lowest possible cost—what is known as value-based health care (VBHC). (See *Competing on Outcomes: Winning Strategies for Value-Based Health Care*.)

What AI Can Do for Health Care

There are major opportunities to increase efficiency in seven areas across the health care value chain. Players in the four traditional health care sectors, as well as technology companies, are already deploying AI tools and approaches in order to seize those opportunities. By 2022 spending on AI-related tools will top \$8 billion annually across the following seven areas:

- **Remote Prevention and Care.** AI can be used to serve patients outside their doctor's office or the local hospital. Virtual agents, for example, can be used to conduct an initial consultation with a patient, screen out those who do not need to see a doctor, and provide important information to physicians about those who do need treatment. In addition, wearables or other devices can trigger alerts and interventions
- **Diagnostics Support.** AI applications in medical imaging and other clinical tests can help doctors identify conditions such as breast cancer, brain injury, or heart disease earlier and more accurately. One recently FDA-approved medical device, for example, uses AI to analyze retinal images, allowing early diagnosis of retinopathy. Such tools can not only improve patient outcomes, but also save money. Earlier diagnosis and treatment of many cancers, for example, can cut treatment costs by more than 50%. And given that some 20% of diagnosis costs are related to salaries, there is a tremendous payoff if AI can improve the utilization and efficiency of highly paid radiologists and other professionals. By 2022, health care players will spend about \$1.2 billion annually on AI-related diagnostics support.
- **Treatment Pathways and Support.** Health care professionals can use AI tools to create individualized treatment plans that support VBHC by reducing risk, improving outcomes, and cutting costs. Case in point: the direct costs of medical errors, including those associated with readmissions, account for about 2% of health care spending in the US. Those errors ultimately take a toll on the broader economy with indirect costs—including lost productivity—estimated to total nearly \$1 trillion. By 2022, about \$2.8 billion will be spent annually on AI tools to improve treatment and support.
- **Drug Discovery and Development.** Biopharma companies invest roughly 60% more in R&D than companies in almost any other sector, spending half of that investment in clinical develop-

based on data such as anomalies in patient vital signs. Goldman Sachs estimates that the use of such tools could save roughly \$200 billion annually in the US alone. Given that potential, BCG expects that by 2022 the health care industry will spend roughly \$2.1 billion annually on AI tools in remote prevention and care.

ment. But the payoff is declining. Over the past 60 years, the number of new molecular entities from the biopharma industry per dollar of R&D spent has declined about 9% annually, according to Bernstein Research. AI can begin to reverse that trend, leveraging past screening results and clinical data to help companies identify and develop promising drugs, while also accelerating trial design and recruitment. Though AI will certainly not be a silver bullet, with the right data infrastructure and industry partnerships, biopharma companies can harness it to make headway against declining R&D productivity. Total spending on AI-related drug discovery and development tools in 2022 is expected to hit \$1.3 billion.

- Operations.** AI—including natural language processing (NLP)—can help automate the writing and reviewing of many health care–related records. This has major implications for providers and payers. Physicians, for example, spend one-third of their time on paperwork—and payers have a significant administrative burden in handling claims. In biopharma and medtech, AI can help streamline operations, including areas such as the global supply chain, beyond the gains created by traditional analytics. By 2022, spending on AI tools in this area is projected to hit \$500 million.

