

Artificial Intelligence Gains Ground Across Healthcare

► Adoption of artificial intelligence is accelerating across the healthcare industry.

According to a survey of 50 executives at healthcare companies currently using AI, half believe AI will be broadly adopted across the industry by 2025. However, nearly half of U.S. companies say there is a need for evidence to demonstrate the value of AI to the healthcare industry.

The potential for AI in healthcare is extensive. According to Accenture, AI applications could potentially result in savings of \$150 billion annually for the U.S. healthcare economy by 2026. The market's growth is huge, with expectations that it will reach \$6.6 billion by 2021, from \$600 million in 2014.

AI is a broad term used to describe computer-based technologies that perform tasks typically carried out by humans. The different types of AI include machine-learning algorithms or natural language programming, machine learning in which a computer system is modeled on the human brain, and deep learning, which uses various artificial neural networks to teach computers to learn by example.

Companies are investing in AI for multiple purposes: for drug discovery, for personalized medicine, to assist patients with treatment and recovery, for disease identification and diagnosis, to identify the right patients for clinical trials, for device development such as robotic surgical devices that assist surgeons, for better data management, including managing medical records, for monitoring patients, and for medication management.

Most of the largest pharmaceutical companies are deploying machine learning and AI in some form. The 10 largest companies — Novartis, Roche, Pfizer, Merck, Astra-Zeneca, GlaxoSmithKline, Sanofi, AbbVie, Bristol-Myers Squibb, and Johnson & Johnson — have all either bought AI technologies or are collaborating with technology companies in this area.

Nevertheless, gaining the level of knowledge to fully leverage AI has been a challenge for the life-sciences industry. As such, companies have looked at various ways to gain that expertise. One way has been to collaborate with or acquire AI start-ups or with academia. Other approaches include developing internal expertise and investing in the resources needed

to get internal teams up to speed. For smaller companies without deep pockets, a useful approach has been to establish open science projects.

AI Investments in Pharma

One of the best-known AI collaborations is the alliance between Pfizer and IBM Watson aimed at advancing immuno-oncology research. Pfizer is tapping into Watson for Drug Discovery's machine learning platform with the hopes of identifying relationships between genes, diseases, and potential therapeutics far quicker than researchers can do by reading abstracts.

Novartis has placed a huge priority on digital technologies including AI. One way the company is deploying AI is through virtual assistants that help sales people determine the best practitioners to visit and what to discuss with them. The company is also using AI to assess global clinical trials and determine which will enroll on time, which are having quality issues, etc. — all based on algorithms gathered from the hundreds of trials the company performs each year. And Novartis is working with the University of Oxford's Big Data Institute to analyse large datasets, using AI and machine learning, to gather disease insights and progress drug development.

Amgen is using AI in a number of different areas. These include finding patterns in manufacturing deviations, working collaboratively to improve diagnosis of osteoporotic fractures, and the company is also looking at how best to use AI to develop new solutions for the aging population and patients with serious illnesses. For example, the company is looking at how it can provide clinicians with insights into how patients with multiple myeloma respond to different therapies in order to improve outcomes.

Novo Nordisk is using natural language processing to help its product managers better understand patient and provider concerns by mining data from various sources, including medical information requests, notes from medical affairs professionals, and calls from

customers on drug usage. The company is also using NLP for insights in areas such as safety and efficacy, clinical trials, patient populations, dosing, etc.

Overcoming AI Barriers

One of the challenges the industry faces when it comes to taking advantage of AI is a dearth of skilled labor. Indeed, survey data shows that lack of skills is second only to access to data as a barrier to adoption of AI in the life sciences (44% vs. 52%).

It's understood that experienced AI developers aren't drawn to the industry. There is also the issue of finding data scientists or AI experts with deep enough knowledge of the life sciences, preferably through a background in the industry or in academia.

Dr. Steve Arlington, president of The Pistoia Alliance, a nonprofit focused on lowering barriers to innovation in life-sciences R&D, has noted that to make AI work for the industry, there's a pressing need for highly trained, specialist data experts.

"The industry must work closely with academic organizations and educators to highlight these opportunities and attract the next generation of data scientists," Dr. Arlington says.

Other barriers that will need to be over-

Business Functions Adopting AI in Pharma

- Service operations: **31%**
- Product/service depts.: **31%**
- Manufacturing: **28%**
- Marketing and sales: **27%**
- Supply chain management: **13%**
- HR: **6%**
- Strategy and corporate finance: **4%**
- Risk: **3%**

Source: AI adoption advances, but foundational barriers remain, McKinsey & Company, Nov. 2018

come include skepticism over AI tools by both providers and patients. A survey found consumers were concerned about not knowing how the technology works as well as the technology not understanding them.

A McKinsey survey on AI adoption found that only 21% of respondents had embedded AI into multiple functions and many lack the foundation needed to achieve wide-scale benefits from AI, which include mapping where

AI opportunities exist and planning where to source data needed for AI.

The first step, according to the McKinsey report, is to bring in a complete digital strategy across the business, with the survey showing that businesses that have made the most progress in digitizing processes are leading in AI adoption.

The opportunity to impact the R&D-focused pharmaceutical industry in terms of

innovation means applications for AI will continue to grow and be adopted. A majority of pharmaceutical companies consider AI will be crucial to support innovation but legacy systems, insufficient storage capacity, and poor interoperability have been barriers.

