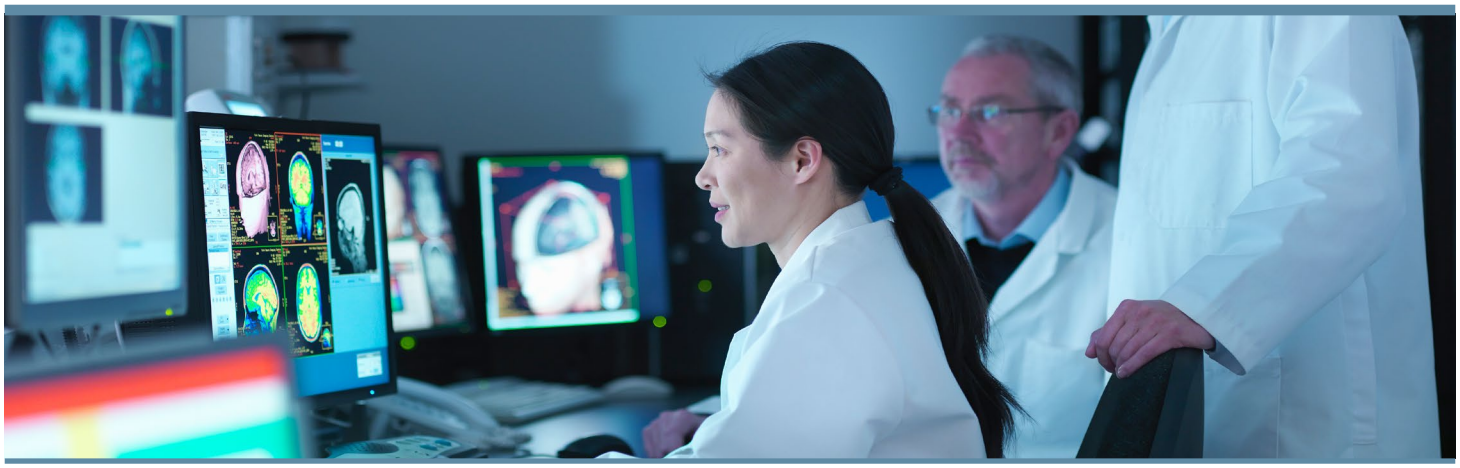

Executive Insights

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Artificial Intelligence: Six Challenges for the European Healthcare Sector

The revolutionary impact of AI on global healthcare could be felt in as little as the next five years. The hope is that lives will be saved, operational costs reduced and skills shortages eased, but alongside rapid advancements in AI capabilities come numerous challenges that must be addressed, especially concerning partnership development and data set creation.

Developments in AI applications are being made across the healthcare sector, including in back-office areas such as claims management and instrument maintenance programs, because of the relative lack of regulatory and registration hurdles. However, arguably the most exciting innovations are in frontline care, where patients will, over time, benefit most directly.

This *Executive Insights* focuses on some of the most promising developments in AI in the frontline of European healthcare. It also highlights the core challenges that healthcare organizations, from hospitals and their suppliers to insurers, need to be aware of and overcome before AI can be adopted on a scale wide enough to improve patient outcomes and system sustainability.

What is AI and how is healthcare set to benefit?

While there is no universal definition of AI, it broadly refers to systems that are able to function with a degree of autonomy and iteratively optimize their processes. The term "AI" can be applied to four major categories:

- Machine learning: Processes that analyze input data and then repeatedly optimize their approaches based on generated outputs
- Deep learning: A machine learning process that utilizes a logic structure akin to biological neural networks
- Natural language processing: A refined automatic speech recognition system that is able to interact with people through dialogue, not simply reactions to well-stylized user requests
- Robotics and the internet of things: Integration of devices to collect, combine and share different types of information

AI has the potential to offer benefits to the full range of healthcare stakeholders. With AI, patients will receive more rapid and accurate diagnoses than is possible with current systems, allowing for tailored treatment interventions with higher first-time success rates.

As diseases are managed more effectively, payers will see cost savings associated with improved patient outcomes, such as a reduction in the number of complications.

The overall efficiency of hospitals will be increased, as hospitals see a decrease in admissions and, as a result, a reduction in costs. In the U.S., Philadelphia's Temple University Health System's use of the tool Accolade is a powerful case study that demonstrates some of the early-stage wins that AI can bring: In two years the hospital has seen a 7% reduction in admissions and has saved nearly $10 million.

Artificial Intelligence: Six Challenges for the European Healthcare Sector was written by **Ben Faircloth**, Partner, **Clay Heskett**, Partner, and **Stephen Roper**, Manager. Ben, Clay and Stephen are based in London.

