



## Investment Perspectives

# Generative AI Investing: Tracking the Transformation of Health Care

Artificial intelligence can potentially unlock innovations across health care sectors and play a key role in helping to identify investment opportunities.



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### Key Takeaways

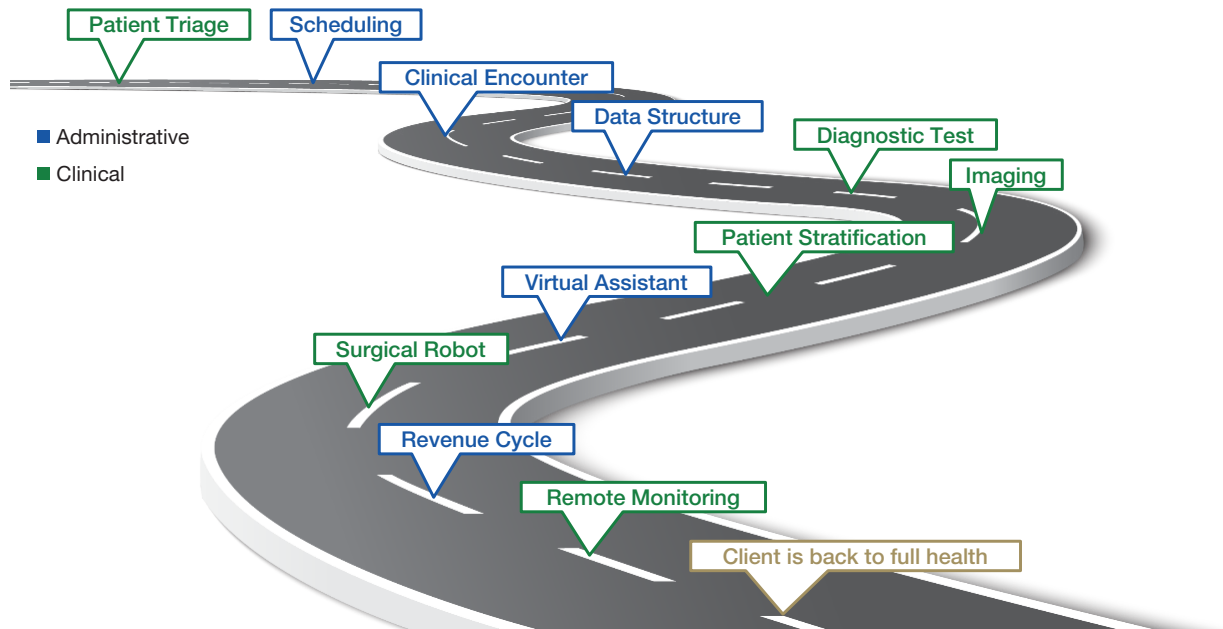
- We believe artificial intelligence (AI) has become a disruptive factor in health care and has the potential to revolutionize the industry and unlock substantial efficiencies.
- Here, we focus on three important ways that AI tools and technologies could influence health care: disease detection and monitoring, drug discovery, and health care delivery and treatment optimization.
- For investors, it has become critical to be aware of the secular shifts occurring now, which are separating the long-term winners with AI strategies from the laggards who are not investing in these capabilities.

### Industry-Wide Impact and Areas of Opportunity

Generative AI's influence extends across many touchpoints in both the patient and administrative journeys, shown in Figure 1. The integration of AI technologies across so many aspects of the industry could drive a significant transformation and propel an advancement of the health care sector.



Figure 1. Potential AI Touchpoints in the Patient and Administrative Journey



Source: Silicon Valley Bank (SVB), The AI-Powered Healthcare Experience, June 2024, <https://www.svb.com/trends-insights/reports/artificial-intelligence-ai-in-healthcare/> The information shown in the chart above is for illustrative purposes only and does not represent any specific portfolio managed by Lord Abbett.

