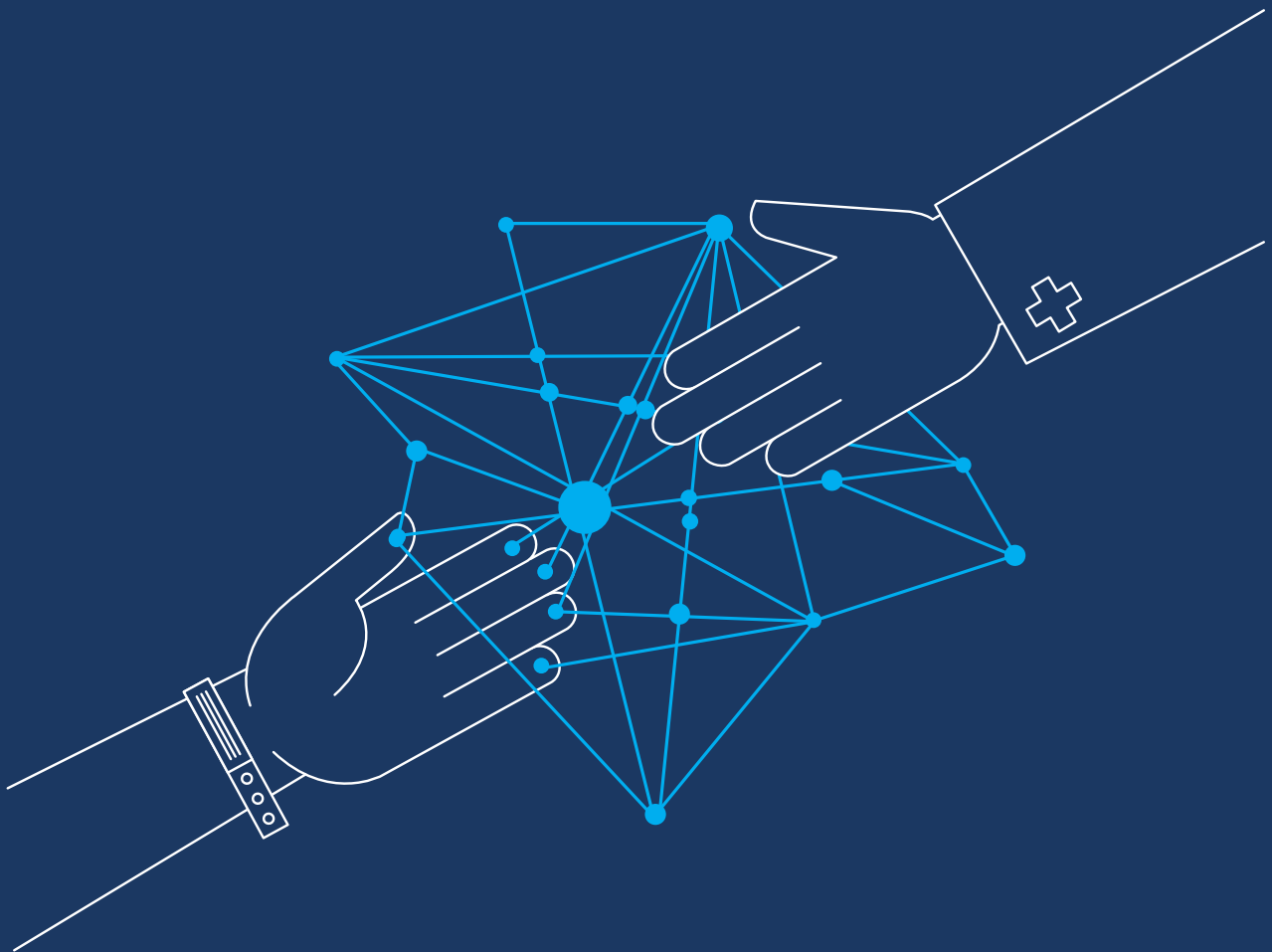




The AI effect:

How artificial intelligence is making health care more human



Foreword

One of the privileges of being part of a global health-care organization is the opportunity to listen and learn from those on the front lines of this business of keeping and making people healthy. You also get to see the progression of big trends reshaping the industry from many angles – some embrace the new; others watch and wait. Some have questions; others have answers. Some are ready; some are not.