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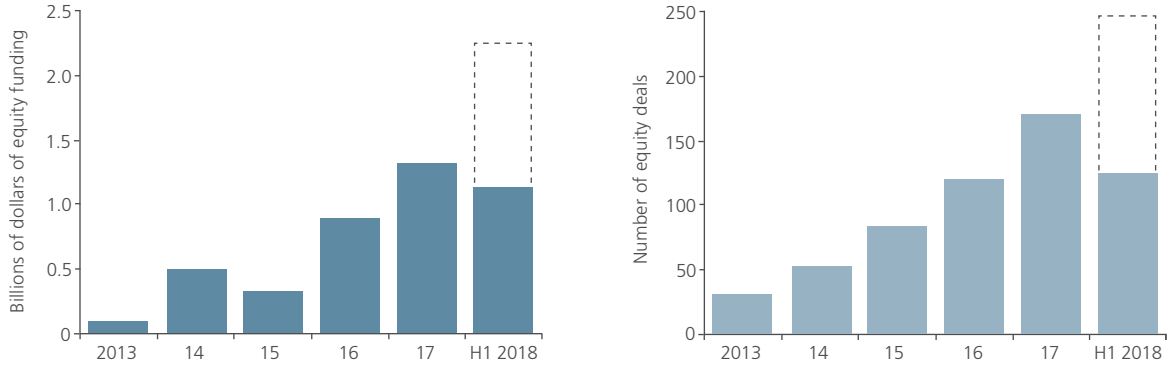
L.E.K.

Figure 1
Healthcare AI equity funding (2013–H1 2018)



Source: CB Insights; L.E.K. analysis

AI will also alleviate the significant and intensifying pressure of increasing staff shortages. The U.K.'s National Health Service (NHS), for example, has 45,000 clinical vacancies and a further 50,000 non-clinical open roles, and a similar lack of staff and capacity can be seen across Europe. Many of these positions are currently filled by temporary staff — a short-term fix that only serves to add further financial strain due to the higher costs associated with temporary employees. AI applications, such as those that conduct triage before patients arrive at a clinical facility, will give overstretched healthcare professionals greater leverage, allowing them to focus on interacting with patients on arrival.

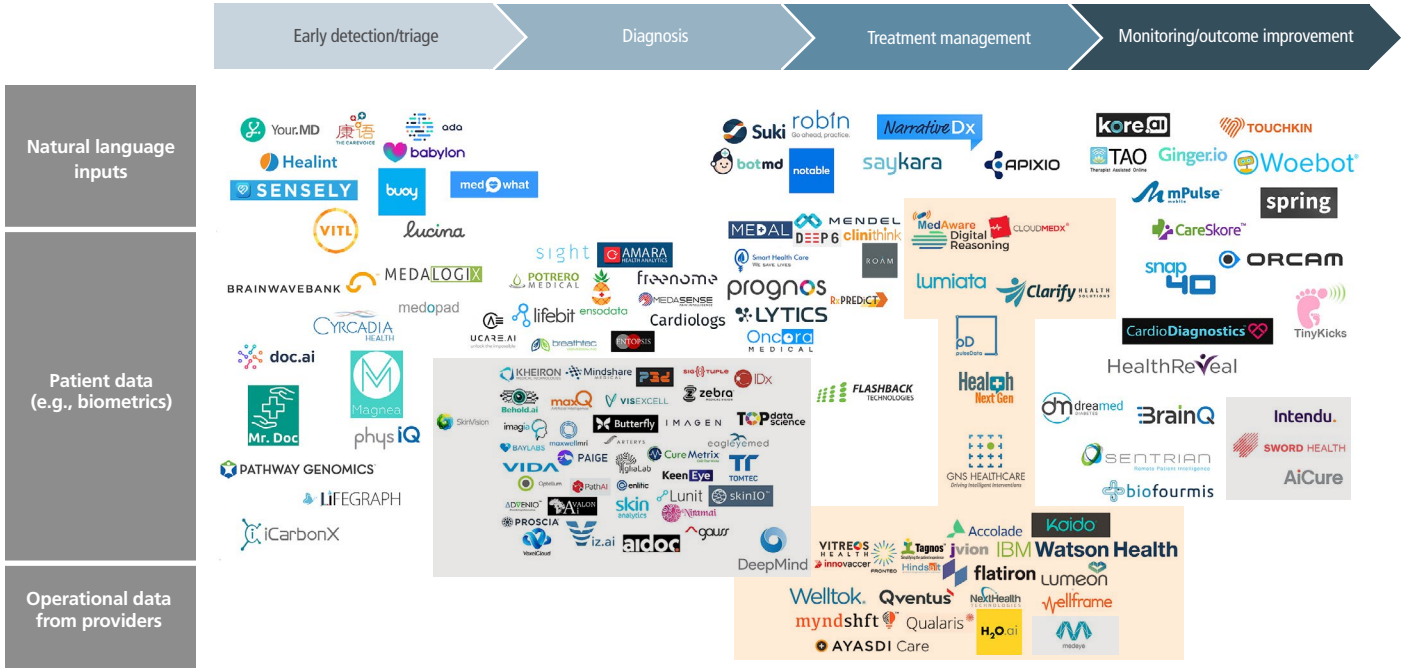
An increasing appetite for AI

The transformative capabilities of AI in healthcare are attracting substantial investment, with CB Insights reporting that AI deal activity across healthcare and life sciences has surpassed all other industries since 2013. Globally, healthcare AI companies raised $4.3 billion across more than 500 equity deals in this period. Funding levels and deal volume have grown significantly since 2013, with 2018 on track to significantly exceed 2017 levels (see Figure 1).