While AI will likely impact all areas of health care, we see three areas of the health care industry where AI and related technologies have, and will likely continue to demonstrate powerful growth and cost savings potential, which can then translate into investment opportunities:

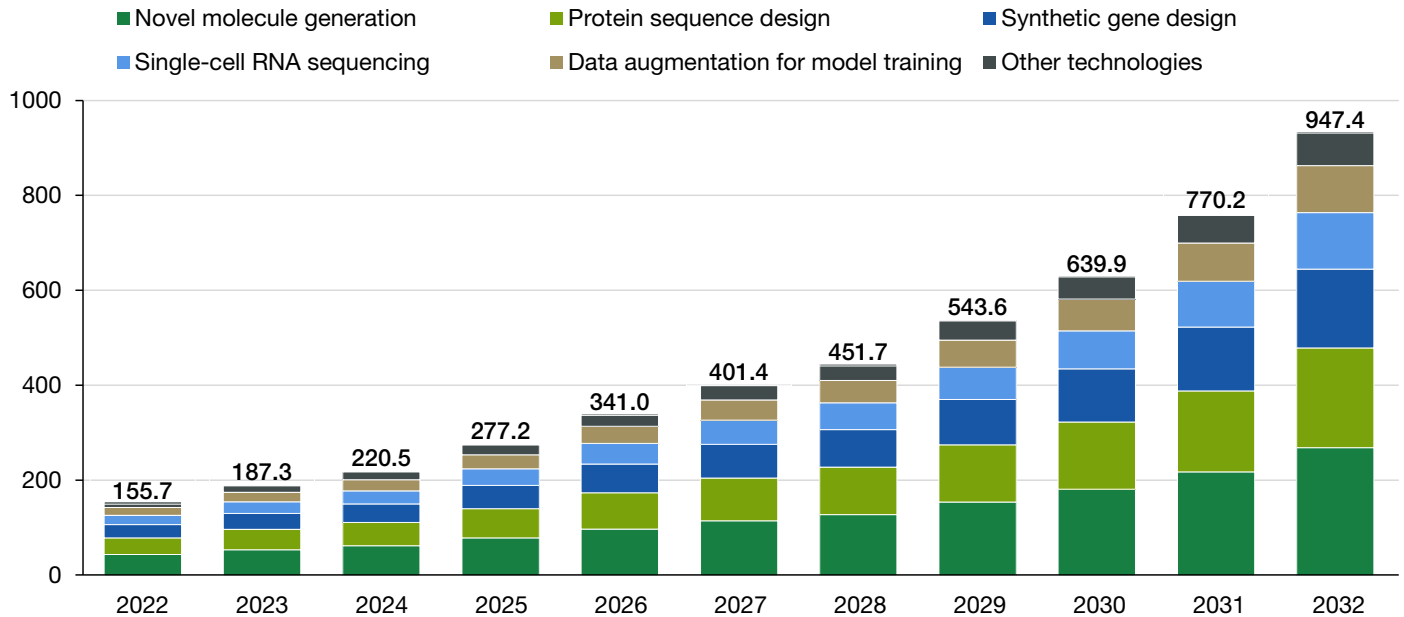
- 1) **Disease Detection and Monitoring:** By leveraging big data and AI, health care systems can seamlessly integrate genomic information with electronic health records (EHRs), providing a more comprehensive understanding of complex diseases. AI can potentially help health care providers detect conditions at their earliest stages and implement preventive measures that could improve patient outcomes and reduce health care costs.
- 2) **Drug Discovery:** Generative AI can enable a more accurate understanding of complex biology which can dramatically cut down on discovery time and increase the efficiency of a biotech company's drug pipeline. AI tools may potentially allow for faster and more accurate clinical trial recruitment which could result in a higher probability of success for a trial.
- 3) **Health Care Delivery and Treatment Optimization:** AI tools can help drive efficiencies in patient care, reduce bottlenecks driven by labor shortages, ageing demographics, and soaring costs.