The proliferation of artificial intelligence (AI) is one of those moments. The increased use of data analytics and machine learning, combined with connected devices and genomics, is ushering in a new era with the potential for real breakthroughs in patient outcomes and operational efficiencies.

As such, much has been predicted and proposed about the impact AI will have on health care. But today AI has finally been implemented widely enough (in at least seven out of 10 hospitals, according to research conducted by MIT Technology Review Insights and GE Healthcare) that we can start to move from early conjecture to initial conclusions. That was the motivation for this report: to look at how AI has actually impacted health-care professionals' jobs and the patients they serve today, the roadblocks still preventing others from adopting it, and the opportunities for collective contributions.

At GE Healthcare, we look forward to continuing on our 100-year journey alongside our partners on the front lines of health care, as they seek to tackle this and the next big trend that becomes reality. Because no matter what external factors shape and remake the industry, our collective goals in the business of keeping and making people healthy will always be about doing so in the most precise, individualized, and compassionate way possible. This isn't just a business, after all – it's humanity.

KIERAN MURPHY
President and CEO, GE Healthcare

Preface

To produce this study, MIT Technology Review Insights, in association with GE Healthcare, conducted a survey of more than 900 health-care professionals in the US and the UK, and a series of interviews with experts. The report is sponsored by GE Healthcare, and the views expressed within are those of MIT Technology Review Insights, which is editorially independent.

The survey

- In October 2019, MIT Technology Review Insights surveyed 908 professionals working at health-care institutions, including medical professionals and business and administrative professionals who are involved in the purchasing or who influence the selection of artificial intelligence, big data analytics, or medical equipment and technology. Of the total, 17% are medical doctors and specialists, 5% are nurses or nurse practitioners, 26% are senior management, 16% are in information technology, 16% are in research and development, 9% are in legal or regulatory departments, and 9% are in finance or accounting.
- Survey respondents are from the US (70%) and the UK (30%).

Executive summary

For some time, leaders of technology-enabled health-care institutions – and today, that means practically all health-care institutions – have been anticipating the potential impact that artificial intelligence (AI) will have on the performance and efficiency of their operations and their talent. But in reality many, if not most, have already been reaping the benefits of AI tools, which are improving many activities in health-care institutions, from enhancing oncological diagnosis accuracy to reducing time spent scheduling patient visits. In a survey conducted by MIT Technology Review Insights, in association with GE Healthcare, more than 82% of health-care business leaders report that their AI deployments have already created workflow improvements in their operational and administrative activities – giving clinicians time back to work with their patients more closely, and with more insight. This report, alongside an interactive experience on technologyreview.com, is the conclusion of our survey of more than 900 health-care professionals in the US and the UK.

CONTENTS

Foreword	2
Preface	3
Executive summary.....	3
The effect of AI is already here	6
Actionable insights untangle complexity	8
More time, more meaningful relationships	8
Expect the unexpected challenges	9
Collaborative care, connected ecosystem	10
Conclusion.....	10



Artificial intelligence (AI) is increasingly seen as the catalyst for transforming the health-care industry. For Matthias Merkel, professor of anesthesiology and perioperative medicine at the School of Medicine at Oregon Health & Science University, it's doing something big by doing something really small: noticing minute irregularities in patient information. That could be the difference between acting on a life-threatening issue – or missing it.

“In a lot of diagnostic uncertainties, a robust AI mechanism can alert us to abnormalities, which then prompts a physician’s medical interpretation of whether that has clinical relevance,” Merkel says. “If done right, that will help us not miss subtle differences.”

