Case Study

Predicting Misdiagnosed Adult-Onset Type 1 Diabetes Using Machine Learning

Situation

Type 1 Diabetes (T1D) is often misdiagnosed in adults as Type 2 Diabetes (T2D) due to overlapping symptoms and the common perception that T1D primarily affects children. This misdiagnosis can delay appropriate treatment, leading to suboptimal patient outcomes.

Challenge

Recognizing this challenge, IQVIA and Breakthrough T1D (formerly JDRF) have partnered to leverage artificial intelligence (AI) and real-world data to improve diagnostic accuracy for adult-onset T1D.

The primary objective of this collaboration is to develop an AI model that can accurately distinguish between T1D and T2D in adults. This initiative aims to:

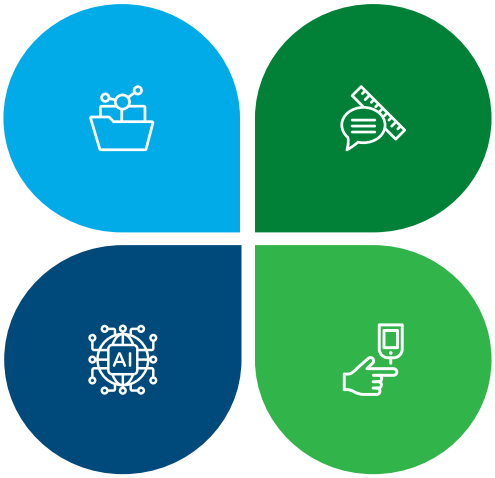
- Reduce the rate of misdiagnosis
- Ensure timely and appropriate treatment for patients
- Enhance overall patient outcomes and quality of life
- Inform best practice for integrating AI into clinical workflow to enable clinician decision making for diagnostic evaluation

Solution

IQVIA built an algorithm that accurately identified misdiagnosed Type 1 Diabetes (T1D) patients, which utilized de-identified patient-level real world data derived from hospitals' and healthcare practices' ambulatory Electronic Health Records (EHRs). The AI model was trained to identify patterns and markers indicative of T1D, which are often overlooked in traditional diagnostic processes.

Data collection and pre-processing:
Data from various sources were aggregated and anonymized to protect patient privacy. This dataset included demographic information, clinical history, lab results, and treatment records.

Model development:
Advanced AI algorithms were employed to analyze the data. The model was trained to recognize specific indicators of T1D, such as autoantibody presence, C-peptide levels, and insulin dependency, but also less recognized predictors such as higher incidence of specialist visits, absence of metformin treatment history, and lower incidence of metabolic disease management.



Validation and testing:
The model underwent rigorous validation using an independent dataset to ensure its accuracy and reliability. Performance metrics such as sensitivity, specificity, and positive predictive value were evaluated.

Implementation:
The validated model was designed to be integrated into clinical decision support systems to assist healthcare providers in diagnosing diabetes more accurately.

Results

Preliminary results from the collaboration have shown promising improvements in diagnostic accuracy. In an independent validation of the algorithm in EHR data collected by a Health Information Exchange, the algorithm demonstrated 35% precision at 5% recall, translating to over 1 in 3 patients being identified correctly and allowing their physicians to deliver the right care to the right patients with the right diagnosis.

The AI model aims to demonstrate a significant reduction in the misdiagnosis rate of adult-onset T1D, ensuring that patients receive the correct diagnosis and appropriate treatment sooner.

The successful implementation of this model has several key impacts:

Improved patient outcomes: Accurate diagnosis leads to better management of T1D, reducing complications and improving patients' quality of life.

Healthcare efficiency: Early and correct diagnosis reduces the burden on healthcare systems by minimizing unnecessary treatments and hospitalizations.

Research advancements: The insights gained from this study contribute to the broader understanding of T1D and its manifestations in adults, paving the way for future research and innovation.

Conclusion

IQVIA is currently running a prospective validation study at three health systems in the U.S. to test real-world performance of the algorithm by identifying and testing patients with elevated risk for misdiagnosis. Providers will be asked to do an independent review of the patient medical records before recommending testing to further assess the risk of T1D.

Outcomes from the validation are intended to inform the utility of deploying an AI algorithm to improve timely detection of adult-onset T1D, and over time, may provide a helpful input into T1D screening guidelines.

The partnership between IQVIA and Breakthrough T1D exemplifies the potential of combining advanced analytics with real-world data to address critical healthcare challenges. By leveraging AI, this collaboration not only improves diagnostic accuracy for adult-onset T1D, but also sets a precedent for future initiatives aimed at enhancing patient care through innovative technologies.

References

1. Predicting misdiagnosed adult-onset type 1 diabetes using machine learning
2. IQVIA and JDRF Collaborate to Improve Understanding of Type 1 Diabetes Using Real World Data
3. The Role of Patient Organizations in Accelerating Innovation in Patient Care Through AI

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