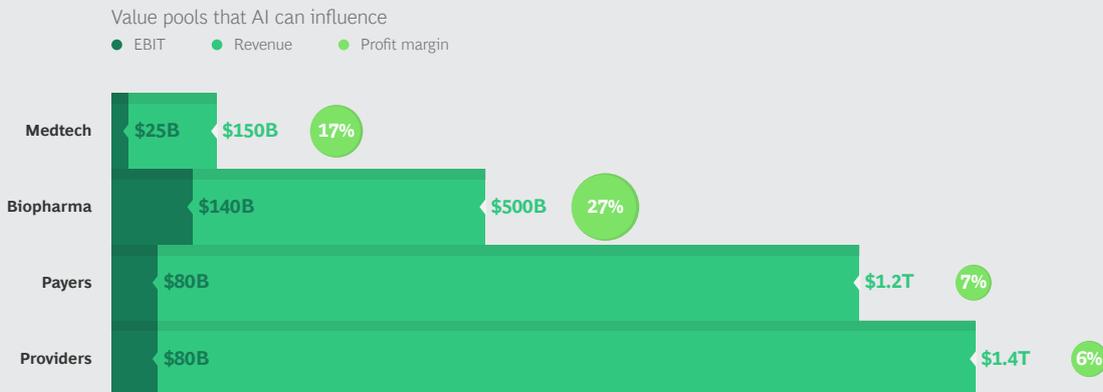
- Marketing and Sales.** AI can allow both biopharma and medtech companies to identify providers who are likely to be receptive to the company’s products and create highly effective, personalized marketing messages to reach them. That could improve the efficiency of sales forces in both sectors, a critical objective in industries where marketing and sales expenses frequently top R&D spending.

- Support Functions.** Computer vision, voice recognition, and NLP are making the automation of standard tasks and processes a reality. Chatbots, for example, can answer consumers’ questions related to bills or password resets. Those AI tools, in combination with advances in robotics, can enhance support function performance across all four health care sectors. (See *How Digital Can Turbocharge Shared Services.*)

Value Pools Shift

AI will cause shifts in health care value pools—reflected in revenues and profits—by exposing inefficiencies, improving medical decision making, and increasing the quality of care. (See Exhibit 1.) Value will shift not only among the health care sectors but also to players traditionally outside the industry, and to consumers.

EXHIBIT 1 | Value Pools Within Four Health Care Sectors Will Be Impacted by AI



Sources: Expert interviews; Economist Intelligence Unit; BMI Research; Insurance Information Institute; IMS Institute; S&P Capital IQ; BCG analysis.

Note: All figures are approximate for 2017. Profit margin calculated using average EBIT of public companies with revenues greater than \$10 million.

Impact on Health Care Players. There are three primary categories of value pool shifts. The first category includes changes created by applications that will reduce costs within a sector and therefore unlock additional value within that sector. These are net positives for the sector. The second are AI shifts yielded by applications within one health care sector that will threaten revenue or profits within other sectors. In such cases, value will flow from one health care sector to the other. The third includes shifts driven by AI applications within one of the four health care sectors that cause value to flow from that sector to either technology companies or consumers.

- **Biopharma.** In the first category of value pool shifts, biopharma will benefit significantly thanks to AI-driven efficiency improvements in areas such as R&D, sales, marketing, and manufacturing. Some companies are already using AI to predict bottlenecks in manufacturing, allowing for adjustments that prevent stock-outs on critical products. In the second category of shifts, value will move from biopharma to payers and providers as AI tools identify optimal treatment pathways and change prescribing patterns, or implement preventive measures. In addition, with many providers operating under contracts that reward them for better outcomes achieved at lower cost, the savings from more efficient use of biopharma products will cause some of the value previously captured by biopharma to shift to providers. And technology companies will capture some value from biopharma as their algorithms for things like target identification, lead optimization, and patient recruitment become more deeply ingrained in the R&D process.
- **Providers.** Diagnostic and treatment selection algorithms improve outcomes and reduce waste. Providers will retain some of that improved efficiency, through fewer hospital readmissions (which often come with financial penalties) and lower hospital overhead costs, for example. As noted above, changing drug utilization will shift some value from biopharma to providers. Also, AI-driven resource scheduling, coding, and billing will improve operational efficiency. But there are negative shifts for providers as well. Improved monitoring, management, and a movement to prevention of chronic conditions will reduce demand for provider services, with the value of those savings captured by payers. In addition, some value within the provider sector will flow to technology companies and medtech players that create AI solutions and intelligent monitoring systems, respectively.
- **Payers.** As in the other sectors, AI will yield major efficiencies in claims handling and other operations, including improved fraud, waste, and abuse detection. That value will be retained by payers. AI-driven enhancements to population health management (PHM) are likely to keep patients healthier and reduce claims. In addition, improved efficiency and clinical decision making, reflected in reduced hospital readmissions, for example, will create savings. As noted above, providers will retain some of those AI-driven savings—but payers will capture much of it. Payers will also capture some of the value previously garnered by biopharma, as AI drives more efficient utilization of medicines and enables more aggressive formulary negotiations. Payers will, however, see the third (negative) category of shifts. Market competition and regulatory pressure, including minimum medical loss ratios, are likely to compel payers to pass some value on to consumers in the form of lower premiums or enhanced coverage.
- **Medtech.** AI will improve overall medtech efficiency, including within the supply chain and marketing and sales operations—unlocking value that the industry retains. As noted earlier, the introduction of intelligent monitoring and diagnostic devices will generate treatment savings—with some of the

