451 Research PATHFINDER REPORT

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How AI Can Accelerate Operations and Administration for Healthcare Institutions

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About this paper

A Pathfinder paper navigates decision-makers through the issues surrounding a specific technology or business case, explores the business value of adoption, and recommends the range of considerations and concrete next steps in the decision-making process.

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Introduction

Artificial intelligence (AI) is generating excitement across the enterprise landscape. This enthusiasm is especially prevalent in the healthcare industry, where the transformative potential of this technology to automate and optimize business processes is arguably greater than in any other sector.

Many healthcare institutions are already putting AI into action. According to data from 451 Research, 28% of healthcare institutions have adopted the technology in some capacity, and 15% plan to implement AI within the next 12 months. Overall, 75% of healthcare institutions say they expect to have an AI initiative in place within the next three years.

For all the talk about AI, it maintains an air of mystery, especially for those without a deep understanding of the technology. The foundation of contemporary AI is machine learning, a branch of computer science in which models are tuned using historical data to perform tasks commonly associated with human intelligence, such as natural language processing or decision-making.

The process of training a machine learning model is technical and compute-intensive. The recent AI renaissance can be attributed to the massive increase in data creation, storage and digitization, as well as huge improvements in high-performance computing and advances in the efficiency and capabilities of the underlying algorithms. In addition, the emergence of vendors providing enterprises with tools and services has allowed early adopters to abstract away some of AI's mystery and instead focus on implementing specific use cases to generate business value.

So what benefits can AI bring to an organization – and to a healthcare institution in particular? Because the technology can be integrated into a variety of business processes, AI can add value in a multitude of ways, depending on the specific context. In a recent Voice of the Enterprise: AI & Machine Learning study, 451 Research asked early adopters in the healthcare industry about the benefits they had accrued through AI adoption, and the results are illustrated in Figure 1.



Figure 1: Business Benefits of Healthcare Institution AI Adopters

Source: 451 Research's Voice of the Enterprise: AI & Machine Learning, Use Cases 2020

Q: What are the most significant benefits your organization has realized or expects to realize from its use of machine learning? Please select up to 3.

Base: Healthcare Providers (n=61)



Over one-third of healthcare institution adopters – 36% – reported that their AI initiatives have improved the productivity of their workforce. Healthcare institutions face significant human resource constraints – from the number of skilled medical professionals to the quantity of support staff – in delivering quality and timely care to patients. AI can enable healthcare institutions to produce more with their existing employee base by removing inefficiencies in the care process and enabling caregivers to focus on higher-complexity tasks. A further 33% of healthcare institutions surveyed identified reduced costs as a benefit of AI adoption, which could be a side effect of improved workforce productivity or the optimization of the use of physical assets, such as hospital beds.

Other significant benefits of AI adoption cited by healthcare institutions include a decrease in risk exposure (34% of respondents) and improved customer service (31%). Basic errors in care are unfortunately more common than they should be, and anyone who has spent time in a hospital recently can attest to the amount of time consumed dealing with administrative tasks. When implemented correctly, AI technology can automate rudimentary processes to reduce the chance of mistakes and make the care processes smoother. All in all, these efficiency gains generated by AI enable healthcare institutions to focus on what matters most: improving outcomes for patients. The next section details some specific use cases where AI can produce the benefits described above.



Use Cases for AI in Healthcare Institutions

One of the reasons for AI's tremendous transformative potential is the versatility of the technology. Computer vision, speech, language and text processing, facial recognition, sentiment analysis and search, to name a few, are all examples of functionalities powered by AI. These functionalities can be combined and tailored to address the needs of specific business processes. These larger AI applications can improve almost any given business process today via automation or optimization.

This breadth of opportunity is exciting, but also overwhelming. Business leaders are not struggling to find an AI opportunity within their organization; instead, they find it difficult to identify the right use case to start with. Focusing on specific use cases is important to the success of AI initiatives, since AI isn't implemented for its own sake. The goal is to make narrow improvements that create a more general transformation.

In that spirit, 451 Research asked healthcare institutions that have already adopted AI about the use cases where they are applying AI now, and which ones they were looking to implement within two years. The results are shown in Figure 2.

Figure 2: How Healthcare Institutions Are Applying AI Technology - Today and in Two Years

Source: 451 Research's Voice of the Enterprise: AI & Machine Learning, Use Cases 2020

Q: Which of the following best describes your organization's machine learning use case(s)? Please select all that apply. Q: Looking ahead, which of the following best describes your organization's future machine learning use case(s) two years from now? Please select all that apply.