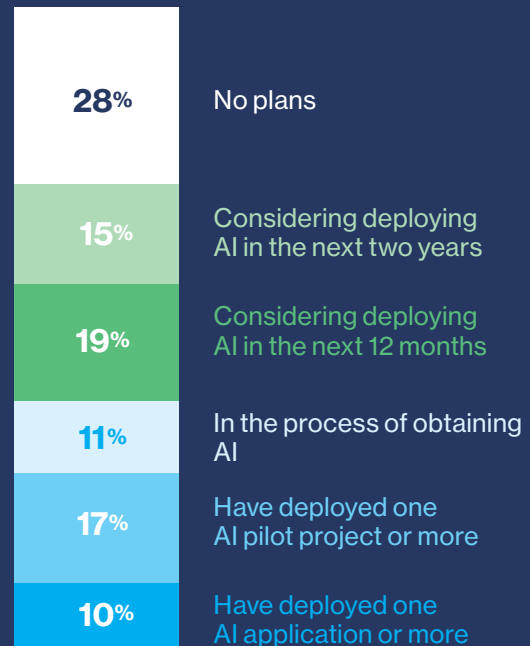
Not long ago, no one would have dreamed that a machine could be a partner in guiding a medical procedure. But advancements in AI have positioned this class of technologies as a powerful tool for clinical and operational efficiency. AI today is allowing everyone involved in the health-care ecosystem – doctors, nurses, administrators, and patients – to benefit from enhanced resource efficiencies and diagnosis. It extends and augments professional capabilities and provides the foundation for more personalized, cost-effective, and impactful outcomes.

And contrary to common, yet unproven, fears that machines will replace human workers, AI technologies may actually be “re-humanizing” health care, just as the system itself shifts to value-based care models that may favor the outcome patients receive instead of the number of patients seen. In a survey of more than 900 health-care professionals in the US and UK, conducted by MIT Technology Review Insights, in association with GE Healthcare, 57% of medical staffers report AI will let them focus more on preventive medicine as a result of better prediction capabilities, and almost half indicate it will enable more robust diagnoses.

These findings are even more critical as health-care delivery and administration are becoming more complex and costly, and professional and technological capacity is ever more burdened, with doctors buried amid vastly expanding workloads and administrative, lower-yield work, and patients robbed of personal interactions with their physicians. During the next 10 years, AI will radically streamline health-care delivery processes, transforming them into collaborative platforms that will allow patients and professionals to harness, share, and act on immensely powerful insights.

Health-care professionals are ready for AI

The health-care industry is eager to capitalize on the benefits of artificial intelligence, including improved quality of care and lower costs.



7 out of 10

health-care institutions have adopted or are considering AI.

In a series of conversations, health-care professionals in the US and UK told MIT Technology Review Insights that the benefits from AI usage are already accruing to their operations and diagnostic capabilities, through the use of clinical diagnostic tools to increase the accuracy of detection and treatment, and through workflow management platforms that help doctors triage their time to see patients more efficiently and effectively. For example, 86% of survey respondents who have adopted AI report that the technology has helped their institutions analyze and make use of data, and 79% indicate that it has helped avert health-care worker burnout.

Of health-care institutions that use or plan to use AI:

74% will develop their own customized AI algorithms.

83% plan to buy third-party AI algorithms.

79% will increase spending on AI applications.

Industry insiders also shared their belief that AI is beginning to allow patients and professionals to more proactively manage their own health-care regimes, particularly through the use of insight from AI-enhanced wearable devices. Yet they also say there are hurdles to overcome before AI transforms health-care provision.

For one, machines must work for doctors and clinicians, not the other way around; much patient consultation time is spent entering data, not drawing inference from it. This, however, is largely an evolutionary transition in the adoption of AI. More important, health-care organizations must allow for fundamental shifts in how patients are cared for – doctors and other health-care workers must leverage increasingly comprehensive pools of AI-mediated medical data to make decisions in collaboration with machines.

The effect of AI is already here

Eighty percent of business-facing and administrative health-care workers believe that AI is helping them, or will help them, improve revenue opportunities.

Numerous technologies are in play today to allow health-care professionals to deliver the best care, increasingly customized to patients, and at lower costs. The survey found that seven out of 10 health-care institutions have either adopted or are considering AI: 10% have already deployed one AI application or more in their operations, 17% are conducting pilot projects, and 11% are in the process of acquiring at least one AI application by year's end. More than one-third plan to increase their spending on AI in the next two years.

A particularly powerful set of health-care capabilities is achieving better image recognition, detection analysis, and diagnosis decision support. Almost two-thirds of survey respondents indicate that such AI-enabled tools are either in use at their facilities (41%) or are under consideration for adoption (23%). While such tools have grown profoundly more useful in recent years, such diagnostic tools already enjoy a long history: "AI and machine learning in the field of cardiology started way back – 15, 20 years ago – in electrocardiograms," says Bijoy Khandheria, a cardiologist at Aurora Hospital's Aurora International & Executive Health Program in Milwaukee, Wisconsin. Surgical procedure enhancement and targeted treatment is another area gaining traction; 23% of respondents indicate that they have already employed such capabilities.