AI solutions have been developed that work with multiple data types, including patient-reported symptoms, biometric and biosensor data, imaging, and biomarker data (see Figures 2 & 3). These applications can be used across the patient care pathway, from initial triage to monitoring of ongoing treatment.

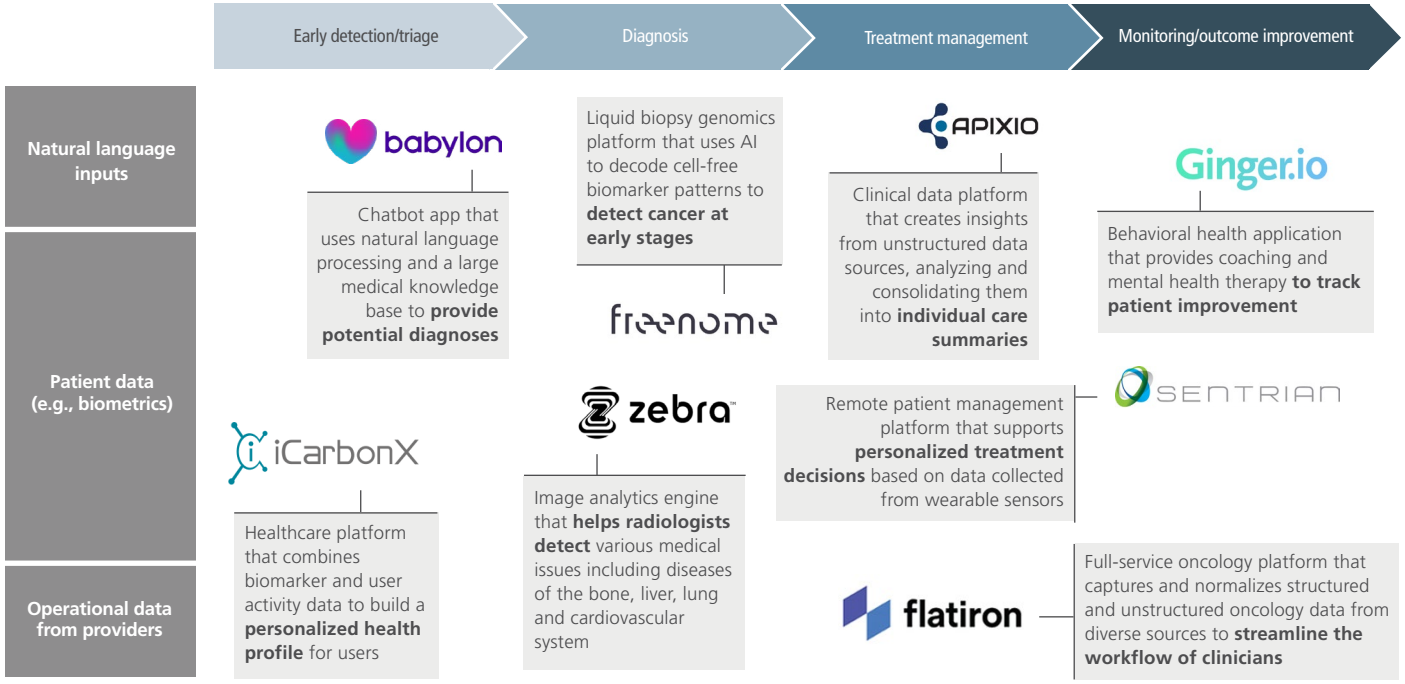
- **Early detection/triage.** Large-scale analysis of patient-reported symptoms or biometrics can suggest potential diagnoses and next steps for patients. Babylon Health provides an interactive symptom checker for smartphones that allows private users to analyze their condition by responding to a series of questions.
- **Diagnosis.** There are many diagnosis-focused applications being developed, with oncology, neurology and cardiovascular being the most commonly targeted therapeutic areas, and results of AI deployment in this field are already very encouraging. For example, research from the Catholic University of Leuven has shown that AI was twice as accurate as pulmonologists in interpreting the results of respiratory tests, correctly diagnosing the primary disease in 82% of 1,430 Belgian patients versus the doctors' 45%.
- **Treatment management.** AI enables the optimization of clinical pathways for individual patients. GNS Healthcare uses machine learning to predict which treatments individual patients would benefit most from, and the U.K.'s NHS has been interacting with Google DeepMind's Streams app, which helps alert clinicians to acute kidney injury in patients — although the app's use of confidential data has raised further questions about data protection and control.
- **Monitoring/outcome improvement.** Patients and physicians have access to continuous assessment and support in areas such as compliance, through applications such as AiCure, a smartphone interface that ensures patients take their medications correctly. There are also a number of AI chatbots that are designed to give real-time support and advice to patients receiving treatment. Unsurprisingly, drug-therapy-adherence support has seen investment from pharmaceutical companies, as in the example of Sophia, Novo Nordisk's recently launched chatbot to help diabetes patients.