What stands out immediately is how eager healthcare institutions are to use AI to improve pointof-care processes. Clinician workflow optimization and patient data analysis are, respectively, the top and second-most-prevalent use cases, both today and for the future. Another use case, disease diagnosis, is expected to be an area of significant growth over the next few years.

Before discussing these patient-centric use cases in more detail, it is worth noting the diversity of other business processes to which healthcare institutions expect to apply the technology. From digital and physical security to marketing and financial analysis, AI technology is set to impact all corners of healthcare institutions.

Use Case Deep Dive 1: Hospital Management

Hospital management software provides a unified, secure system for aggregating patient data and handling common processes like billing and scheduling. These systems are in many ways the central nervous system of a healthcare institution in that they orchestrate the inputs needed to deliver care to patients. AI can make this software smarter and more efficient by, for example, making high-level decisions and automating mundane tasks.

One example is physician scheduling. Because doctors should spend as much time as needed interacting with and caring for patients, efficiently scheduling a physician is important. A human process can only account for a certain number of variables, but AI can evaluate as many as can be digitized. AI-based scheduling systems should free up doctors to devote more time for patient care.

Another example is the allocation of newly admitted patients. At a typical hospital, this responsibility falls to an experienced nurse lead. This person must consider several factors – such as congestion, patient wait times, bed availability, patient health, etc. – when making decisions. But an AI system trained on historical data would likely do this job faster and better, freeing up a valuable care worker for other important responsibilities.

Use Case Deep Dive 2: Patient Monitoring

The proliferation of connected healthcare devices in both inpatient and outpatient environments has opened a new frontier for the automation of patient care. Each of these devices – from a pacemaker to a glucose monitor – generates digitized data that can serve as fuel for AI applications. Applying AI-driven analytics to these data sets can improve care in individual and collective ways.

On an individual level, AI-enhanced patient monitoring can help identify health problems before they manifest. A traditional patient monitoring system might set a threshold for a certain metric and trigger an alert when that vital sign surpassed a pre-established range. A modern system with AI can provide more nuance. Perhaps, given other factors, an atypical measurement is not an indication of a health problem. Conversely, maybe the patient's health is at risk despite perfectly normal vital signs. AI can help analyze the data generated by devices connected to a patient and provide the proper alerting to generate better health outcomes.



On a larger scale, AI can find new trends and even care regimens by analyzing patient monitoring data in aggregate. The sheer volume of data collected through patient monitoring devices often exceeds the abilities of traditional analytics methods. The human mind has a limited ability to conceptualize multivariate problems, so AI techniques can help extract the full value from these vast data sets. This method of analysis has the potential to identify otherwise-hidden trends, which can serve as a launching point for the development of new treatment approaches.

Use Case Deep Dive 3: Diagnostics

Before a patient can receive care, they must first obtain a diagnosis, and this step is not necessarily straightforward. Healthcare institutions are often overloaded with responsibilities, and they face pressure to adjudicate a patient's situation quickly in order to get the care process moving along. In addition, the data sources necessary to produce a diagnosis might be incomplete or inaccessible. Whatever the reason, a misdiagnosis can put a patient's health in jeopardy, and increases operational risk.

Al can help healthcare institutions make faster and more accurate diagnostic decisions. A machine learning model trained on a large sample of historical patient data can make predictions (i.e., diagnoses) on new patient data. Not only can these systems scrutinize the types of data commonly used to make diagnoses – electronic health records, lab results or MRIs – but they also can examine nontraditional data assets. For example, Google trained a machine learning model to predict a person's risk of heart disease through a scan of the patient's eye.

Barriers to Adoption for Healthcare Institutions

Whether through augmented emergency room and hospital management systems, enhanced patient monitoring capabilities or advanced diagnostics, AI technology can enable healthcare institutions to improve the quality of care and patient outcomes. Although a significant portion of organizations in the healthcare sector have already embarked on their journey of AI adoption, this does not mean that the process is either quick or easy – according to 451 Research, only 8% of surveyed organizations say they experience no problems.

In fact with technologies as potentially transformative as AI, a number of institutional obstacles can slow or derail even the best of plans. 451 Research asked healthcare institutions that had adopted AI about their most significant barriers, and the results are shown in Figure 3.