value previously captured by providers flowing to medtech. On the downside, technology companies will increasingly offer products and solutions that encroach on the domain of medtech.

- **Consumer.** The primary impact on consumers will be a positive one. As noted above, AI-driven efficiency improvements in the health care system will unlock value for payers—and some of that value will be passed on to consumers in the form of cheaper, or better, insurance coverage and improved health.
- **Tech Companies.** AI will provide a new opportunity for technology companies to stake out major positions in the traditional health care landscape. Already, players such as Alphabet, IBM, Apple, Amazon, and Alibaba are making significant investments in the health care space. These companies are developing AI-driven products and solutions across all four health care sectors, including clinical decision support for providers, diagnosis tools that medtech companies can embed in their products, population health management for payers, and target identification for biopharma—to name a few. At the same time, smaller technology players are emerging, creating innovative AI-focused health care solutions. Among them: Atomwise, which is developing AI-enabled drug discovery approaches; Babylon Health, which is developing an AI-driven system for matching patients with caregivers; and Zebra, which is building software for automated analysis of diagnostic imaging.

Two Possible Outcomes. The directional flow of the various shifts in value is clear—but the magnitude is not. It is difficult to predict the extent to which the four traditional health care sectors will retain value instead of passing it on to consumers or the technology industry. Multiple scenarios are possible. Let's consider two:

- **Scenario 1.** Under this outcome, most of the value unlocked by AI stays within

the health care industry and the technology industry. (See Exhibit 2.) Players in all four sectors keep the value that is unlocked by improvements in their own efficiency (the first category of value described above). In this world, tech, medtech, providers, and payers reap the largest gains, while the impact on biopharma is likely neutral. Consumers, meanwhile, see improved outcomes but limited savings.

