

Disruption Of Healthcare With Machine Learning Is The Future, How Will This Curb Avoidable Readmission Rates and Reduce Healthcare Costs?

Machine learning has the ability to provide clinical and financial insights that are driving healthcare toward personalized treatments and maximizing the cost effectiveness of interventions.

Current Challenges for Healthcare Organizations

Healthcare costs in the United States are spiralling upwards, with an aging population and a growing number of people with multiple chronic illnesses. Healthcare organizations are having to provide care for a large number of patients who require more intense and costly interventions. One of the reasons cost is increasing for healthcare organizations, is the high hospital readmission rates.

Healthcare organizations are looking for ways to slow down or stop preventable readmissions. A useful tool would be the ability to predict which patients require hospital level care, and when, so that strategies can be put into place. Preventable readmissions is an area where machine learning can be used to augment current approaches and significantly reduce the cost and waste in healthcare.

Hospital admissions are a major focus for payers and providers, 17.6% of hospitalizations in the United States result in a re-hospitalization within 30 days with an estimated 76% of those re-hospitalizations being potentially avoidable.

The financial risk of high hospital readmission rates has been shifting to providers through financial penalties and withheld payments. Medicare estimate that they will withhold \$564m in payments over the 2018 financial year.

While there are many effective programs and interventions to reduce hospitalization rates—such as intensive transition management and patient support—come with a relatively high price tag. Current readmission prediction tools, such as the LACE Index for Readmission - Length of stay (days), Acute (emergent) admission, Charlson Comorbidity Index and Number of ED visits within 6 months (LACE), are relatively poor at predicting patient readmission. If health systems can't target these high cost, highly effective readmission interventions at the right patients, the interventions are unlikely to save a health system any money.

The Machine Learning Approach

Current models that predict readmission risk such as LACE have relatively poor predictive performance with AUC (area under the

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.

curve) of 0.62 (where 0.5 is random chance). Published evidence now demonstrates that AUC scores of 0.75 to 0.85 are now achievable through the use of machine learning tools.

There are two key themes related to improving accuracy that emerge from the literature:

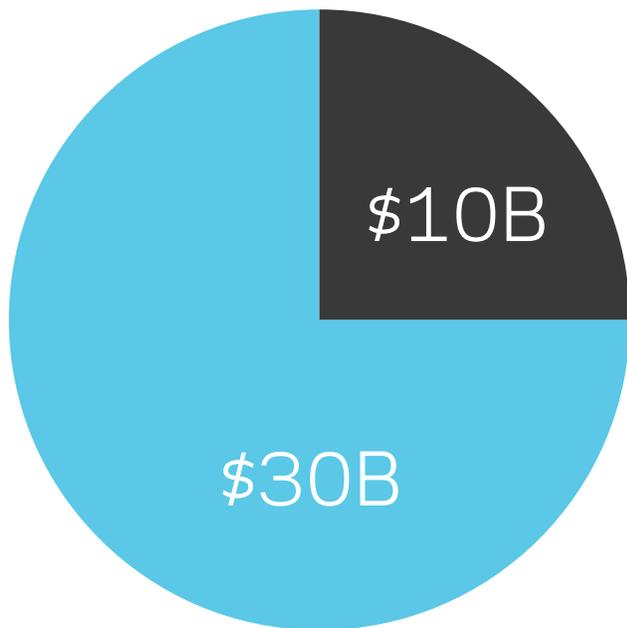
- Having a large data set for the Machine Learning Model to train on; the more patient records and the larger the medical history, the better the model can train itself.
- The second is the breadth of data types available to the model; combined clinical data from acute and community providers, claims data, patient reported outcomes, social and demographic data can all be used to improve the predictive power of a Machine Learning model.

\$1 in \$10

of hospital budgets spent
on potentially avoidable
readmissions



\$40B problem for
US Healthcare



\$30B in potentially
avoidable readmissions

Machine learning will dramatically improve the way health systems target limited resources toward those patients with the highest needs, driving better outcomes and reduced costs.

To learn more see here:
orionhealth.com/amadeus-intelligence

Orion Health Amadeus Intelligence Project For Assessing Readmission Risk

Research was undertaken on a data set of 100,000 anonymized US patient records. The analysis showed that machine learning approaches were 20% better at assessing the readmission risk of patients than the standard LACE risk-scoring approach. The machine learning models achieved a greater accuracy because they were able to incorporate additional information to the factors already considered by LACE. The more accurate the tool for identifying at-risk patients, the more targeted healthcare intervention can be in order to reduce readmission rates and lower costs. Orion Health calculated that the potential savings from the machine learning models were four times higher than those from LACE.

Outcomes and Benefits of Machine Learning Disruption

There were over 3.1 million readmissions in 2014, generating a total cost of \$40 Billion across both Centers for Medicare and Medicaid Services and privately insured patients. Up to 76% of these readmissions are potentially avoidable, meaning just over \$30 Billion in costs could be removed from the health system through improved management of these patients.

Patients with Heart Failure represent one of the most costly groups of patients to manage in a health system. 30 day readmission rates for Heart Failure patients are over 22% and the total cost per readmission is almost \$15,000 USD per patient. We know from these findings that poorly targeted but effective readmission interventions can reduce readmission rates by over 28%. With better targeting and personalization of interventions using machine learning techniques, health systems can expect larger reductions in readmission rates that are achieved in a far more cost effective manner.

Key Takeaways

- High potentially avoidable readmission rates are a \$40 Billion USD problem with three quarters of the cost being potentially avoidable
- Current tools to predict patient readmission are not accurate, leading to poor decisions about targeting resources
- Machine Learning Models benefit from large data sets with broad data types to achieve the best results
- Healthcare organizations can use the predictions of readmission risk, to improve targeting of resources and lower readmission rates
- Orion Health calculated that the potential savings from the Machine Learning Models were four times higher than those from LACE
- Lower readmission rates result in significant cost savings and improved patient outcomes