James Heilman, MD, Oregon Health & Science University, Portland, Oregon, USA

Cognitive Care

Healthcare organizations are using artificial intelligence to make more precise decisions. But project teams must manage data privacy risks.

BY STEVE HENDERSHOT

PORTRAITS BY ISAAC LANE KOVAL

Artificial intelligence (AI) might be just what the doctor ordered. Healthcare organizations are collaborating with scientists and tech companies to launch R&D and pilot projects. The goal is to improve hospital and caregiver effectiveness by leveraging predictive insights.

Projects sponsors have lofty goals. They aim to deliver applications that are designed to, for instance, anticipate kidney disease before it strikes, help emergency dispatchers better assess the dangers their callers face, and streamline hospital resources and operations with digital precision. In May, one of England's largest hospitals—University College London Hospitals—launched a three-year joint-venture program with the Alan Turing Institute. The first project aims to use machine learning to prioritize patients and reduce wait times in emergency rooms. Another project will use machine learning to analyze CT scans to help doctors more precisely diagnose diseases.

According to Accenture, the healthcare AI market will reach US$6.6 billion in 2021, a more than tenfold increase from 2014. And 39 percent of healthcare provider executives say they're investing in AI, machine learning and predictive analytics, according to a 2017 PwC report.

But project teams must balance the need to gather enough data to develop a legitimate and accurate AI project with patient privacy limits that can restrict access and value. Teams must also overcome immense regulatory hurdles and organizational complexities to deliver real change in healthcare, says James McCullough, CEO of startup RenalytixAI, New York, New York, USA.

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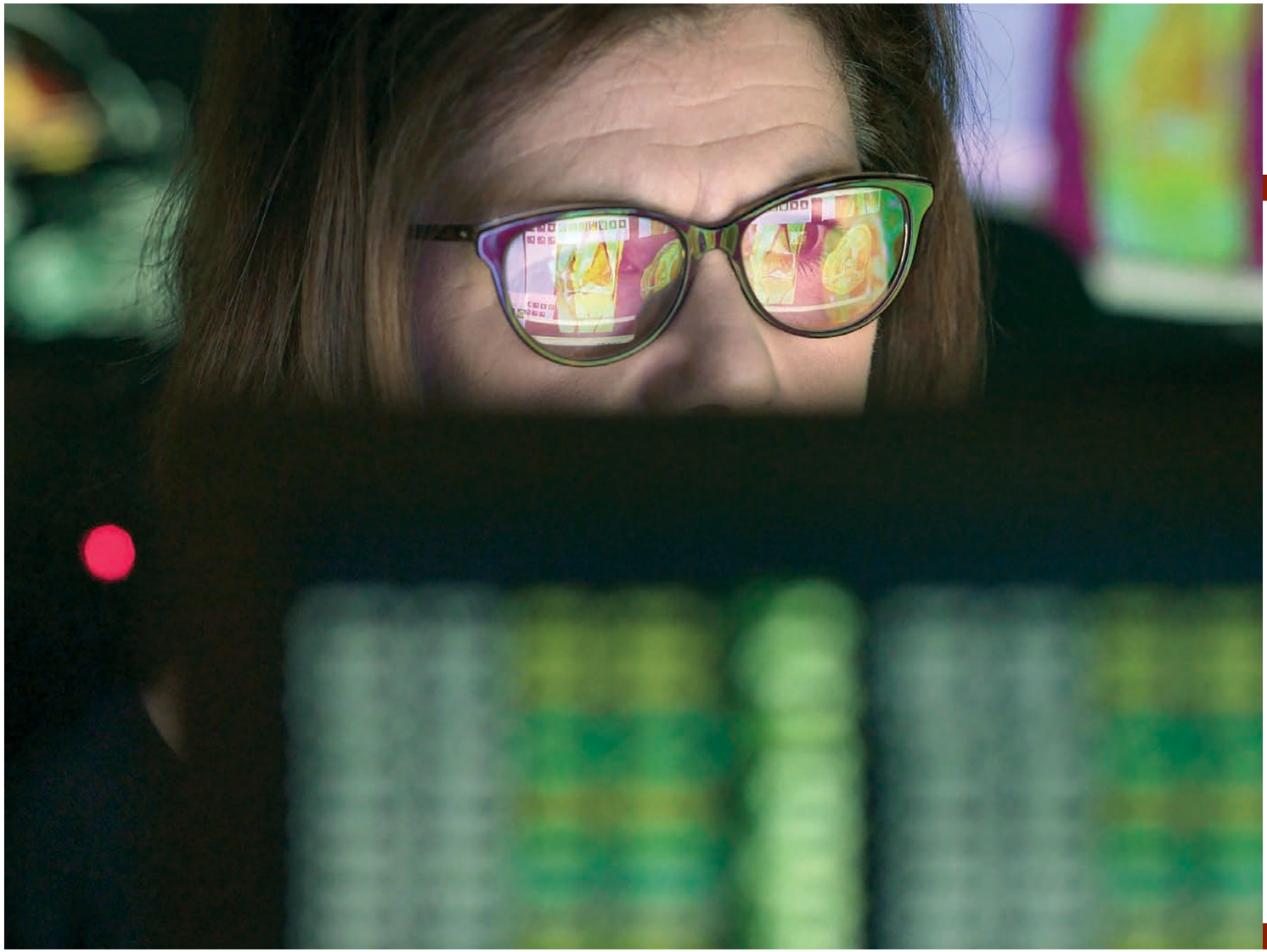
—James McCullough, RenalytixAI, New York, New York, USA

