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Title

Using Machine Learning to advance primary care: an example of predictive modeling of hypertension risk to impact outcomes

Priority 1 (Research Category)

Hypertension

Presenters

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Abstract

Context: While hypertension is the most common chronic disease cared for during adult primary care visits, it is challenging to know which hypertensive patients have the highest risk of cardiovascular complications in the future. Objective: This is a predictive model, custom developed at Lehigh Valley Health Network (LVHN), to predict future risk of cardiovascular admission in patients with hypertension, and integrated into Epic to create a hypertension high risk cohort for targeted resource support. Study Design and Analysis: This predictive XGBoost algorithm model was built with the target defined as an admission for DRG codes encompassing CHF, Stroke, MI and HTN greater than 2 years from the risk calculation. Variables used in the model include demographics, past medical history, ejection fraction, and lab values. The model was trained on 80% of the data and validated on 20% of the data. Dataset: This model was developed on patients aged 18 or older, and the patient is required to have an office visit appointment within the previous 2 years. A total of 269,411 patients were used for model training. Population Studied: LVHN has 107,851 adult out-patients with hypertension, and 66.4% of those patients have 1-3 primary care visits per year. Intervention: Using our developed predictive modeling, we have created a risk score within Epic, to alert primary care physicians of future admission potential, as well as to create a high-risk hypertensive patient panel to receive additional wrap-around care navigation through a NP-led care team. Outcomes Measures: The AUC for the model was 0.88. A cutoff value of >12 was used for high-risk patients, and >5 for intermediate-risk patients. Sensitivity and specificity of the model for high-risk and intermediate-risk are 47% and 92%, and 79% and 77% respectively. Results: The risk score is live within Epic and highlights low, intermediate and high-risk patients. Just over 28,000 patients are identified as high-risk for the Epic alert, and a small subset of that group, who have not been engaged in care, fall within the high-risk cohort for additional hypertensive panel support. Conclusions: We have successfully utilized Machine Learning predictive modeling, applied

within primary care, to identify patients with hypertension who are at the highest risk of a cardiovascular admission in the future. With this model integrated into Epic, we have created a clinical pathway to mitigate future risk in our hypertensive patients.