

Healthcare Disruption Is Underway With Machine Learning Models That Can Predict Patient Outcomes And Dramatically Improve Cost Effective Delivery Of Care

Machine learning will improve the way health systems target limited resources toward those patients with the highest needs, driving better outcomes and reduced costs. The ability to predict patient outcomes and clinical decision support tools can give clinicians context around the data, allowing them to make better and more personalised decisions. Data driven health aims to help clinicians quickly understand the patient, the conditions, and interpret the information for that individual patient.

Current Challenges for Healthcare Organisations

There is an estimated \$1 trillion worth of wastage in the United States Healthcare System. These wasted health dollars can be attributed to many causes, ranging from duplication of administration efforts and lack of adherence to medications, right through to avoidable patient readmissions. Healthcare is experiencing increasing costs, massive pressure on budgets and a projected shortfall in the clinical workforce.

The digitisation of health records through electronic medical records and health information exchanges hasn't quite delivered yet on promised cost savings. Machine learning represents the biggest opportunity to leverage these existing investments and deliver significant cost reductions for health systems.

The current shift from fee-for-service to value-based contracting is driving a fundamental change in the way the health system contracts for, and provides care to, patients. This change creates a renewed focus on the cost effectiveness of interventions and ensuring each intervention is right for each patient.

The shift to electronic medical records, combined with advances in genomics, wearable technology and environmental monitoring, has meant there has been an explosion in both published literature and usable data about individual patients. Current models and processes simply can't keep up with the volume of data. The options are either to continue the way health has always been delivered, or utilise technology such as machine learning to consume and process this vast repository of information to produce meaningful insights for healthcare decision makers.

There are many applications where machine learning models will help to reduce the cost of healthcare, in this report we discuss exciting projects underway, including the Orion Health Amadeus Intelligence Project for Clinical Decision Support Tools. In this

Why is Machine Learning Important?

Orion Health is leading ground-breaking research in machine learning, exploring meaningful ways to minimise waste, reduce operating costs and help clinicians make more accurate decisions at the point of care. Significant amounts of data exist that will support better decision making, drawing on key information from entire populations to treat and manage a person's health.

The healthcare sector is being transformed by the ability to record massive amounts of information about patients and their environments. Machine learning provides a way to find patterns and reason about data, which enables healthcare professionals to move to personalised medicine. There are many possibilities for how machine learning can be used in healthcare, and all of them depend on having sufficient data and permission to use it.

project Orion Health has created an accurate machine learning model to screen patients for the life threatening condition of Abdominal Aortic Aneurysm (AAA).

The Machine Learning Approach

Healthcare has become an industry which hosts immense quantities of data that's not being used to its full potential. It's essential to ensure that tools are developed to efficiently process this information and present back meaningful insights for healthcare decision makers to support better outcomes and lower costs of care.

Machine learning models have already demonstrated their ability to support healthcare professionals, with providing improved target interventions to the right patients. Research has demonstrated that machine learning models can out-perform existing approaches which predict lack of adherence to medication, chances of readmission, and high cost users by more than 30%.

This is already having a positive impact in healthcare, from data pattern recognition to supporting cancer diagnosis. There are machine learning models that can detect early patient deterioration through vital sign monitoring, reduce the number of requested X-ray images through providing better clinical decision support, and even provide improved predictions on which patients will miss clinic appointments. These are all examples of how machine learning will improve efficiency in the healthcare system and reign in costs.

Outcomes and Benefits of Machine Learning Disruption

One of the more immediately obvious applications of machine learning models is with augmenting clinical decision making by providing procedurally consistent automated processes. This will provide tools to speed diagnosis and improve the reliability of the diagnosis, plus streamline clinical interventions. We're

Orion Health Amadeus Intelligence Project for Clinical Decision Support Tools

The HOPE (Health Outcome Prediction Engine) is designed to identify patients at risk of an Abdominal Aortic Aneurysm (AAA). This research project is a public private partnership under Precision Driven Health, a collaboration between Orion Health, Waitemata District Health Board (Hospitals) and the University of Auckland. 800 individuals were identified through data analysis of patient records as a likely candidate for AAA during a precision screening trial. AAA is caused by a weakness in the wall of the main artery leaving the heart. Rupture is usually sudden, unexpected, and fatal.

The machine learning model is based on epidemiological studies that identified individuals most at risk of AAA. The application of data science and machine learning, known as precision screening, has the potential to save lives. Big data makes it possible to create precise criteria to select those most at risk to AAA and, in the future, to other preventable conditions. All the patients identified during the precision screening trial were contacted and 632 took up the offer of an ultrasound. Thirty-six were found to have AAA, a prevalence rate of 5.5% and almost exactly the rate that was predicted by the data analysis. The machine learning model performed well - 97% of AAA were found in the 29% of patients with a predicted risk of 2% or more. There are also plans to develop the AAA screening tool further so it can be generalised to other medical conditions.

Precision screening presents a huge opportunity for the health sector, where data science can help target health interventions to those with the greatest need. Orion Health research using Amadeus Intelligence is providing machine learning models that can be utilised in healthcare organisations to predict patient outcomes and improve cost effective delivery of care.

also able to outsource normally exhaustive analytical work to machine learning models which will have significant impacts in the public health sector-especially in preventative care. A recent report by Accenture has predicted that machine learning applications can save the United States health systems up to \$150 billion per year by 2026. Machine learning represents the biggest opportunity to leverage these existing investments and deliver significant cost reductions for health systems. Machine learning models are able to scan vast data sets and identify individualised and precise treatment plans for patients which will provide more appropriate care, reduce medical errors, and control healthcare costs.

\$1 Tn

Waste in the U.S Healthcare system

\$150 Bn

Potential savings generated by Machine Learning

Key Takeaways

- There is an estimated \$1 trillion worth of wastage in the United States Healthcare System
- The shift from fee-for-service to value-based models is a paradigm shift within the industry with far reaching implications
- The amount of data available within the patient record, across data sets and publications, is increasing exponentially
- This data collection is essential for improving and developing machine learning models, which in turn provide new insights into which data is most useful
- Better predicting outcomes and costs dramatically improves cost effective delivery of care
- The primary outcome of these models is improvements to inpatient and outpatient care across the board; both short term prognostic outcomes and long term health
- Machine learning is expected to save the United States Health System \$150 billion per year

There are many applications for Machine Learning, if you'd like to explore how Orion Health can bring Machine Learning insights to your organisation see here:

orionhealth.com/global/products/amadeus-intelligence/