BMC2 Machine Learning Risk Prediction of Post-Discharge Mortality and Readmission After PCI: The Perilous Road Ahead

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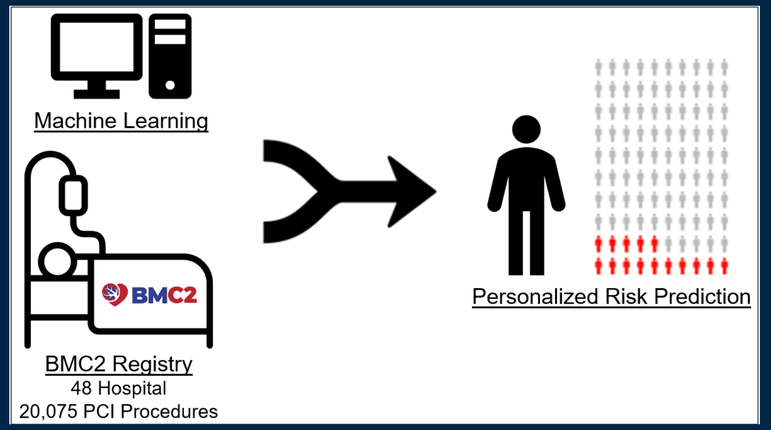
Background/Objective

- Readmissions following percutaneous coronary intervention (PCI) are frequent, costly, and often preventable.
- BMC2 Risk Prediction tool accurately predicts many in-hospital outcomes.
- Accurately identifying patients at high risk for readmission or death after discharge remains challenging.
- Our study aims to develop a risk prediction model to detect patients most vulnerable to adverse events after PCI.

Methods

- Blue Cross Blue Shield Cardiovascular Consortium (BMC2) Registry includes all adult patients undergoing PCI from 4/1/2018-11/30/2022 at 48 non-federal hospitals in Michigan.
- Linked to claims data using Michigan Value Collaborative (MVC) including patients with Medicare fee-for-service beneficiaries in the state of Michigan.
- XGBoost Machine Learning Model trained on development cohort (60% split of the patient population).
- Model performance assessed using area under the receiver-operating characteristic curve (AUC) on validation cohort (40% split of patient population).

Full Abstract/Limitations/Disclosures/References



The BMC2 Machine Learning Risk-Prediction Model accurately predicts 30-day readmission and 1-year mortality for elderly patients after PCI.

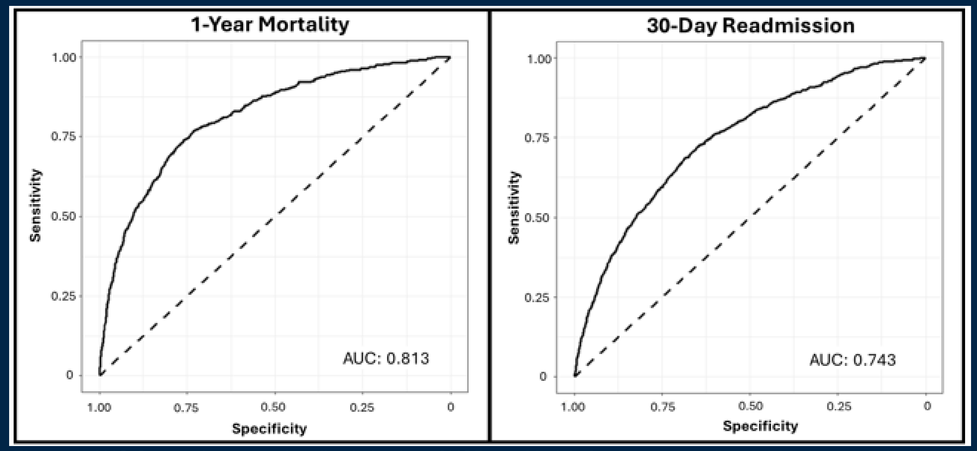


Figure 1: AUC Curves demonstrating discrimination of XGBoost Models for 1-year mortality and 30-day readmission

Results

	Overall Population (n=20,075)
Demographics	
Age, mean (SD)	72.6 (9.3)
Sex, female, n (%)	7,571 (37.7)
Race, n (%)	
White	17,853 (90.8)
Black/African American	1,463 (7.4)
Asian	243 (1.2)
Other or multiple races	102 (0.5)
Comorbidities, n (%)	
Diabetes	
IDDM	3,368 (16.8)
NIDDM	5,041 (25.1)
Prior MI	5,441 (27.1)
Prior PCI	8,104 (40.4)
Prior CABG	3,190 (15.9)

	Overall Population (n=20,075)
Clinical Data	
LVEF, %, mean (SD)	52.5 (12.7)
Clinical status, n (%)	
Elective	8,807 (43.9)
Urgent	8,187 (40.8)
Emergent	3,064 (15.3)
PCI indication, n (%)	
CAD w/o ischemic symptoms	774 (3.9)
Stable angina	1,840 (9.2)
Unstable angina	1,440 (7.2)
NSTE-ACS	7,923 (39.5)
STEMI	2,901 (14.5)
Other PCI indication	5,181 (25.8)
Cardiovascular instability, n(%)	3,859 (19.2)
Cardiac arrest, n (%)	251 (1.3)

Table 1: BMC2 registry demographics, clinical history, and data.

	1-year Mortality		30-day Readmission	
	n	AUC (95% CI)	n	AUC (95% CI)
All Data	8,030	0.813 (0.795-0.831)	8,030	0.743 (0.726-0.760)
Female	3,077	0.803 (0.775-0.832)	3,064	0.708 (0.681-0.735)
STEMI	159	0.785 (0.584-0.986)	152	0.701 (0.581-0.822)
NSTE-ACS	3,181	0.810 (0.785-0.834)	3,162	0.693 (0.666-0.719)

Table 2: XGBoost model performance in select populations.

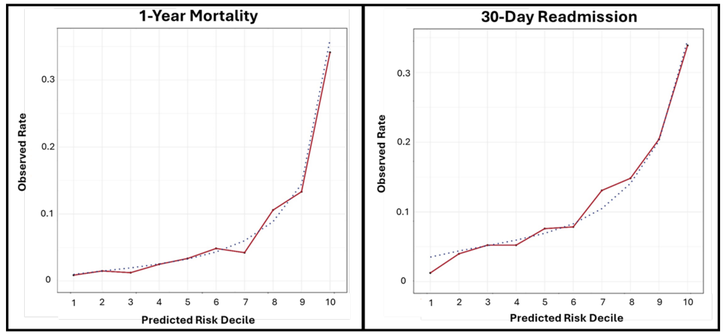


Figure 2: Calibration curves for XGBoost Models.