"When you're developing an AI-driven diagnostic product, it's got to be done with quality control suitable for regulatory review. You're very much concerned about privacy and integration into legacy healthcare systems and clinical workflows," he says. "That can be a challenge for data folks who are used to operating in the more fluid regulatory realm of software development."



ISTOCKPHOTO

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Source: Accenture

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VIABILITY VITAL

AI excels at processing vast amounts of data and making predictions about future results based on all the previous scenarios it has studied. But AI algorithms are useless if they aren't fed the right data. That means access to large amounts of healthcare data—and the attendant dance around privacy issues—is crucial.

To get access to enough data to train their AI models, many tech firms turn to clinical trials and partnerships with research institutions. Data collected from those studies can be used more flexibly than regular patient data. Regular patient data must be stripped of personal information to comply with health information privacy laws, such as the Health Insurance Portability and Accountability Act (HIPPA) in the United States.

For example, RenalytixAI is partnering with Mount Sinai Health System in New York, New York to fine-tune its proprietary AI solution to identify and manage kidney disease, using Mount Sinai's data warehouse of 3 million patient records. The project development phase began earlier this year, and now Mr. McCullough is working with Mount

Sinai to conduct validation and utility studies. He hopes to deliver the kidney disease app by 2019 but doesn't expect to receive U.S. regulatory approval before 2020.

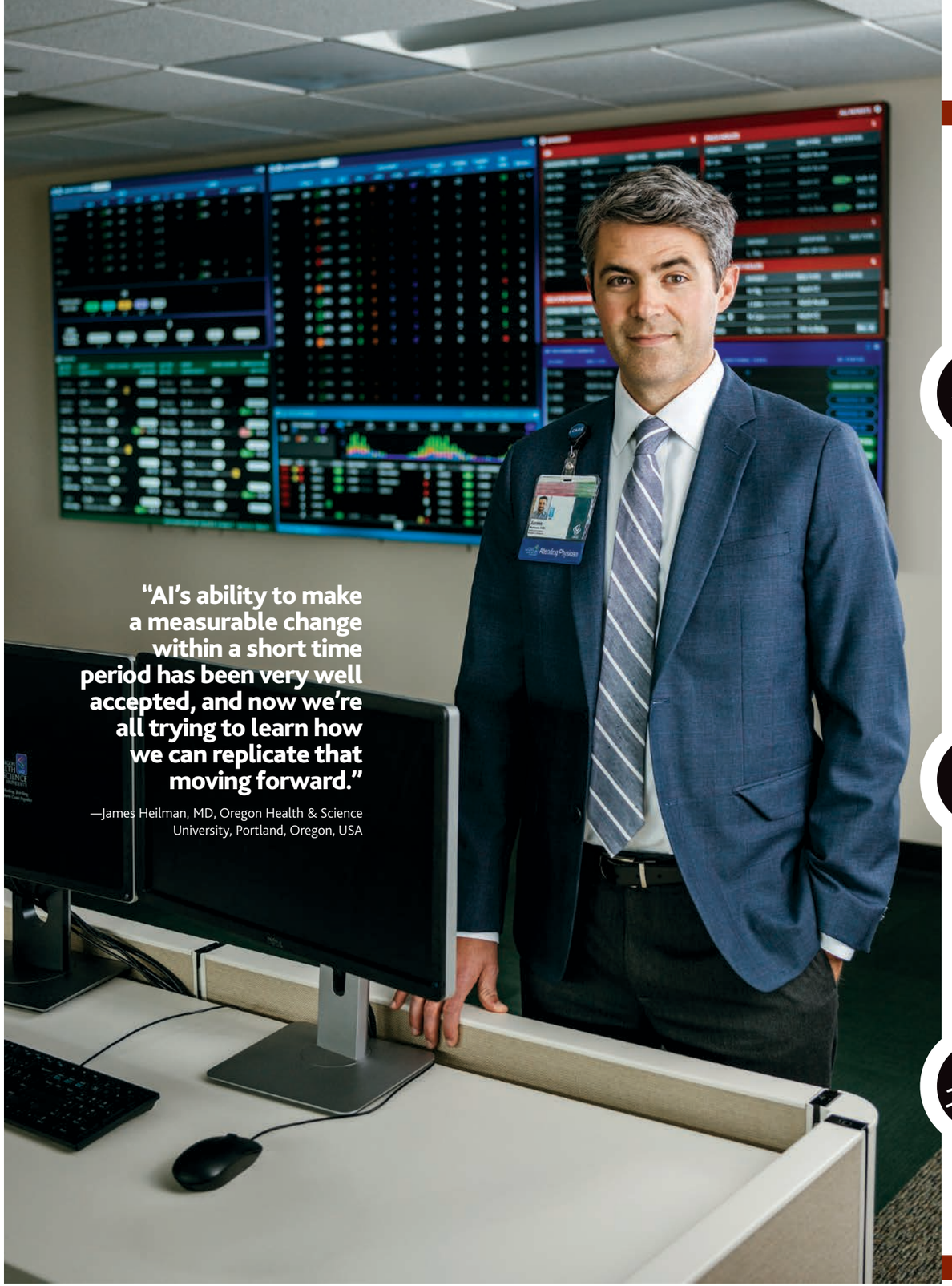
Likewise, SkinIO, a startup that leverages AI to analyze total body imagery and assist in dermatological examinations, used clinical trials conducted at Northwestern University to train its algorithm. Those tests helped the company develop and drive the storage mechanisms and interface used for the medical data. SkinIO houses the images and maintains the IT infrastructure needed for thousands of high-resolution photos, says Nathan Tornquist, project manager and lead engineer, SkinIO, Chicago, Illinois, USA.