Figure 2
AI companies active across the healthcare ecosystem



Note: Many companies span multiple stages of the patient journey or data types, therefore relative positioning is indicative
Source: L.E.K. research

Figure 3
Examples of healthcare AI companies



Source: L.E.K. research

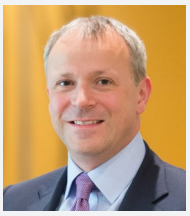
Future vision

In spite of the high level of investment, research, and development and concept testing, adoption of AI applications remains at an early stage. Before we see the widespread use of the technology, there are six barriers that need to be overcome:

- **Partner with care providers in deployment to help practitioners be more effective.** Due to the importance of practitioner uptake and support in promoting AI adoption, partnerships and pilots with providers are key to success. Healthcare AI companies need to form partnerships with care organizations or run pilots with universities and hospitals, so that healthcare practitioners get early access to their applications and are able to influence their development (thereby lowering implementation barriers). As AI develops and is implemented on a wider scale, it promises to allow health professionals to focus on the more challenging tasks that AI is unable to replicate. Therefore, an element of getting buy-in is for AI companies to recognize that practitioners will, over time, have more-leveraged — but likely more demanding and tiring — roles, and to help providers offer additional support for practitioners in "stretch" positions.
- **Define clinical and health economic benefits upfront, then track progress.** Demonstrating the benefits of pilots and partnership programs is critical, particularly given the crucial roles that payers play, so their needs should be factored into solution design from the outset. Health economic (real-world) benefits need to be anticipated before deployment of AI technology so they can be measured over time.
- **Identify and secure access to core data sets.** A major problem in the deployment of IT in healthcare is the identification and cleaning of credible data. The time required to identify and gain access to suitable data sets and prepare them for analysis is typically underestimated in the planning phases of IT and AI programs.
- **Actively promote compliance with data protection and privacy requirements.** Companies must ensure that they have robust legal and compliance infrastructures to address data protection and privacy regulations such as the E.U.'s General Data Protection Regulation, as connected devices, data volumes and the applicability of AI in healthcare grow and data sharing between partners increases. While failure to comply is neither a legal nor a clinical option, giving patients control over how their data is used is expected to become the norm over time. AI providers should design such controls into their technology platforms and ensure they are actively communicated to all stakeholders.
- **Co-develop tools with clinician leaders to avoid regulatory pitfalls in the future.** Although the regulatory environment for AI deployment in healthcare is behind the curve of technical development, it will catch up. Developers need to avoid falling into the trap of AI technologies becoming a "black box," potentially resulting in key algorithms not being subjected to rigorous peer review or full scientific scrutiny. One way to do this is to collaborate with leading clinicians (e.g., at a well-recognized hospital network).
- **Work with regulators and payers to develop liability management frameworks.** The assignment of legal responsibility when an AI application has been actively involved in healthcare — and in all industries — is still a novel concept and one that must be addressed. If, for example, a patient is incorrectly triaged by an AI system, who is at fault? The developer, the partner provider (if one exists) or the AI system itself? While AI developers will not define the answers in this complex legal area, they will need to work with lead adopters to build approaches to liability management.

There is no doubt that AI is set to have a transformative impact on the healthcare sector. There is huge investment in the technology and a plethora of pilots are underway, but ensuring that the promise of AI can become a reality will not be straightforward. Many of the challenges that have slowed deployment of IT in healthcare environments will have to be overcome, and new ones will arise due to the dynamic characteristics of the technology involved. The nature of these challenges is becoming increasingly clear and emerging winners in the field are taking steps to actively address them as they ramp up their activity.

About the Authors



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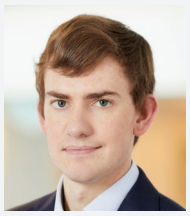

Stephen Roper is a Manager focused on the Life Sciences and Healthcare sectors. Stephen's experience spans therapeutics, diagnostics and healthcare services. He has worked on a range of engagements, including long-term strategy development, product valuation and transaction support. Stephen holds a PhD in Molecular Biology from Cambridge University.

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