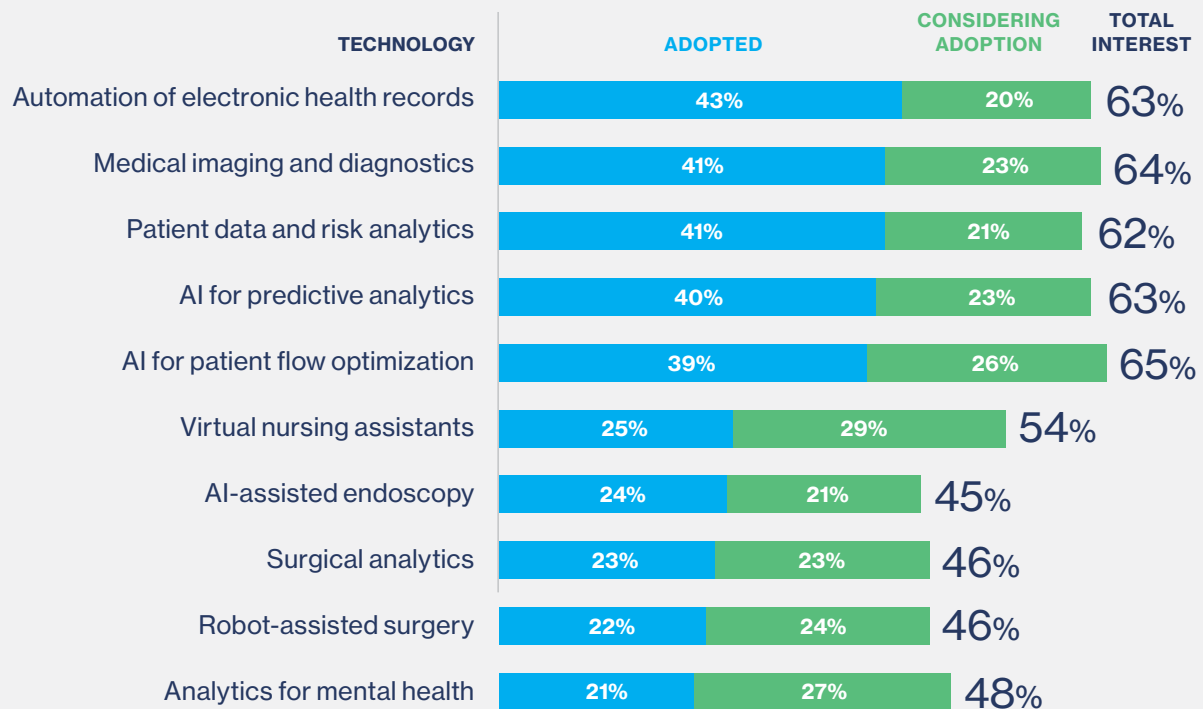
"Distributed" analytics-enhancing wearables, such as health monitors or fitness trackers, and ongoing care regimes are also making an impact on health-care provision and outcomes – although these tools are, currently, not deeply integrated with the operations of health-care organizations themselves: just 31% of survey respondents indicate that their institutions are currently leveraging AI-enabled wearables. But 28% are thinking about leveraging them in the future, which means hospitals see wearables as tools that link insight to patients and customized care. The increasing prevalence of consumer wearables will have a growing impact on the way health information is consumed and acted on.

For example, wearable systems can help people mitigate potential health risks. Take hay fever, says Michael Brady, professor of oncological imaging at the University of Oxford in the UK and the founder of several medical imaging companies. With all of the aerosols that are now in our environment, "simply having a warning that you're in a particular area where the ambient level is high, and that therefore you should ideally be indoors" would prove valuable to patients seeking to manage their own outcomes. But Brady cautions that many of these applications do not yet have business cases associated with them.