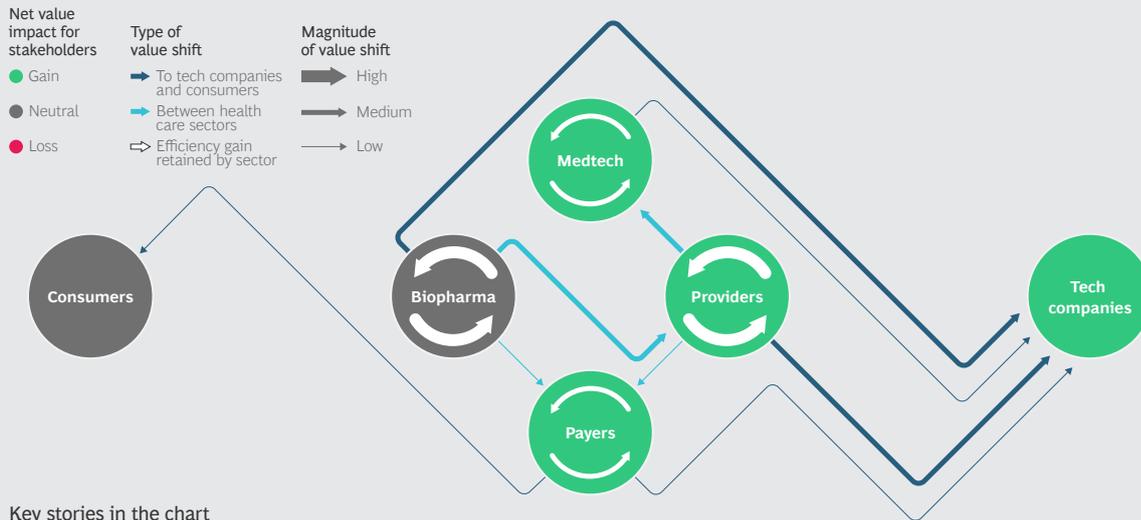
- **Scenario 2.** In this world, a significant amount of the value is passed on to consumers. (See Exhibit 3.) AI helps drive VBHC—improved outcomes at lower cost—and the value unlocked passes to consumers in the form of lower premiums or out-of-pocket costs. Technology companies and medtech also benefit significantly, while biopharma loses value because of shifts such as enhanced detection, prevention, and earlier treatment.

The Path Forward

The journey to integrate AI into strategies and operations must be a sustained one. But even companies that have yet to invest in AI decisively can make some smart, low-risk moves to either enhance the positive value shifts or minimize the negative impacts.

- **Biopharma.** To maximize the upside efficiency boost from AI, biopharma companies should move quickly to adopt AI in both R&D and sales force management. In order to limit the loss of value triggered by lower prescription drug utilization, biopharma players must accelerate their efforts to “go beyond the pill.” This can include developing diagnostics and monitoring products and services, including those that can identify patients most likely to respond to a drug. It could also encompass collecting real-world data that demonstrates the value of their treatments to payers, providers, and regulators.
- **Providers.** Hospitals and other provider groups should move quickly to embrace AI tools that provide clinical decision

EXHIBIT 2 | In Scenario 1, Much of the Value Unlocked by AI Is Shared Among Health Care Sectors and Tech



Key stories in the chart

Consumers: Neutral impact, as much of the value unlocked by AI is shared among health care sectors and tech companies

Providers: Positive impact, due to improved operations and clinical decision making

Payers: Positive impact, due to improvements in claims processing; fraud, waste, and abuse detection; and population health management

Medtech: Positive impact, due to more efficient operations and increased demand for AI-related devices

Biopharma: Neutral impact, as the greater focus on disease prevention and more efficient use of prescription drugs counteract operational and R&D efficiencies

Tech companies: Positive impact, due to increased demand for AI expertise and solutions

Source: BCG analysis.

Note: Arrow width proportional to estimated impact on value in five to ten years.

support, diagnostic imaging analysis, patient monitoring, and automation of processes such as resource scheduling, coding, and billing. These steps will help providers maximize the value they unlock and retain through improved efficiency. To minimize negative value shifts, providers should also embrace the evolution toward prevention and remote care by expanding their outpatient, home care, and virtual consultation offerings.