In the rapidly evolving landscape of health care, the integration of AI, machine learning (ML), and adaptive learning models has emerged as a transformative force. We believe that the use of these tools will enhance disease detection and prediction, as well as increase the efficiency of drug discovery, research and development (R&D) productivity, and optimize health care delivery. And the impact is likely to be profound—in Figure 2, the street estimates that generative AI in life sciences applications will grow by over 20% through 2032.



Figure 1. Forecast Market Size of Generative AI in Health Care

Estimates of generative AI in life sciences applications, by technology, in millions of U.S. dollars, (2022-2032E)



Source: CG Capital Markets U.S. Equity Research, August 27, 2023, and MarketResearch. Data beyond 2023 are estimates. E=estimate. The data shown in the chart above are for illustrative purposes only and do not represent any specific portfolio managed by Lord Abbett.

We explore the powerful synergy between AI and big data, which refers to their combined effect, that could revolutionize patient care, enable personalized treatment plans, improve diagnostic accuracy, and facilitate real-time monitoring of health conditions. The integration of this advanced technology can also drive significant cost savings and operational efficiencies, creating a more sustainable health care ecosystem that could offer the potential for new investment opportunities in the decade ahead.

## Detection: Enhancing Disease Detection and Predicting Onset and Recurrence

Generative AI has the remarkable ability to extract intricate patterns from various biological data types, including genomics, transcriptomics, proteomics, and fragmentomics.

- **Genomics** refers to the study of an organism’s complete set of deoxyribonucleic acid (DNA), including all of its genes. By analyzing genomic data, generative AI can identify genetic variations and mutations that may contribute to disease development.
- **Transcriptomics** involves the study of ribonucleic acid (RNA) transcripts produced by the genome. This helps in understanding gene expression patterns and how they change in different conditions, such as in the presence of a disease.
- **Proteomics** is the large-scale study of proteins, which are vital for most biological functions. Generative AI can analyze proteomic data to uncover protein interactions and pathways that are disrupted in diseases.
- **Fragmentomics** focuses on the study of DNA fragments, which can provide information about cell death and disease states, particularly in cancer.

By integrating and analyzing these diverse data types, generative AI can offer profound insights into disease mechanisms. This more thorough understanding enables the early detection of blood-based biomarkers—molecules found in blood that indicate a disease state. Early detection is crucial for effective disease screening, allowing for timely intervention and better patient outcomes.



Moreover, generative AI can leverage existing biomarkers, enhancing their utility in monitoring disease recurrence and guiding therapy selection. This means that health care providers can tailor treatments based on the specific biomarkers present in a patient, leading to more personalized and effective care. For example, by combining biomarkers with AI-driven detection of cancer-associated DNA fragment patterns in circulation, screening accuracy could be significantly improved. This approach helps distinguish cancerous tumors from benign growths ahead of imaging.

## Diagnosis and Monitoring: Improving Diagnostic Accuracy and Disease Tracking

Big data can integrate genomic signatures with information from a patient's electronic health record (EHR), clarifying causal relationships and functional mechanisms of complex diseases in a much faster way than what could be done through human analysis. This application of AI and machine learning could, for instance, help diagnose a child presenting with intellectual disabilities and numerous mutations. Traditional methods of diagnoses could take years to sort through to find which mutations would present with that specific intellectual disability. In short, by leveraging big data, we can combine genetic information with details from a patient's medical records, which could help better diagnose and treat complex and rare disease.

Another use case for AI and machine learning is in longitudinal genetic studies. These studies track changes in a person's genetic make-up over time to explore how environmental risk factors might influence the development of traits over time. For example, this type of analysis helps researchers identify patterns and markers that are associated with the development of diseases like Alzheimer's. This analysis requires large amounts of genetic and clinical data to be interpreted over long periods of time, so the need for AI and machine learning will continue to grow from this application.

