



AMERICAN COLLEGE of CARDIOLOGY

The American College of Cardiology National Cardiovascular Data Registry (NCDR) utilizes statistical models to provide both risk-adjusted, and risk-standardized outcomes to participating facilities. The results of these models are used by facilities to benchmark their performance and guide quality improvement efforts.

The NCDR CathPCI Registry® has several risk models that are currently approved and reported as executive level metrics. These risk models include in-hospital risk-standardized mortality, risk-standardized bleeding, and risk-standardized acute kidney injury.

In 2022, the ACC NCDR established a workgroup to:

- Provide guidance on development of a new 30-day mortality model for patients undergoing percutaneous coronary intervention (PCI) procedures.
- Formulate model eligibility including inclusion and exclusion criteria.
- Recommend updates and adjustments to the clinical variables in the risk model utilizing the CathPCI Registry® v5.0 dataset.
- Develop a model useful for internal benchmarking for healthcare facilities.

We are pleased to share the proposed **In-hospital or 30-day Risk-Standardized Mortality Model in patients undergoing Percutaneous Coronary Intervention** for your review and welcome your comments.

Risk Model Summary

Model Specifications:

- Inclusion Criteria:
 - Patients with a PCI procedure performed during the measurement period. The measurement period is a 12-month period beginning from December 1st-November 30th.
 - For patients with a PCI procedure performed during multiple episodes of care during the measurement period (12-month period), the 30-day window resets every 30 days.
- Exclusion Criteria:
 - Patients with an index PCI procedure performed greater than 10 days after arrival at the facility.
 - Patients who left against medical advice.
 - Patients not ineligible for linking to National Death Index (NDI).
- Outcome: All-cause mortality determination follows a 2-step process:
 - Patient records with a discharge status of deceased from a NCDR facility are identified as deceased with a Date of Death equal to the Date of Discharge.
 - Patient records with a discharge status of alive from a NCDR facility where the minimum matching criteria for the NDI are met and are sent to NDI for inclusion₁

in a matching process to determine if the patient is deceased and identify the date of death.

- **Facility Eligibility:** A minimum cutoff of 80% of facility records within the population cohort must meet the NDI minimum matching criteria for a site to receive a mortality score.

Model Type

The proposed model is a multivariate hierarchical logistic regression model.

Risk Variables:

Full Model	
Age	Chronic Kidney Disease (CKD) Stage
Sex	Moderate or Severe Frailty
Family History of Premature CAD	Aortic Stenosis
Cerebrovascular Disease	Left Ventricular Ejection Fraction
Peripheral Arterial Disease	Systolic Blood Pressure
Chronic Lung Disease	ST-Elevation Myocardial Infarction
Prior Percutaneous Coronary Intervention	Surgery not Recommended
Diabetes	NYHA Class
Cardiovascular Instability	Cardiac Arrest
Salvage PCI or Refractory Cardiogenic Shock	Cardiac Arrest and Responsive
Cardiogenic Shock (not refractory) without Salvage PCI	Cardiac Arrest and Unresponsive
Cardiovascular Instability without Salvage PCI	Highest Risk Lesion
Emergency PCI without Cardiogenic Shock/Cardiovascular Instability	Number of Diseased Vessels
Urgent PCI without Cardiogenic Shock/Cardiovascular Instability	Chronic Total Occlusion

Model Performance

Model discrimination in the validation dataset was highly predictive for both in-hospital and 30-day mortality in patients undergoing percutaneous coronary intervention (c-statistic = 0.906).

Draft Measures

In efforts to support facility level quality improvement efforts, the workgroup has proposed the following measures:

- PCI In-hospital or 30-day Risk-Standardized Mortality (all patients)
- PCI In-hospital or 30-day Risk-Standardized Mortality (patients without cardiogenic shock or cardiac arrest)
- PCI In-hospital or 30-day Risk-Standardized Mortality (patients without STEMI)
- PCI In-hospital or 30-day Risk-Standardized Mortality (STEMI patients without cardiogenic shock or cardiac arrest)