A new Rx: AI for operations in health care

We may think of artificial intelligence (AI) in health care in terms of scientific advances, such as a cure for cancer or a science-fiction tricorder-like device. But in the real world, AI is making its initial impact in workflow and administrative tasks. That’s not to say AI technologies aren’t being used for genuinely exciting work in radiology, drug discovery, or to flag high-risk patients in covid-19 analysis.1,2

According to a recent MIT Technology Review Insights survey of 1,004 AI experts, the top three uses for AI in health care are in quality control (60%), customer care and support (44%), and monitoring and diagnostics (42%). The importance of quality control in health care is obvious—better medicines and diagnostics help everyone from doctors to patients to pharmaceutical and insurance companies. Some might think that putting
resources into the health-care back office is a cop-out. After all, isn’t the point of technology to save lives? But attention to “paperwork” by health-care technologists and vendors is a good thing.

Here we look at how AI is changing and challenging health care. Are health-care professionals using AI? What AI functions are they most anticipating? Will AI in health care show the same type of return on investment that is being seen in other industries?

**Back-office AI fixes annoying problems**

Operational AI for health care reduces frustration and stress. This presents an immediate value on which to build other, patient-centric AI projects. Plus, health-care professionals may not understand or appreciate the algorithms behind biomedical drug trial data analysis, but they know it when technology improves the quality of their lives, which in turn improves patient care.

But it isn’t as though most people in medical fields have encountered AI technology personally—especially when business AI adoption has just started. Overall, according to the survey, just two in five (39%) large businesses using AI in any manner have been doing so for more than two years. For about half (48%) the organizations, across all industries, AI has been employed since 2018, and 13% are busy deploying their AI-related projects in 2020 and 2021. The health-care and pharmaceutical industries are in the middle of the pack: 39% of health-care companies have been using AI in any form for more than two or three years, compared with 57% of IT companies and 42% of retailers (see Figure 1).

What health-care professionals are acutely familiar with are the daily frustrations that they feel computers ought to be able to solve. “The low-hanging fruit is in addressing inefficiency,” says Leo Martin, an anesthesiologist in private practice in Phoenix, Arizona, with 35 years of experience. He’s been so frustrated by administrivia that he’s considering retiring early.

As with any other computing task, AI is most attractive when it automates boring, repetitive jobs—characteristics that also make those tasks error-prone. Doctors go into health care because they want to heal people, not fill out insurance paperwork. Operational AI also frees up patients’ time and keeps them from filling in medical forms or waiting in doctors’ offices.

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**About The global AI agenda**

This sectoral report examines the adoption of AI in health care. It is part of “The global AI agenda,” a thought leadership program by MIT Technology Review Insights examining how organizations are using AI today and planning to do so in the future. Featuring a global survey of 1,004 AI experts conducted in January and February 2020, the report explores AI adoption, leading use cases, benefits, and challenges. It also seeks to understand how organizations might share data with each other to develop new business models, products, and services in the years ahead.

The respondents are evenly distributed globally, with 20% based in each of North America, Europe, Asia, Latin America, and the Middle East and Africa. Some 26% of respondents are C-level executives, 30% are directors, 16% heads of AI, and 10% heads of data or analytics. Over half (55%) of the organizations they represent are large, earning annual revenue of $1 billion or more; nearly one-third (32%) generate revenue of $5 billion or more.

Of the 11 sectors represented, the largest contingents come from manufacturing (15%), IT and telecommunications (14%), consumer goods and retail (13%), financial services (11%), and pharma and health care (10%). The other sectors in the survey are professional services, energy and utilities, transport and logistics, travel and hospitality, media and marketing, and government.

In addition, MIT Technology Review Insights conducted in-depth interviews with leading AI experts globally, from organizations such as the World Economic Forum, Philips, Emirates Group, Vodafone, Walmart, Bank of Singapore, Lemonade Insurance Company, and Loom.ai, among others.

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Improving efficiency in health care
Inefficiency is expensive and frustrating. From skipped appointments, for example, to the hours that physician assistants spend on the phone waiting to speak with insurance company representatives, enormous sums of money go to waste.

There’s a big payoff in optimizing how a department is run. AI can help take a patient from one step to the next, says Kevin Lev, marketing leader at Philips. A computer system can optimize “patient-care pathways,” moving patients quickly and efficiently through a health-care facility. If the software can access the electronic patient record, the radiology scanner, and the reporting system, it can improve business operations considerably. For instance, AI-supported systems can monitor patient no-show rates (because idle staff and radiology scanners are expensive) and identify socioeconomic patterns that suggest that a patient could be a no-show (so the medical staff can take steps to engage with the person and ensure that appointments are kept). Philips is one of the companies already deploying systems that use this AI technology.

Today in health care, a surprising amount of information travels by fax machine, which means someone spends time retyping medical data—and potentially making expensive, even life-threatening typos. “AI could make my life easier just by connecting medical records,” says Martin. As a result, choosing AI systems to streamline back-office health-care processes has a lot of appeal, particularly in larger pharmaceutical and health-care organizations. Today 39% use AI for legal and compliance work; 91% expect to do so in two years.