The business models of health-care providers will need to adjust to fully accommodate AI-powered technologies, but as Khandheria observes, they'll likely evolve as AI transforms health care entirely. "It's not about whether it will benefit the consumer, the patient, the health-care system," he says. "We want to ensure the health of a population." Khandheria cites as an example that the maker of a medical technology, such as an AI-enabled

AI adoption spans diverse technologies

Health-care institutions are looking at an assortment of applications to achieve better health outcomes, with keen interest in EHR automation, medical imaging and diagnostics, and patient data and risk analytics.



diabetic pump, carries certain risks and rewards by putting its product on the market, just as health-care facilities do by offering it to patients, as do the patients themselves. If patients don't use the devices as instructed, for instance, they can expect their insurance premiums to go up. But if health-care providers enter into a partnership with the patient, the health-care system, and the industry, "all the parties then become involved and have skin in the game," Khandheria says. "It's a win-win for everybody."

The survey shows that health-care administrators and leaders see AI as an agent for positive change: 80% of business-facing and administrative health-care workers believe that AI is helping them, or will help them, improve revenue opportunities, and 81% believe AI will make them more competitive health-care providers. Further, nearly three out of four health-care institutions that use or plan to use AI will develop their own AI algorithms in the next two years.

What the industry is realizing is AI-enabled tools represent extension – not extinction – of professional capability in health care. For magnetic resonance imaging, for example, "the basic interpretation, with the help of machine learning and AI, can be standardized and left to the machine. But there is still a need for human intervention," Khandheria says. "Humans are not going away; they are just going to make smarter decisions, with fewer errors."

Brady underscores this with observations from the use of AI in medical imaging analysis: "When we combine AI-based imaging technologies together with radiologists, what we have found is that the combination of the AI technology and the radiologist outperforms either the AI or the radiologist by themselves. So, far from replacing radiologists, what we see is that the technology supports decisions and amplifies the performance of radiologists."

“We need to adapt to AI in a meaningful way.”

Matthias Merkel, Professor of Anesthesiology and Perioperative Medicine, Oregon Health & Science University

Actionable insights untangle complexity

“With improvement in the physician’s workflow and health-care operations, diagnostic tools will be better applied.” — Dushyant Sahani, Professor and Chair of Radiology at the University of Washington Medical Center

Across the health-care service ecosystem – from patient management, operations, and administration to diagnosis and treatment – health-care professionals are confronted with growing complexity. Regulatory concerns, expanding treatment alternatives, and the sheer onslaught of data and information are all exceedingly challenging to navigate.

AI’s core value proposition is in reducing this complexity, automating and streamlining workflow, and allowing health-care professionals to harness the wealth of insight the industry is generating, without drowning in it. Handling growing workload volumes – and managing the backlog and staff fatigue that accompanies it – was cited by survey respondents as the top challenge that they were looking to mitigate through the use of AI.

One crucial way to face this challenge is to ensure that workflow processing is more efficient. “When anyone thinks of AI in health care, they are thinking of diagnostic tools,” says Dushyant Sahani, professor and chair of radiology at the University of Washington Medical Center – but he points out that in order to fully use AI in that context, more fundamental challenges need to be addressed first. Medical workflow processes, for example, are so complex, with many regulations to heed and lots of paperwork to fill out, that scheduling patients for appointments is slow, manual, and difficult.

But using AI for “smarter” scheduling opens up more slots, which in turn empowers referring physicians to schedule more patients or more effectively match patients with specialists, Sahani says. “With improvement in the physician’s workflow and health-care operations, diagnostic tools will be better applied. If the focus is only on the diagnostic tool, adoption will be much slower.”

The survey bears this out: 43% of survey respondents are already using natural language processing tools to process their electronic health records today, and 39% are using AI for patient flow optimization – and nearly all of those respondents are also using AI tools in more clinical or diagnostic capacities as well.

More time, more meaningful relationships

“The job description of a physician has already changed.” — Matthias Merkel

Scheduling tools allow increased autonomy to patients while streamlining scheduling to increase resource capacity. This is combined with AI’s ability to allow medical professionals to manage what Khandheria describes as “information overload.”

“A health-care provider is bombarded with information – it’s so much, you can’t keep pace with it. And if you can’t keep pace with it, you tend to make mistakes, or you tend to become withdrawn and say it doesn’t matter,” Khandheria says.

