Explainable AI for Real-Time Clinical Decision Support: Predicting Re-admission Risk in Diabetic Patients

Abstract

Patients with diabetes experiencing hospital readmissions continue to be an important issue both clinically and economically. Although various predictive models have been developed and studied, their pragmatic use in clinical settings is often stymied by poor interpretability and inadequate integration into clinical workflows. To address this, we will develop a machine learning-driven clinical decision support tool estimating risk of readmission within 30 days post discharge to predict and mitigate risk. For this, we will use the UCI Diabetes hospitals dataset. This project will focus on three key areas of the tool's design: (1) predicting risk in real time decision support systems to ensure predictions can be delivered at the time of discharge; (2) interpretability by deriving patient-specific risk factors with explainable AI tools, such as SHAP values; and (3) ease of workflow by designing outputs for seamless integration into the EHRs and clinician dashboards. The outcome is a clinically useful decision support tool predicting re-admissions risk with accompanying rationales to assist clinicians in managing post discharge care to minimize avoidable hospitalizations, particularly in the diabetic patient population.

Identified Dataset.

UCI Diabetes 130-US Hospitals for Years 1999–2008

100,000 hospital admissions for diabetic patients across 130 hospitals in the United States. Includes demographic information, admission/discharge details, diagnoses, medications, and readmission status.

Population: Adult patients over 18 years with a primary or secondary diagnosis of diabetes.

Features:

- Demographics: Age, gender, race.
- Hospital & Admission Info: Admission type (emergency, urgent, elective), discharge disposition, length of stay.
- Medical Diagnoses: Primary and secondary ICD-9 codes.
- Treatments & Medications: Insulin and oral diabetes medication changes (metformin, sulfonylureas, etc.).
- Laboratory Results: HbA1c measurements, glucose serum test results.

- Comorbidities: Hypertension, cardiovascular disease, obesity indicators via ICD-9.

Target Variable: Whether the patient was readmitted within 30 days, re-admitted after 30 days, or not readmitted.

Strengths for This Project:

- Large, multi-center dataset → good generalizability.
- Rich clinical + demographic information → supports both predictive modeling and explainability.
- Readmission labels align directly with the CDS goal of predicting risk in real-time for discharge planning.

References

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