Figure 3: Barriers to AI Adoption for Healthcare Institutions

Source: 451 Research's Voice of the Enterprise: AI & Machine Learning, Use Cases 2020 Q: What are your organization's most significant barriers to using machine learning? Please select up to 3. Base: Healthcare Providers (n=62)



Far and away the most common barrier that healthcare institutions face is inadequate funding, which almost half of those surveyed – 49% – cite as a challenge when implementing their AI initiatives. AI is often a significant capital investment, involving some combination of software procurement, investment in skilled resources and process change management. Although AI can improve business outcomes once implemented, the benefits can seem distant when expenditures start accumulating. To address the problem of limited budgets, organizations need to ensure that stakeholders understand the long-term cost-benefit analysis and also wisely invest whatever resources they have. Starting small can help: instituting one use case of AI does not need to be a bank-breaking exercise.

Another common problem, faced by 37% of surveyed healthcare institutions, is the gap between their AI needs and the existing technology assets on the market. It is important to remember that the era of enterprise-ready AI technology is still in its nascent stage, which means many healthcare institutions will be unable to find off-the-shelf applications for their specific use cases. For example, perhaps a diagnostic software is not compatible with the file system used by a healthcare institution. When this problem arises, organizations have no choice but to modify existing assets – or even build an AI application from scratch – for their specific contexts.

The 'build' approach begets another common problem when it comes to implementing AI: a dearth of skilled resources, which 32% of those surveyed identify as a problem. According to 451 Research data, 36% of healthcare institutions say they have an insufficient number of data scientists to achieve their goals. While the lack of data scientists is a common obstacle shared across other industries, it can be especially problematic in the healthcare space, where data science expertise must be combined with domain-specific knowledge to build viable machine



learning applications. Another problem, cited by 31% of healthcare institutions, is the limited technical proficiency of line-of-business users. Think of doctors who may not fully understand or articulate to patients the decisions of a diagnostic engine.

This problem – which is frequently referred to as 'AI explainability' – is particularly prominent for healthcare institutions, as illustrated in Figure 4. Almost all (94%) healthcare institutions that have adopted AI insist that it is important for the predictions of machine learning applications to be explainable to nontechnical users – and of those, 49% say it is 'very important.'

Figure 4: Importance of 'AI Explainability' for Healthcare Institutions

Source: 451 Research's Voice of the Enterprise: AI & Machine Learning, Use Cases 2020

Q: Of the machine learning applications in production, how important is it for their predictions to be explainable to nontechnical users?

Base: Healthcare Providers (n=47)



It is not hard to fathom why healthcare institutions place such importance on explainability. Patients and practitioners alike are wary of automated systems, particularly when the decisions they make touch on critical and personal issues like health. Similar to the situation with self-driving vehicles – which are probabilistically safer than human-operated vehicles but elicit a media firestorm whenever one is involved in an accident – people are generally averse to replacing human-centric processes with AI-enhanced ones.

In short, for these systems to produce value, they must be trusted by those using them. Therefore, for healthcare institutions looking to implement AI technology in their processes, it is integral to ensure that these systems are explainable to both the healthcare workers relying on their outputs and the patients whose care will be impacted by the subsequent decisions made.



Cloud Platforms Inform AI Adoption Strategies of Healthcare Institutions

While budgets, skills and trust issues can inhibit adoption of AI, many healthcare institutions have found ways to address these problems. 451 Research has identified a common trend among healthcare institutions that have navigated these problems successfully: the use of an AI platform. As shown in Figure 5, 53% of healthcare institutions with AI initiatives are currently using a cloud-based AI platform, while 95% plan to be doing so within the next three years.

Figure 5: Use of Cloud-Based AI Platforms Among Healthcare Institutions

Source: 451 Research's Voice of the Enterprise: AI & Machine Learning, Use Cases 2020 Q: Is your organization developing applications using cloud-based AI and machine learning services? Base: Healthcare providers (n=61)



AI platforms advantage healthcare institutions by enabling them to build their own AI applications from scratch or tune existing models to fit their enterprise contexts. Many provide tooling for specific use cases that enable healthcare institutions to quickly build models using their own data. As discussed in the previous section, healthcare institutions find it difficult to source off-the-shelf applications targeting their use cases. Pursuing a 'build' strategy via a cloud platform – as opposed to purchasing readymade AI software – allows healthcare institutions to overcome this obstacle. The quality of the implemented technology is essential for ensuring that it does not become just another digital transformation effort that overloads end users.



But this benefit is only the tip of the iceberg when it comes to cloud platforms. Another problem discussed in the previous section was the lack of skilled resources – both data scientists and technologically proficient line-of-business users. Al platforms can help healthcare institutions surmount this problem as well.