Thus, AI is helping to enable doctors to reconnect with their aspirations to go into medicine in the first place. “The job description of a physician has already changed,” says Oregon Health & Science University’s Merkel. “When I was in medical school, one strong benefit was if you had a photographic memory and could memorize large data sets quickly and know where you read them. This is almost obsolete today, and the ability to combine the patient information rapidly with relevant information in the digital world is pivotal.”

AI can be used to assume many of a physician’s more mundane administrative responsibilities, such as taking notes or updating electronic health records – which survey respondents report takes up 10% of a typical medical professional’s workweek. This frees up their time so they can spend it on patients or the core of their jobs – indeed, 45% of survey respondents believe that AI has helped increase consultation time and time to perform

Medical professionals using AI report that AI has:



This is beginning to happen: Increasingly, AI is playing a key part in reducing physician burdens. Almost 80% of AI adopters surveyed indicate that the technology has automated time-consuming tasks, such as maintaining medical records, that doctors and other medical professionals perform. “Clinicians are looking more and more towards AI technologies to help them focus within the time available onto the most salient part of images,” Brady explains. Cancer doctors, for example, might examine 200 cases at a time, and the majority of the information they sift through will not be clinically significant. So using AI to identify patients who are “the most difficult, the most problematic – the ones who are the most likely to have some adverse condition or pathology – and treating those first while the clinician is fresh, that addresses the real pain points of clinicians.”

surgery and other procedures. But, Merkel points out, there is room for improvement: much of consultation time is spent with computers in between patients and caregivers, with the latter recording information, rather than being health coaches or facilitators.

“We need to evolve and better understand how AI can work for us,” Merkel says, “so we can interpret patients’ health-care conditions, giving them good recommendations and guiding them through a longitudinal process.”

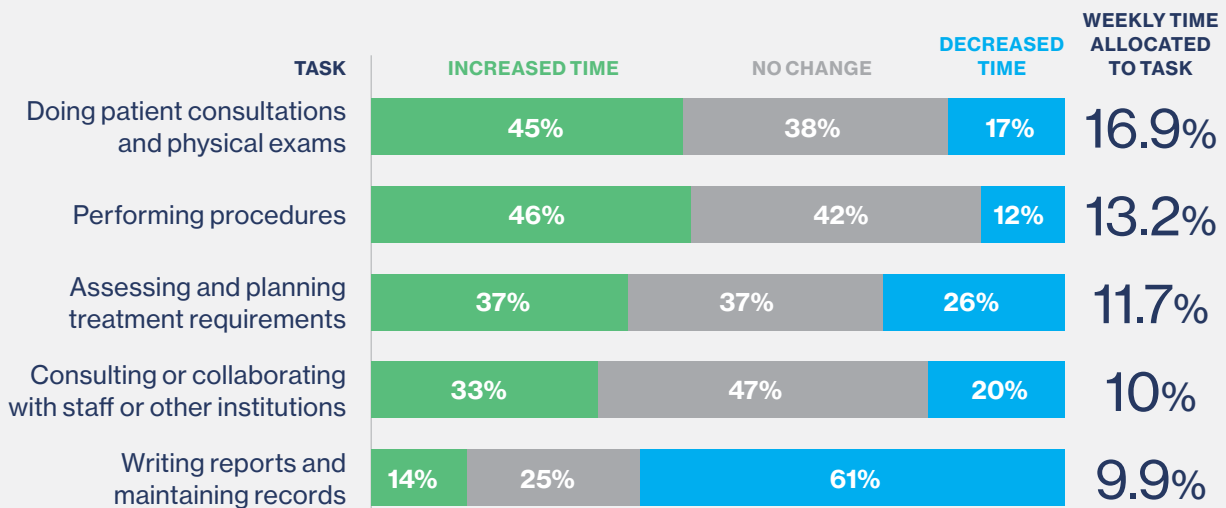
Expect the unexpected challenges

Integrating AI applications into existing systems is the third-most challenging issue for 57% of respondents.

Implementing AI in health-care operations, like any significant technology organizational transformation, presents multiple challenges. Survey respondents who report that they have already deployed AI tools and

‘Busywork’ on life support

For medical professionals, AI means more time for patient care, treatment, and consultations, and less time on rote, repetitive tasks.



“We need to evolve and better understand how AI can work for us.”