As AI technology and regulations evolve, teams also must future-proof their privacy practices. For example, last year Google's healthcare subsidiary announced plans to use blockchain technology to better track how and when patient data is accessed. But tech teams also must hone their approaches to show healthcare organizations that AI systems won't introduce privacy risks.

"Actually, machine learning will do a lot to anonymize data," says David Paré, CTO, digital health, Australia and New Zealand, DXC Technology, Perth, Australia. DXC Technology helps organizations launch digital transformation programs. "If teams manage consent properly, most of the cloud-based AI vendors are already compliant with existing regulations and policies from a privacy perspective. The bigger issue is explaining to existing organizations and governments that it's much more secure and private than what they have now."

AI ALIGNMENT

Privacy issues aren't the only potential obstacles. When projects involve multiple hospitals, requirements and risks often increase. For example, hospitals use different software systems, and connecting



Medical Assistance

Here's how artificial intelligence (AI) is being implemented in healthcare projects around the world:

EMERGENCY ROOM EFFICIENCIES

In May, University College London Hospitals launched a three-year joint venture with the Alan Turing Institute to scale up machine learning across the U.K.'s National Health Service. The first project will focus on reducing waiting times at the hospital's emergency room (ER). A report published in April indicated 24 percent of ER patients in England were not treated in less than four hours. For the ER AI project, an algorithm driven by data from thousands of cases will help prioritize patients based on their symptoms to ensure expedited treatment for the most serious conditions.

DIAGNOSTIC IMPROVEMENTS

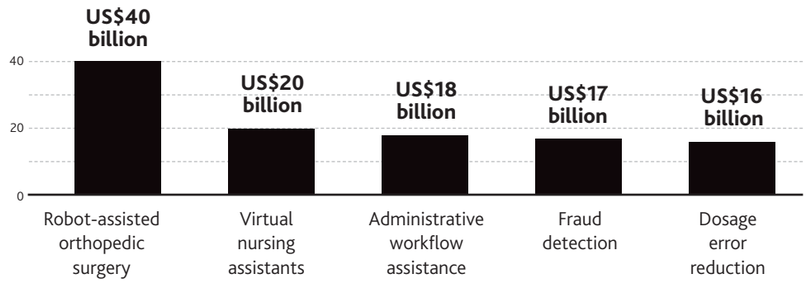
R&D projects around the world suggest AI will deliver groundbreaking disease-detection capabilities. For instance, scientists in Japan last year developed software that can detect colorectal cancer in its earliest stages with 86 percent accuracy. The technology could help doctors improve survival rates through early detection. Similar projects from other teams around the world have shown AI's efficacy at diagnosing skin, prostate and breast cancers, as well as neck tumors.