Moving away from genetics, AI can also be used to better diagnose diseases including the onset of seizures and coronary artery disease. Medical devices in the form of a wearable—worn on the body—can be placed on a patient's head who is suspected to be having a seizure and the wearable can incorporate data that has been trained on billions of electrocardiogram (ECG) waveforms to determine if that patient is having a seizure and where it may be located in real-time. This can help diagnose patients with greater precision and significantly faster, leading to better clinical outcomes and reduced resource usage from a staffing perspective. AI and machine learning models can be incorporated into imaging equipment to enhance the detection of coronary artery diseases. The AI and machine learning models are derived by analyzing large databases of computed tomography angiography or CTA images to build three-dimensional (3D) models of coronary blood flow, locating dangerous plaque, and improving patient risk stratification accuracy.

## Drug Discovery: Increasing Efficiency and R&D Productivity

Predictive modeling of 3D protein structures and functions allows researchers to assess the role and function within a disease state, select optimal targets, and design proteins with a higher probability of success. For example, if a company aims to design a protein to combat an infectious disease, it can use AI to model and optimize for that specific protein. By incorporating evolutionary history, a generative AI model can generate a near-functional version of the desired protein, which typically consists of 400–500 amino acid chains with numerous permutations, or various possible arrangements.

Researchers can further enhance clinical trials by using advanced modeling to build synthetic cohorts, or de-identified patient data used to create groups of virtual patients. This allows scientists to gain valuable insights without compromising patient privacy. By analyzing this data, researchers can refine the criteria for who can participate in clinical trials, ensuring that the right patients are included or excluded based on specific characteristics. This approach offers the potential to speed up the drug development process and may also increase the likelihood of finding successful treatments by making the trials more precise and targeted. Essentially, it's like creating a detailed and accurate simulation of patient groups to test new drugs more effectively.

Developing algorithms to match patients' molecular signatures significantly enhances clinical trial recruitment and aligns existing patients with new medicines. By leveraging advanced computational techniques, which can include the use of algorithms, codes, or other calculations, researchers can analyze the unique molecular profiles of patients, ensuring that they are matched with the most appropriate clinical trials and treatments. This precision matching not only potentially accelerates the recruitment process but may also increase the likelihood of successful outcomes by targeting therapies to those most likely to benefit.



AI can also be applied to previously unsuccessful clinical trials to identify specific sub-populations where the drug demonstrated efficacy. For instance, if a drug was effective for a subset of the population with minimal residual disease (MRD+), rerunning the trial with a smaller, more targeted cohort can significantly enhance the new trial's chances of success. This approach allows researchers to salvage potentially valuable treatments by focusing on the precise patient groups that exhibit a positive response, thereby optimizing the drug development process and improving overall clinical outcomes.

AI plays a crucial role in closing gaps in care and identifying patterns that inform clinical decisions. By analyzing vast amounts of health care data, AI could potentially pinpoint areas where patient care may be lacking and highlight emerging trends. For instance, if a new drug is discovered for triple-negative breast cancer patients with a PIK3CA mutation, AI could alert health care providers to this new treatment option or any updates to clinical guidelines. This would potentially help ensure that patients receive the most current and effective therapies available.

Moreover, AI can detect patterns in patient outcomes that might otherwise go unnoticed. For example, if a significant percentage of triple-negative breast cancer patients with a PIK3CA mutation develop neuropathy following treatment, AI could potentially identify this trend. This insight can prompt additional clinical trials to investigate the cause and potential solutions for this side effect. By leveraging AI to uncover these patterns, researchers and clinicians could potentially make more informed decisions, ultimately improving patient care and advancing medical knowledge.

## Health Care Delivery and Treatment Optimization

Finally, we want to highlight the AI applications driving enhancements and efficiencies in patient care that are prevalent across a patient's health care journey, including AI-powered speech recognition, to transcribe and structure doctor to patient conversations into real-time clinical notes, AI-driven patient support and medical interactions, AI-driven patient risk stratification, smart appointment scheduling to limit wait times, AI-automated billing, insurance verification, and prior authorizations, just to name a few. These tools are increasingly being integrated to automate and reduce time-consuming processes, unlocking more time for health care practitioners to spend practicing medicine.