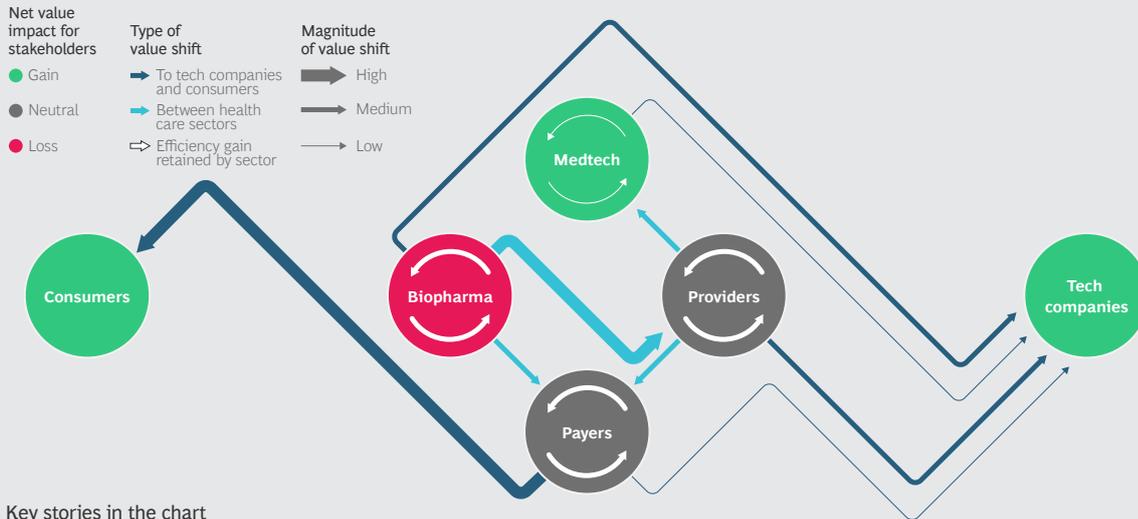
- Payers.** Payers should rapidly adopt AI tools that create value for them by boosting overall health care treatment efficiency. They could, for example, use AI to improve their approach to population health management—the collecting and analyzing of patient data in order to better manage important diseases and health issues within the group—as well as back-end automation that can reduce the costs of fraud, waste, abuse, claims processing, and customer service.

- Medtech.** Medtech companies should move aggressively to develop the AI-enabled devices in imaging, diagnosis, patient monitoring, and surgery that will drive overall efficiency gains in health care. At the same time, they should adopt AI tools that will improve their internal efficiency in R&D and sales and marketing.

To make the most of the value shifts in these areas, health care players must ensure they have the right talent and the right data.

The talent challenge has a number of different—but interconnected—layers. Health care players will need to lure data scientists and engineers away from the likes of Alphabet, Apple, and Tesla. At the same time, they will need leaders who understand the AI opportunity, are conversant with the technical issues involved, and can communicate to the wider organization. Companies will also need to figure out where to house and how to organize AI talent so that

EXHIBIT 3 | In Scenario 2, Much of the Value Unlocked by AI Is Passed on to Consumers



Key stories in the chart

Consumers: Positive impact, such as through lower health insurance premiums

Providers: Neutral impact, as payers claw back savings generated by AI-enabled improvements to operations and clinical decision making

Payers: Neutral impact, as market and political pressures compel payers to pass on savings to consumers

Medtech: Positive impact, due to more efficient operations and increased demand for AI-related devices

Biopharma: Negative impact, as the greater focus on disease prevention and more efficient use of prescription drugs outweigh operational and R&D efficiencies

Tech companies: Positive impact, due to increased demand for AI expertise and solutions

Source: BCG analysis.

Note: Arrow width proportional to estimated impact on value in five to ten years.

they build a group that is both cohesive and dynamic—but is also accessible to, and integrated within, the overall organization.

The data issues associated with AI are similarly daunting. AI requires large amounts of data—but information in health care is often irregular or poorly structured, and dispersed among players that have different standards and regulatory restrictions. As a result, while individual players have valuable data sets, they often have difficulty pulling information together from across the entire industry. Payers, for example, have claims databases that can yield power-

ful insights—but they don't always have access to other information, such as electronic health records, that would give them a system-level view. The bottom line: companies must either invest in generating the data they need internally or strike partnerships with external players to gain access to it.

Having the right talent and data will be table stakes in a transformed industry. The organizations with an edge in both areas will have enormous advantages. Health care players must act now to develop and implement strategies to prepare themselves for this future.

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