The Ability To Predict Clinical Progression With Machine Learning Will Have A Positive Disruption On Value-Based Care Programs, Especially Those Managing Chronically Ill Patients

Machine Learning will have a positive disruption on the care of patients with Chronic Disease especially Diabetes. Machine learning models can predict long-term conditions, enabling interventions that could dramatically cut treatment costs and save healthcare organizations billions of dollars each year.

Current Challenges for Healthcare Organizations

In the United States, Chronic Diseases are the leading cause of death and disability. Amongst the population, as of 2012, about half of all adults—117 million people—had one or more chronic health conditions and one in four adults had two or more chronic health conditions. Seven of the top 10 causes of death in 2014 were Chronic Diseases, Heart Disease and Cancer which, combined, accounted for 46% of all deaths. Diabetes is of major concern, there are an estimated 24 million people with Diabetes in the United States, the leading cause of kidney failure, non-injury related lower-limb amputations, and new cases of blindness among adults.

Predicting patients' risk of developing these chronic health issues has great benefits for healthcare organizations. Firstly, it allows early intervention to occur, giving patients and their healthcare organizations the opportunity to reduce suboptimal outcomes. Secondly at-risk patients can be placed on value-based care programs to manage and promote lifestyle changes that can help to prevent or slow down the development of long-term health issues. The ability to predict clinical disease progression will enable healthcare organizations to develop more targeted care plans, containing healthcare costs and reducing unnecessary escalations into episodic care.

Machine learning models have the ability to predict clinical progression of patients, this is especially helpful in the chronically ill. As hospitals strive to improve clinical care management, machine learning can rapidly help identify the right protocols and interventions to create a personalized plan of care that will achieve the best outcomes for patients.

The number of patients with Chronic Diseases is rising. This is especially evident in Diabetes. Both the number of diabetics and the associated costs are expected to double in the next 25 years, and without advancements such as machine learning modelling, healthcare organizations will struggle to bear this cost.

There are many applications where machine learning models will help to reduce the cost of healthcare, in this report we discuss

Why is Machine Learning Important?

Orion Health is leading ground-breaking research in machine learning, exploring meaningful ways to minimize 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 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 new way to find patterns and reason about data, which enables healthcare professionals to move closer to personalized 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.

exciting projects underway, including the Orion Health Amadeus Intelligence Project for Predicting Clinical Progression. In this project Orion Health has created an accurate machine learning model that predicts patient outcomes following a Stroke.

The Machine Learning Approach

Current evidence suggests machine learning will help predict outcomes for patients with chronic conditions. Diabetes, Cancer and Stroke are all examples of long term conditions where early detection and intervention are highly beneficial.

Examples of current machine learning models are based around utilizing the data collected by healthcare organizations to augment their current practices. Hospitals are using support vector machine modelling, using EHR data and risk factors to determine early diagnosis. Hospitals are using machine learning models to empower clinical decision support, where the model can detect patients deteriorating and alert clinicians so they can intervene at an earlier stage to manage these high risk patients. This leads to improved outcomes for high risk patients as they are receiving timely interventions by clinicians.

Another example of hospitals effectively employing machine learning models is in emergency departments, where reduced hospital readmission rates and patient satisfaction is essential. Machine learning is also being used to help hospitals standardize protocols and implement best practices to improve performance outcomes–such as managing the emergency department triage process.

An example of a challenging area for healthcare organizations is medication management. Patients and especially the chronically ill can be confused by their prescriptions or ignore the advice of clinicians. There are a number of patients who are readmitted to hospital because they didn't understand the risks of not taking

Orion Health Amadeus Intelligence Project for Predicting Clinical Progression

The HOPE (Health Outcome Prediction Engine) for Stroke project aims to tailor care to stroke patients, providing them with more information on outcomes, help manage expectations, and enable better planning and support. 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. The machine learning model uses data from the Waitemata Stroke Register to examine 2,800 strokes over the past five years. It also uses pre-existing data, specifically demographic and clinical variables such as stroke severity, living conditions, age, and time spent in the emergency department. This is then used to predict outcomes following a stroke such as hospital length of stay, dependency level, and rehabilitation requirements.

A machine learning model was developed to calculate the predicted outcomes at 90 days post-discharge and present these in real time as part of a clinical workflow. The system extracts data each morning and incorporates this into the stroke assessment process. The system combines the machine's predicted outcome probabilities with the clinician's predictions to present an accurate view.

The outcomes of this project have huge potential to improve stroke patients' quality of life as well as improve the efficiency of care delivery from early discharge to complete transition of care support both for the patient and their families.

their medications. Machine learning models are also being utilized with medication management. The models can look at prescribing patterns, detect discrepancies such as medication related errors and predict future prescribing patterns. This is highly useful data for healthcare organizations who can use this knowledge to streamline the type of medication and dosage levels being prescribed and put in strategies for dealing with future medication requirements and in doing so contain medication related costs.

Machine Learning will have a positive disruption on value-based care programs, if you'd like to explore how Orion Health can bring Machine Learning insights to your organization see here: orionhealth.com/amadeus-intelligence

Outcomes and Benefits of Machine Learning Disruption

The annual expenditure on Diabetes patients from 2009 to 2034 is expected to increase from $113 billion to $336 billion. This illustrates the future burden of chronic conditions such as Diabetes on the health sector if costs are not significantly reduced. For long-term care services spending–from detection of a condition, through treatment, until the end of these patients' lives–the cost is approximately $US200 billion. Machine learning models can predict long-term conditions, enabling interventions that could save the healthcare industry $150 billion over the next 10 years, potentially cutting treatment costs by up to 50%.

The projected benefits and outcomes of adopting machine learning in long-term healthcare services are: faster diagnoses, improved treatment plans, provision of virtual care assistants, reducing medication related errors, and improving administration and workflow.

ANNUAL EXPENDITURE ON DIABETES PATIENTS
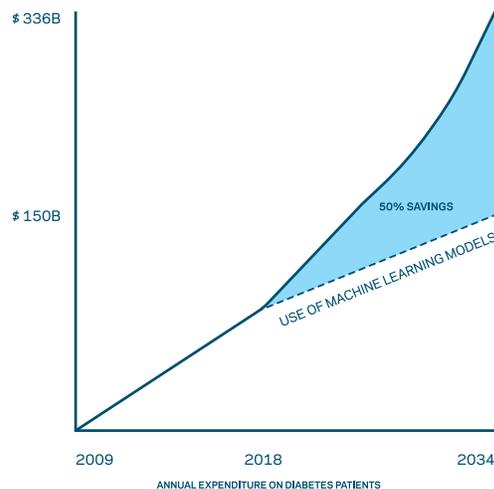
Key Takeaways

- In the United States, Chronic Diseases are the leading causes of death and disability amongst the population
- Predicting patients' risk of developing these chronic health issues has numerous benefits for healthcare organizations
- As hospitals strive to improve clinical care management, machine learning can help in standardizing protocols to ensure patients are cared for in best practice
- The ability to predict life-changing chronic conditions could save healthcare organizations $200 billion US each year in long-term care services spending
- Predicting clinical progression with machine learning will have a will have a positively disruptive impact on targeting value-based care programs especially those managing chronically ill patients
- Predicting clinical progression results gives an opportunity for clinicians to diagnose patients in an early stage of their condition and to intervene earlier, to enable improved health outcomes for patients