Matthias Merkel

applications or plan to deploy them indicate that they found multiple hurdles, particularly integration. The disruptive impact that AI has on existing processes is ranked as the second-most challenging issue for 60% of respondents, and the ability of organizations to integrate AI applications into existing systems is the third-most challenging for 57%.

Notably, there are four issues that current AI adopters don't consider challenging, relatively speaking, in that less than 50% of respondents believe they are obstacles: cybersecurity, lack of compelling adoption rationale, reluctance of staff to adopt the new technology, and, lowest of all, lack of senior leadership support. This is significant because decision-makers traditionally find these issues hard to overcome in the adoption of any new technology. In the case of AI in health care, the fact that they aren't considered that challenging implies that perhaps the toughest problems for AI adoption have already been solved.

Respondents who have not yet committed to an AI adoption plan find these issues much more challenging. In fact, respondents' perceptions of how significant these four issues are vary greatly between those who have adopted AI and those who have not. (These four and one more – the lack of available AI talent – are the only hurdles identified in the survey in which such a variance was found.) The fact that these technology adoption hurdles are ongoing issues for respondents still in the planning stage suggests that leadership, and a commitment to strong business cases, have to exist to bring the organization in line with the AI adoption strategy.

But overcoming “traditional” adoption difficulties isn't easily done: Merkel points out that the reluctance to adopt AI by staff is a perpetual challenge for even the most tech-forward organizations. “We need to adapt to AI in a meaningful way,” he says. As AI tools are adopted, he says, medical professionals need to evolve and embrace them as something positive and “not as a threat.”

Collaborative care, connected ecosystem

“AI is changing the whole sociology of decision-making within health care, towards a more collaborative and change-making system.”

– Michael Brady, Professor of Oncological Imaging, University of Oxford

The growth of AI and automated processes often creates concerns that the human touch will be removed from the health-care delivery process. What the industry is finding, however, is the opposite is becoming true: AI can extend the resources and capabilities of overworked health-care professionals and vastly improve processes.

Critically, as AI allows for the synthesis and more precise distribution of the growing wealth of medical data and insight the industry is generating, it is allowing for more-efficient sharing and collaboration in pursuit of better, less-expensive outcomes.

“As part of that, we are beginning to see the developments of personalized risk models that are updated as new data becomes available,” says Brady. “In the case of radiology, you're combining circulating biomarkers, which have very good sensitivity but very poor specificity,” Brady says. That could be addressed by combining that data with phenotypic information from images.

Ultimately, “AI is changing the whole sociology of decision-making within health care, towards a more collaborative and change-making system,” Brady concludes, where multiple perspectives from data and insight provided by both patients and health-care providers are synthesized in not only immediate diagnosis and treatment, but in monitoring wellness on a continual basis as well.

Conclusion

AI needs to work for health-care professionals as part of a robust, integrated ecosystem. It needs to be more than deploying technology – in fact, the more humanized the application of AI is, the more it will be adopted and improve results and return on investment. After all, in health care, the priority is the patient.

About MIT Technology Review Insights

MIT Technology Review Insights is the custom publishing division of *MIT Technology Review*, the world's longest-running technology magazine, backed by the world's foremost technology institution – producing live events and research on the leading technology and business challenges of the day. Insights conducts qualitative and quantitative research and analysis in the US and abroad and publishes a wide variety of content, including articles, reports, infographics, videos, and podcasts. And through its growing MIT Technology Review Global Panel, Insights has unparalleled access to senior-level executives, innovators, and thought leaders worldwide for surveys and in-depth interviews.

About GE Healthcare

As a leading global medical technology and life sciences company, GE Healthcare provides a broad portfolio of products, solutions and services used in the diagnosis, treatment and monitoring of patients and in the development and manufacture of biopharmaceuticals.



GE Healthcare

Illustrations

Illustrations and graphics by Complex Stories.


While every effort has been taken to verify the accuracy of this information, MIT Technology Review Insights cannot accept any responsibility or liability for reliance by any person in this report or any of the information, opinions, or conclusions set out in this report.


© Copyright MIT Technology Review Insights, 2019. All rights reserved.



MIT Technology Review Insights

 insights.techreview.com

 [@techreview](https://twitter.com/techreview) [@mittr_insights](https://twitter.com/mittr_insights)

 insights@technologyreview.com