Improving Equity and Value of Peripheral Artery Disease Care at a Population Level

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Background. Peripheral artery disease (PAD) affects over 8.5 million Americans who experience increased risks of adverse outcomes including myocardial infarction, stroke, limb amputation, and death. Despite its prevalence, PAD remains underdiagnosed, undertreated, and understudied. PAD also disproportionately affects minority groups and patients with limited socioeconomic resources. These marginalized populations experience lower quality of care, including lower rates of smoking cessation, use of statin medications, and care by a PAD specialist. Timely detection of PAD patients allows for earlier implementation of guideline-recommended care that may reduce downstream adverse outcomes and their associated costs. A previously developed and validated logistic regression model was found to successfully identify PAD patients based on electronic health record (EHR) data from a large health system. Implementing this model at a population health level for patient identification and intervention may ease the disproportionate disease burden on marginalized populations.

Motivation. The purpose of this project is to implement a solution to identify patients who have been diagnosed as having PAD at a population level across a large health system. Efforts to improve PAD care have been hampered by difficulties with clear diagnosis given the failure of diagnosis codes to distinguish PAD from related conditions, and suboptimal care coordination by non-specialist providers less familiar with care guidelines. Here, we use a previously developed model to assign probability risk scores to patients based on their likelihood of having PAD. We initiated an ongoing population health intervention utilizing these scores to prioritize patients for multidisciplinary rounding in partnership with the Duke Population Health Management Office (PHMO). During rounds, personalized recommendations are sent to primary care clinicians.

Methods. Our model was run on a cohort including all adult patients with at least one clinical encounter within the Duke University Health System (DUHS) that resulted in at least one of 108 previously identified PAD-related diagnosis codes. For the initial run, encounters beginning as early as 2014 were included to "backfill" Duke's population from the beginning of DUHS Epic implementation. Additional incremental runs are scheduled on a weekly basis with a two-week offset to update the patient cohort and update risk scores of existing patients. Key parameters of the model included a subset of diagnosis codes and flags for whether the patient had any PAD specialty care, had undergone a revascularization procedure, had any diagnostic testing, and had two or more eligible encounters. Parameters were assessed within the past 365 days from model execution. The associated coefficients for model parameters were derived from the prior logistic regression model. Because the previous model was constructed and validated during the period of International Classification of Diseases code transition, we converted all ICD-9 inputs in the prior model to their ICD-10 definitional counterparts. We also pulled and processed additional data to support the rounding process including medications, comorbidities, specialty visits, recent lab values, and smoking status. Patient prioritization scores were generated based on intervention targets (i.e., current statin, smoking status, next primary care visit date).

Results. We generated probability-based risk scores using a logistic regression model for all DUHS patients with PAD-related diagnosis codes. We applied these scores to active clinical intervention in the form of a weekly population level rounding process in collaboration with Duke PHMO. During rounds, a team including a PHMO specialty rounds program coordinator, clinical pharmacist, and PAD medical director communicate actionable suggestions to a patient's primary care provider (PCP), prioritizing patients with upcoming appointments. As of June 2022, 234 patients have entered active rounds discussions. 53 were recommended statin or PCSK9 inhibitor initiation or adjustments and 45 were suggested for smoking cessation referrals. Additional recommended interventions included other medication adjustments, ankle-brachial index assessment, and care management referrals.

Conclusion. Application of a logistic regression model to active patient care at the population health level appears to be a promising route of care delivery to address gaps in PAD care. The most common interventions utilized in our established rounding process, smoking cessation referral and statin management, have been easy to implement and are high impact for PAD management based on current guidelines. One limitation requiring further exploration is the use of upcoming PCP visit as a prioritization mechanism, as this may exclude high risk patients who are not actively getting PCP care. Moving forward, we plan to consider utilizing alternative approaches to our model algorithm like natural language processing. We will also proceed with further assessment of clinician feedback on basing care around model-generated risk scores, quantifying changes in patient management following PHMO rounding suggestions, and examining the equity impact of our model output.