We believe the companies that embrace these capabilities to augment connections and data feeds into health care practitioners are better positioned to potentially increase market share and strengthen their business models. Additionally, we seek to invest in companies with interventional tools using AI that increase the quality of care and impact the quality of outcomes, while lowering costs. These include AI-assisted robots, imaging, remote monitoring, and training.

## Limiting Factors to Consider in AI and Diagnosis (DX)

The challenges in building models from unstructured and noisy data, coupled with the lack of standardization and data imbalances, are significant. For instance, multi-omics data, which includes data from multiple biological systems, such as genomics and proteomic data, are generated using different technologies, leading to inconsistencies. Additionally, there is often a mismatch between training data and real-world data, further complicating model development. The absence of longitudinal databases—data collected repeatedly from the same subjects over time—underscores the need for a patient-centered collection of various datasets. Barriers could also arise if clinicians lack trust in the data and hesitate to adopt new technologies. Moreover, the regulatory and reimbursement pathways remain unclear, although progress is being made in this area.

Despite these challenges, the integration of AI and big data in health care has the potential to revolutionize disease detection, monitoring, and drug discovery. By leveraging these advanced technologies, we could enhance the accuracy and speed of disease detection, predict disease onset and recurrence, and significantly improve R&D productivity. The sophisticated applications and potential of AI and big data are transforming health care outcomes, paving the way for a future where patient care can be more precise, efficient, and effective.



## Summing Up: The Growth Potential in the Health Care Sector

Advances in genomic sequencing have resulted in the creation of large databases of genetic data, produced at scale, which when coupled with advances in data interpretation through AI, will disrupt the way diseases are diagnosed. Use of genome data married with AI generated interpretations could increase the precision and pace in which we diagnose disease and develop drugs, unlocking new growth opportunities for health care companies.

As investors in health care, it is our goal to capitalize on the disruption and innovation within the health care sector to drive long-term performance. We also believe there are opportunities to potentially monetize the historically underappreciated exponential growth of emerging innovations. Our approach to investing in innovative and transformative growth companies seeks to identify health care companies with the strong business models and strengthening fundamentals that are also recognized for their positive operating metrics. The health care sector is poised to reap significant benefits from advanced technologies such as AI and big data that can generate the potential for attractive investment opportunities for years to come.

### Sources:

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### Glossary & Index Definitions

**Big data** refers to extremely large and complex data sets that traditional data-processing software cannot easily manage or analyze. These data sets are characterized by their volume (large amounts of data), velocity (the speed at which data is generated and processed), and variety (the different types of data).

**Biomarkers**, or biological markers, are measurable substances in an organism that indicate the presence of something, such as disease, infection, or environmental exposure.

**Computed tomography angiography (CTA)** is a medical imaging technique that combines a CT scan with an injection of a special dye to produce detailed pictures of blood vessels and tissues in parts of the body.

**Consensus estimate** is an aggregate forecast of a public company's expected earnings based on the combined estimates of all analysts that cover the stock.

**Coronary artery disease** is a common type of heart disease that affects the main blood vessels supplying blood to the heart, known as the coronary arteries.

**Electrocardiogram (ECG or EKG)** is a medical test that records electrical signals in the heart. It shows how the heart is beating and can help diagnose various heart conditions.

In finance, **street estimates** refer to the average forecast of a public company's quarterly earnings and revenues, or other industry specific data, as predicted by market analysts and industry specialists. These estimates are derived from the research and analysis conducted by securities analysts who cover the company.

**Generative artificial intelligence (AI)** is a subset of AI that uses generative models—artificial intelligence algorithms used to create complete units of content. These models learn the underlying patterns and structures of their training data and use them to create new data based on input, often in the form of natural language prompts

**Machine learning** is a branch of artificial intelligence (AI) that focuses on developing algorithms and statistical models that enable computers to learn from and make predictions or decisions based on data. Instead of following explicit instructions,

A **PIK3CA mutation** can cause cells to divide and replicate uncontrollably, contributing to the growth of various cancers.

**Synthetic cohorts** are virtual or imagined groups of people created by combining data from multiple individual cohorts that span different but overlapping periods during life.



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