TARGETED TREATMENT

Last year, Mayo Clinic and startup Tempus teamed up to develop a machine-learning platform designed to tailor cancer drugs for each patient. The ultimate goal is to build a massive database that helps doctors prescribe customized care based on a patient's specific cancer mutation.

Realizing Benefits

Which artificial intelligence applications hold the most value* for healthcare organizations in the future?



*The estimated potential annual benefits in terms of additional revenue or reduced costs for each application by 2026

Source: *Artificial Intelligence: Healthcare's Nervous System*, Accenture, 2017

"Machine learning will do a lot to anonymize data."

—David Paré, DXC Technology, Perth, Australia

data from those disparate sources requires project managers to ensure alignment, says Andy Day, principal of command center partnerships, PMI Global Executive Council member GE Healthcare, Philadelphia, Pennsylvania, USA.

"Even if they have the same IT system from the same vendor, they don't use the fields in exactly the same way. It's getting those nuances right that's the difference between getting data that's actionable and insightful versus something that's just noise," he says.

Last year GE Healthcare partnered with Oregon Health & Science University (OHSU) on a six-month project to implement an AI-driven command center that manages patient logistics and treatment plans. The system was designed to help the organization prioritize and distribute patients properly among OHSU's three hospitals, including one that's best equipped to handle the most serious cases. But each hospital used a different electronic health records system, and none of them connected to the others. The project team had to bridge those systems before it could build and implement its algorithm.

The team identified another flaw as part of its risk identification process in the AI system-testing phase. None of the hospitals were properly inputting patient-status data, limiting the impact of the AI command center. "We thought our workflow was better than it was," says James Heilman, MD, chief medical transfer officer, OHSU transfer center, Portland, Oregon, USA. "A lot of the decision making was in people's heads and was not transparent."

To mitigate the risk of such workflow problems on other projects, GE Healthcare teams now run simulation models of hospital processes on each project to ferret out inefficiencies, Mr. Day says. Anticipating those risks is part of a laparoscopic approach to data science.

"It's more important to me to have the exact data elements I need and have them up to date than to have 30 more variables, but access is delayed," he says. "The key is to forecast things while there's still time to act."

PRESCRIPTION FOR CHANGE

Getting medical professionals to embrace AI can be difficult. Doctors and nurses might view AI as a substitute for their hard-earned knowledge and expertise. But they shouldn't feel threatened, Mr. Tornquist says. "AI is a tool for medical professionals to operate, not a replacement for their clinical judgment," he says. "It's more about accessibility, speed and data management."

Project managers can build buy-in by adding key medical professionals to the team as change champions. Those doctors or nurses can share project insights and AI value with other medical staff to stem resistance. Teams also can solicit feedback from medical staff at various project phases to elevate engagement.

Robot-assisted hysterectomy

PHOTO BY: BSIP/UIG VIA GETTY IMAGES

For example, some of OHSU's staff initially expressed skepticism about relying on AI to guide important healthcare decision making, Dr. Heilman says. So the project team brought them into the testing process to record their observations. The team incorporated the feedback from doctors and nurses to improve system performance as part of the post-testing phase. The observation and feedback sessions also helped the staff better understand how AI works and "made the AI decision making more transparent," Dr. Heilman says.

OHSU's system went live in December 2017 and was an immediate success. It has helped enable the transfer of more than 400 patients to secondary hospitals so that the primary research hospital could treat other patients in need of advanced care. System expansions are already underway. The project team convinced OHSU to create a new role—a physician primarily responsible for accommodating high-acuity patients who are referred to the main hospital and triaging patients to partner hospitals via the AI system. The team also plans to update the system to alert the command center when a patient might be at risk of sepsis.

"AI's ability to make a measurable change within a short time period has been very well accepted, and now we're all trying to learn how we can replicate that moving forward with ways that are a little bit more clinically based," Dr. Heilman says.

AI teams typically follow agile approaches and deploy minimum viable product software, then add iterative improvements along the way. But with healthcare's life-and-death stakes, teams can realize more value using hybrid approaches.

"It's like building a rocket to Mars—it's not like we can have a thousand tests, so we need to really engineer the AI the best way possible right at the beginning of the journey," says Christian Guttmann, vice president and global head of AI for software firm Tieto, Stockholm, Sweden. "It means that there's more effort in developing it upfront." **PM**

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