First, AI platforms decrease time to value by getting organizations up and running. They abstract much of the complexity of building an AI application with low-code or no-code features, and they provide component functionalities that can be composed into larger applications. Together, these capabilities allow enterprise users to build applications faster and with less technical knowhow. Second, these platforms provide a collaborative environment for data scientists, application developers and domain-area experts to come together to build models. When trying to prepare a banquet with a limited number of chefs, it is crucial to take advantage of tools that allow everyone to work collaboratively in the kitchen.

Another common feature in AI platforms is explainability tooling. While this area of research is relatively new, there has been a consistent level of innovation both in academia and from the private sector. Many AI platforms integrate best-of-breed capabilities around explainability directly into their products. In many cases, a simple click of a button can give data scientists building a model immediate insight into the most important parameters affecting its decision-making. This insight can be used to reduce bias in the overall system and provide a greater understanding to end users about how a decision was made. All in all, the explainability tooling embedded within AI platforms directly addresses the needs of healthcare institutions to implement trustworthy AI technology.

The propensity of healthcare institutions using AI platforms to successfully adopt the technology is a notable and understandable trend. These services help address key barriers around budgets, skills and trust while enabling healthcare institutions to build care-improving systems for their unique contexts.



Conclusion

Al is set to become one of the most societally transformative technologies in human history, and its impact on the healthcare sector over the long run could be massive. Although enterprise Al is still in a nascent stage, stakeholders within healthcare institutions should start laying plans for the adoption of this technology. Before long, the Al will be a pervasive component of healthcare – it will support hospital management, automate patient monitoring and assist physicians with diagnostic decisions. Healthcare institutions that embrace this technology sooner will accrue its benefits earlier and will be in a better position than competitors in the long term.

Here are some tips for the leadership of healthcare institutions when considering AI adoption within their organizations:

- **1.** Al adoption is happening now, and it can provide a variety of benefits to healthcare institutions. Adoption of AI in the healthcare space is robust, and 28% of healthcare institutions say they have already adopted the technology in some capacity. Many are reporting initial successes, from improved workforce productivity and a smaller risk imprint to cost reductions and better customer service. As always, the goal for healthcare institutions is to improve the quality of their care, and AI can deliver toward that goal in many ways.
- **2.Al can transform a variety of processes within healthcare institutions, particularly around point-of-care services.** Use cases for AI within an organization are everywhere, as almost any business process can be automated or optimized with AI. The real key to deploying the technology successfully is focusing narrowly on a specific process. For healthcare institutions looking to adopt AI, they can leverage it for hospital management, patient monitoring and patient diagnostics. These use cases are advanced in terms of functionality and can improve the quality of care that patients receive from these organizations.
- **3.** Adoption isn't easy for healthcare institutions considering the lack of skilled resources and the issue of trust. If healthcare institutions do not go about AI adoption in the right way, they risk the initiative becoming just another newfangled technology system complicating employee workflows. Skilled technologists with domain expertise are not a dime a dozen, so healthcare institutions will need to go about adoption in a smart way. AI platforms can help alleviate this pain point by not only abstracting away the more complicated aspects of AI but also by providing component pieces that can be aggregated into a custom-built application. In addition, the platforms often contain explainability functionality to help end users understand the decisions of AI. These tools are important for building systems that healthcare institutions, caregivers and patients can trust.





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The healthcare industry has embraced new data-driven initiatives at a surprisingly rapid pace. Hospitals, physicians, dentists, and laboratories have begun using patient data and medical records in unique ways to save lives and improve their own operations. With new AI and ML technologies available, the healthcare industry as a whole is at the forefront of an AI transformation. H2O.ai, the open source leader in AI, is empowering healthcare companies to deliver AI solutions, including improving patient outcomes, managing claims, detecting fraud, and predicting hospital-acquired infections.

In fact, 7 out of 10 of the leading healthcare providers have turned to H2O.ai to help them with AI and ML, where these technologies are helping to solve some of the most pressing challenges, including sepsis detection, predicting ICU readmissions, predicting staffing loads, detecting medical claims fraud, matching patients to the right doctors, prescribing more personalized medicine, and more.

Our vision at H2O.ai is to democratize AI for all and empower every company to be an AI company. This is an imperative for the future of every business and organization. Today, there is a race to use AI, which will decide the winners and laggards in every industry. AI empowers companies to augment their human intelligence, gain more value, and, most importantly, to achieve a competitive edge in their markets. With industry-leading AI and machine learning platforms from H2O.ai, every company can now compete, win and become an AI company.

Discover how AI can help your healthcare business today at www.h2o.ai/healthcare/.





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