As company decision makers see more ways to leverage AI, it's likely more pharmaceutical companies will look at what they need to do to make AI a reality. ^{PV}

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Susan Abedi

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Redefining Expectations

AI has redefined expectations and standards of efficiency in clinical trial recruitment, particularly in the field of rare disease research. By identifying clinicians who have a high likelihood of having patients with a specific disease who meet the inclusion and exclusion criteria for a clinical trial, AI pinpoints an optimal segment of healthcare professionals who can maximize patient recruitment. Analytics-driven patient identification can shorten the development process, thereby streamlining and expediting the completion of clinical trials.

Improving Customer Interactions

AI improves efficiencies in customer interaction with more effective, personalized, multi-channel engagement strategies. AI can be used to identify influential clinicians with the greatest concentration of relevant patients who can be engaged to support patient/customer educational programs. AI algorithms can assess how patients flow between healthcare providers, elucidate networks of clinicians, highlight treatment dynamics within networks, and identify the most influential clinicians

based on their ability to impact the clinical behavior of other clinicians in the network.



Matthew Van Wingerden

VP, Analytical Services
Aktana

Personalized Engagement

In an increasingly noisy, competitive marketplace, brands in commercial pharma need to be hyper-personalized, attentive to customer preferences, and tireless about acting on data from the field to improve. AI enables more personalized engagement by scouring data, detecting patterns, and surfacing only what's relevant to field teams when they need it. Delivering relevant information in a way healthcare professionals prefer to receive it can increase engagement, grow sales, and ultimately support improved outcomes.

Balancing Technology and Human Oversight

Often, the biggest barriers to technology adoption are never related to the technology itself or even the availability of sufficient data. Our industry is still working out the balance between AI and human oversight and that is the key barrier for teams to overcome. This often requires broader education for stakeholders, level-setting expectations, and overseeing change management across the organization.



David Geisinger

Managing Director
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Enhancing the Human Bond

Data and AI can enhance the human bond between a company and its customers. Don't think of AI as just another term for "bot." It can help make person-to-person contacts more welcome and human by steering more meaningful content to each unique person at the right time and on the right channel. By elevating personalized experiences, customers feel more valued and not like a name on a spreadsheet, which can help to increase loyalty and business growth.



Mark Miller

Managing Director
Deloitte Consulting LLP

Justifying the Investment

The question of justifying an investment in AI often proceeds from the assumption that AI has to be a big investment. Many of the solutions that today's AI can bring to research, commercialization, safety, administration, and other vital functions are modular and scalable. That frees companies to

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start with targeted pilot applications that are likely to produce visible results more quickly. In turn, those can serve as proofs of concept for more AI down the road.



David Coman

Product Line Executive,
Trial Oversight
ERT

Improved Decision-Making

Running AI and predictive algorithms on a cloud-hosted data lake can help researchers better flag and predict clinical trial risks, including those related to site management, patient adherence, safety, and adverse event monitoring, as well as the impact of disease and treatments on clinical trial patients. By generating the knowledge needed for better decision-making during clinical trial monitoring, AI can provide the foundation for determining clinical trial success, which can accelerate the timeline from protocol submission to regulatory approval, resulting in reduced cost and faster time-to-market.



Don Ragas

VP and Chief
Technology Officer
ERT

AI and Clinical Trials

There are many applications of AI for improving patient engagement in clinical trials. Technologies such as smart speakers, telehealth, digital apps, mobile coaching solutions, and wearables allow for real-time engagement,

communication, and support in patient-centric trials. Patients use these devices to send feedback on treatment and symptoms, manage medication intake, and share information with researchers. This reduces or eliminates the need to travel to sites, which, in turn, improves patient engagement and compliance while reducing site costs.



Ben Hughes, Ph.D.

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Creating an AI Strategy

AI can revolutionize healthcare, but the transformation will be iterative, taking time to realize the full promise. The pharma industry is successfully piloting AI/ML but struggles to implement at scale. To be successful, pharma leaders must define where in their molecule to market capabilities they apply AI and identify the best AI strategy use case to achieve desired goals. AI has enormous capacity to answer some of healthcare's toughest questions, but it requires the right volume and quality of data combined with data science and healthcare domain expertise.

AI Bridges from Studies to Clinical Practice

AI is a bridge from studies to clinical practice that drives significant time and cost efficiencies. We've seen AI's success on large-scale data to drive clinical trial efficiencies of 20% to 40%, by identifying the right sites, investigators, and target patient populations. The same approach integrates clinical research with clinical care, such as AI for disease diagnostics

or progression, leveraged for smarter trials and by physicians to drive better treatment pathways. We already see scaled examples of both using identical technologies and techniques.



Vimal Narayanan

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Lessons to be Learned

Pharma can use AI to its best advantage by getting more data by running more pilots, especially on patient engagement and disease management. The data that is available currently is not significant. Companies can learn from other pharma franchises; clinical trials is an area where there is a great deal of progress. For example, Novartis has a clinical trial control room that monitors 2,000 clinical trial programs running all over the world. This is done using intelligent algorithms and partnerships with startups specializing in data management and analysis. Companies need a framework for the development of AI-based solutions for specific purposes. Otherwise this would lead to inefficiency.

Identifying the Challenges

The principal challenge of AI is the lack of qualified personnel available to manage the huge tasks involved in drug discovery, diagnosis, and disease management. Also the question of how to make sense of data is still a big issue. We also need enough content providers who can develop intelligent AI-based solutions, who can make better sense of data available through various sources.



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