But even if health-care organizations are interested in compliance, that’s not where the payback is. Just 22% of health-care organizations cite compliance as a tangible AI benefit. The biggest perceived takeaways are in improved operational efficiency and cost savings (54%), faster time to market (47%, which in this context could...
be taken to mean better response times), and improved customer experience (44%). The results can be interpreted this way: technology leaders in health care are primarily interested in improving their patients’ experiences (see Figure 2).

**Freeing up expertise**

It will take years for AI and machine learning to get good enough for us to trust them implicitly—and that’s fine. It’s another reason to automate the boring stuff, so smart people can do the things that require brain sweat. That perspective is reflected in the sentiment expressed by Omar Eton, a medical oncologist at the Hartford HealthCare Cancer Institute. “Artificial intelligence may never catch up with the now readily available point-of-care subspecialty information prepared by teams of seasoned investigators who are capable of weighing real-world available information,” Eton says.

AI is a fast-developing field with ethical and data privacy issues yet to be resolved; people understandably are hesitant to trust the technology with some decisions. “Computers are good at what you tell them to do,” says Lev. “An algorithm is as good as its trainer, its coding, and the people who use it.”

That’s why reducing paperwork and optimizing business processes is something everyone can support. AI adoption in hospital operations is easy to accept because nobody is at risk. Even if a project stumbles in its version 1.0 imperfection, we’re no worse off. If it fails, we fall back to the same administrative tedium we’re used to.

**Building a foundation for clinical AI**

Using AI in the back office is a stepping stone for exciting clinical AI uses that can come later. Survey results show AI adoption is hindered primarily by complexity, with too few people available to help make sense of the technology. In other words: it’s hard—particularly so when it comes to data interoperability, which is among the problems health-care professionals most urgently want to address.

![Figure 2: Benefits of AI in health care](image)

Hospitals and pharmaceutical companies rank AI tech wins that affect patients the most—faster response times (time to market) and better customer experiences—slightly higher than counterparts in other industries.

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Healthcare/Pharma</th>
<th>All Other Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved operational efficiency/cost savings</td>
<td>54%</td>
<td>51%</td>
</tr>
<tr>
<td>Faster time to market</td>
<td>47%</td>
<td>41%</td>
</tr>
<tr>
<td>Improved customer experience</td>
<td>44%</td>
<td>41%</td>
</tr>
<tr>
<td>Improved management decision-making</td>
<td>43%</td>
<td>44%</td>
</tr>
<tr>
<td>Better risk management</td>
<td>41%</td>
<td>34%</td>
</tr>
<tr>
<td>Increased revenue</td>
<td>26%</td>
<td>29%</td>
</tr>
<tr>
<td>Improved compliance</td>
<td>19%</td>
<td>22%</td>
</tr>
<tr>
<td>None yet</td>
<td>6%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: MIT Technology Review Insights survey, 2020
It makes sense to start with the relatively straightforward items—such as making connections between a patient’s medical records—because connecting health-care systems and data isn’t a one-shot deal. “For clinical guidance targets, the value of artificial intelligence will be limited by the quality of the data to which it has access,” Eton says. Access to full patient data enables a holistic clinical approach. An algorithm can take into account a patient’s genomic profile, blood work, and other data such as population-based metrics—assuming that data is accessible. For instance, if an AI system suggests that a 42-year-old patient is at increased risk, he can be directed to get a colonoscopy earlier than the typical age of 50.

And doctors are excited about using connected data sets to improve patient care. “With an expanded data set, a powerful AI engine will uncover things we have never thought about,” says Jerome Tannenbaum, CEO of Sanderling Renal Services in Nashville, Tennessee. He contemplates inputs from direct monitoring, claims-based diagnosis data, laboratory test values, analysis of all medications a patient is taking, and socioeconomic factors. That’s a lot of information, but today it’s stored in different data silos.

For oncology, says Eton, the hope is in helping clinicians select the best treatment for a patient. An AI-based approach to doing that would be based on an entire panel of mutations found through next-generation sequencing or gene-expression profiling of each patient’s tumor. “For now, we are just good at identifying a few driver and predictive mutations,” Eton says. “Artificial intelligence could fill the high unmet need in interpreting reams of genetic sequencing data for each patient.”

But for that to happen, the health-care industry and computer scientists have to find better ways to share data. “Let the AI network travel, and not the data,” says Michael Perkuhn, general manager for Philips IntelliSpace AI, an AI system for medical research. If the AI can train on the same data, Perkuhn says, the network becomes more stable. “It sees more heterogenous data, so we can access AI on a larger scale.”

The cost savings of operational AI are evident. Return on investment is easier to measure when projects have easily quantified numbers, such as “reduction in missed radiology appointments.” Perhaps that’s one reason the top three uses for AI in health care are in quality

“With an expanded data set, a powerful AI engine will uncover things we have never thought about.”

