Artificial Intelligence to support diagnostic accuracy in primary care EMRs for population health management

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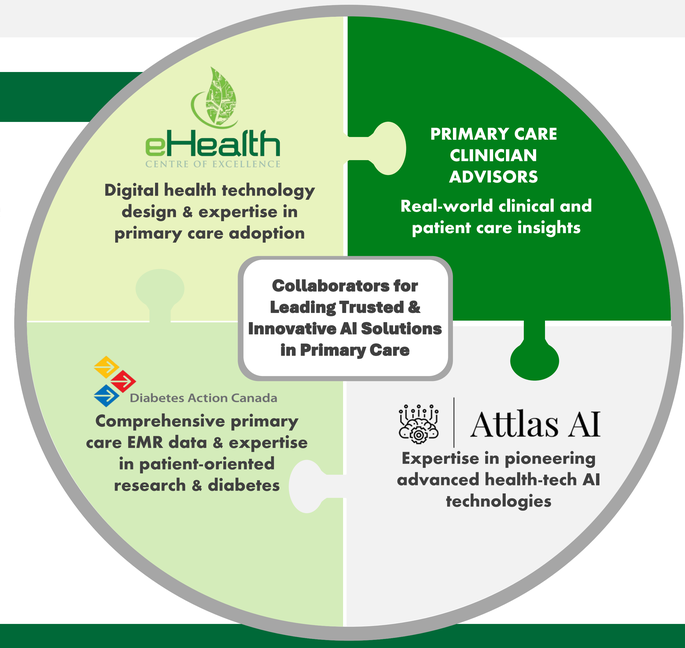
Purpose & Our Collaborative Approach

Incomplete coding and poor standardization in electronic medical records (EMRs) hinder the effective segmentation of priority populations, limiting population health management (PHM) and chronic disease management (CDM) efforts. Improving EMR data quality is challenging due to time and resource constraints.

To address these issues, we developed a robotic process automation (RPA) technology named "Cody" to automate the coding of chronic diseases like diabetes in primary care EMRs. Artificial intelligence (AI) offered the possibility to augment Cody's diagnostic accuracy for diabetes in EMRs and optimally support PHM and CDM, with its capabilities in analyzing free-text and historical data in EMRs.

In this project, we took a collaborative approach and partnered with **Diabetes Action Canada (DAC)**, and **Attlas AI**, to **explore the feasibility of developing an AI model using patient history data to predict diabetes diagnosis coding**. **Clinician engagements** guided the scope and the direction of the project. An **Ethical AI framework for responsible development of AI in healthcare** outlining principles of accountability, fairness, privacy and security, safety and reliability, and transparency, was established by the project team, to guide the development of the model.



Methods and Promising Results for Future AI Use in Primary Care

Methods: A time-series sequential AI model was developed and tested on **DAC's National Diabetes Repository (NDR).** The AI model was trained to recognize patterns in patient data that indicated a likelihood of diabetes.

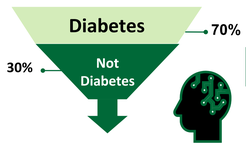
Phase 1: Feasibility study of developing a time-series AI model for diagnostic accuracy

Research Ethics Board Approval & Access to DAC NDR:

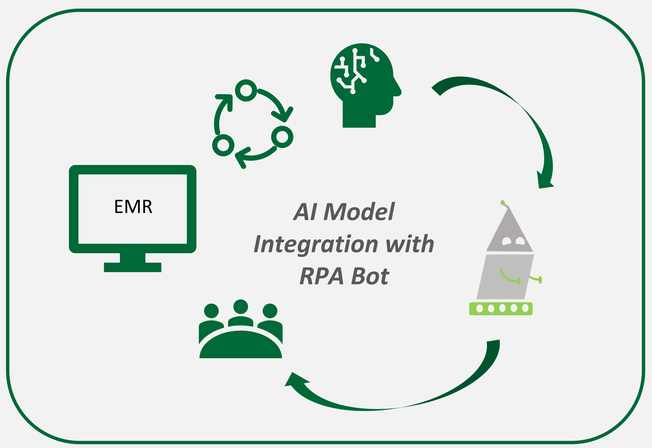
- DAC is a comprehensive CPCSSN retrospective data (1910-2020) for 147,459 patients (both diabetic and non-diabetic).
- Anonymized & standardized EMR data from existing primary care repositories in 3 Canadian provinces.

In collaboration with Attlas AI, we developed the AI model:

1. **Transformed dataset** to time-series sequential format.
2. Conducted **descriptive analytics**.
3. **Developed model** to predict the probability of a diabetic diagnosis.



Future Opportunity: A time-series AI model can be developed on real-EMR data and integrated with the Cody bot to enhance automated diagnostic coding in the EMR



Model Performance

The model performance was tested at differing thresholds. At the 72% confidence level (threshold) that a patient is diabetic, the model correctly identified:

- **80.45 %** of patients as having diabetes who were truly diabetic (precision).
- **73.05 %** of patients with diabetes (recall).
- **76.57%** of all non-diabetic patients in the dataset (specificity).

Unique large dataset & competitive:

- This is the only model to our knowledge, with similar objectives, that was trained and built on **such a comprehensive dataset**.
- Despite the larger sample size, the model's performance showed **one of the most competitive accuracies** (proportion) in correctly identifying diagnoses within 95% certainty (confidence interval).

Implications & Future Opportunities

- ✓ The AI model can be integrated with RPA to support automated coding in the EMR.
- ✓ This project lays the foundation for similar PHM projects to improve diagnostic accuracy and enhance the capability of leveraging real-time EMR data to **support PHM and CDM efforts and enhance proactive care in primary care**.

About the eHealth Centre of Excellence

The eHealth Centre of Excellence is a not-for-profit organization that assists clinicians, healthcare facilities, and Ontario Health Teams across the province with meaningful and sustainable adoption of digital health tools that can improve patient outcomes.

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