Jerome Tannenbaum, CEO, Sanderling Renal Services
control, customer care and support, and monitoring and diagnostics (see Figure 3).

Even so, it takes a while to collect data to back up the investment justifications, particularly when these systems are expensive to deploy. The longer an organization uses AI, the better it is at judging success—and the better ROI it reports. Half of the health-care companies using AI before 2018 say it delivered more value (or a lot more value) than expected, compared with 27% that have been using the technologies beginning in 2018 or 2019.

Better health-care decisions

Health-care AI does more than improve business operations. It’s doing cool things, such as speeding up the image acquisition in magnetic resonance imaging machines by 30% to 50%, using 3D image modeling to better spot problems, and applying machine-learning skills to evaluate radiology reports. More innovations are on the way, including those that contribute to the perception that AI is primarily an element in scientific achievement.

AI technology allows us to see patterns in complex information, says Jeroen Tas, chief innovation officer at Philips, “and most health-care information is complex by nature.” On the clinical side, AI can optimize speed, insights, and workflow.

But medical personnel can also learn from how that information is used as part of a diagnosis, Tas adds. Advances aren’t limited to clinical innovations. Data connections—which are set up by the operational efficiencies enabled by AI—may offer additional insights and improve health-care practices. For example, in an interview before the covid-19 crisis began in the United States, anesthesiologist Martin envisioned AI models that watch news reports, recognize price fluctuations, and automatically order more equipment (from bandages to drugs) to ensure that a hospital doesn’t run out at a critical time. Hospitals can save a lot of money by better handling inventory and recognizing which items have to be kept in stock, Martin adds.

Figure 3: Top uses for back-office AI

AI technologies in health care are found where success can be quantified—for example, quality control, customer service, and monitoring and diagnostics.

<table>
<thead>
<tr>
<th>Use</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality control</td>
<td>60%</td>
</tr>
<tr>
<td>Customer care and support</td>
<td>44%</td>
</tr>
<tr>
<td>Monitoring and diagnostics</td>
<td>42%</td>
</tr>
<tr>
<td>Inventory management</td>
<td>30%</td>
</tr>
<tr>
<td>Personalization of products or services</td>
<td>25%</td>
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<tr>
<td>Cybersecurity</td>
<td>24%</td>
</tr>
<tr>
<td>Asset maintenance</td>
<td>21%</td>
</tr>
<tr>
<td>Fraud detection</td>
<td>17%</td>
</tr>
<tr>
<td>Finance processes and analysis</td>
<td>14%</td>
</tr>
<tr>
<td>Pricing</td>
<td>13%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
</tr>
</tbody>
</table>

Source: MIT Technology Review Insights survey, 2020
“AI could make my life easier just by connecting medical records.”
Leo Martin, Anesthesiologist

Martin is also eager for machine learning to address the frequency with which medical alarms go off when they should not. Ninety percent of those alarms are wrong, he says, which leads to alarm fatigue.4

The possibilities extend beyond individual medical practices. “Imagine reaching someone in a remote area,” says Perkruhn, and how much telemedicine can improve patient care.

Some of these AI advances are less about technology than about business systems—and changing those will take time. “You don’t need to change a health system if instead of just a patient monitor, we can have predictive analytics on which patient needs what intervention,” says Perkruhn. But getting better health outcomes at the population level is a different story. “You want to understand individually which patients need what care at what time. We need to be able to do it virtually and optimize that. I think that we need a little bit longer runway for that one.”

Ultimately, the medical experts hope, AI can help health-care practitioners make better decisions. Tannenbaum attributes many of the advances in medicine to the “uncanny powers of observation and intuition” of a few physicians from long ago. “They were able to use these almost superhuman powers to identify subtle historical, physical, physiologic, and laboratory findings, which allowed them to categorize the patient’s situation into a ‘diagnosis.’ In many cases, the diagnosis was unheard of. They invented it,” Tannenbaum says. “Most of us don’t have those unique powers. AI has the potential to replicate the genius of those handful of clinicians and put that talent in reach of the average physician.”

Key takeaways

1. AI’s impact on health care is being seen in the back office, cutting costs, optimizing how departments are run, and overall improving patients’ experience. This may not seem like the most exciting use of AI, but in health care saving time and money matters, too.

2. Operational AI frees up needed expertise by eliminating tedious clerical tasks and allowing doctors and nurses to deliver better care. This allows health-care professionals to focus on doing what they do best, whether it’s research or patient care.

3. Health-care institutions that use AI to break down data silos are building a solid foundation for clinical innovations. Connecting medical records and data sets will ultimately improve patient outcomes.
This report, “A new Rx: AI for operations in health care,” is an executive briefing paper by MIT Technology Review Insights produced in partnership with Philips. It is part of a series of regional papers published as part of The global AI agenda research program. Jason Sparapani and Laurel Ruma were the editors of this report, and Nicola Crepaldi was the producer.

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Footnotes


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