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

The NCDR CathPCI Registry® has several approved risk models that are currently reported as executive level metrics. These risk models include: In-hospital Risk-adjusted Mortality, Risk-standardized Bleeding, Risk-adjusted Acute Kidney Injury and 30-day Risk-standardized Mortality.

In 2020, an ACC NCDR workgroup was established to:

- Provide guidance on developing a hierarchical mortality model in patients undergoing percutaneous coronary intervention (PCI)
- Recommend model inclusion and exclusion criteria
- Recommend updates and adjustments to the risk model variables utilizing the CathPCI Registry® v5.0 dataset
- Develop a model useful for internal benchmarking for healthcare facilities and public reporting

At this time, we are pleased to share the proposed **In-hospital Risk-standardized Mortality Model in patients undergoing Percutaneous Coronary Intervention** for your review and welcome your comments.

Risk Model Summary

Model Eligibility

- Inclusion Criteria:
  - Patients undergoing a PCI
  - Index procedure when a patient has more than one PCI performed during the same episode of care
- Exclusion Criteria:
  - Patients who transfer to another acute care facility after the index PCI

Risk Variables

Full Model	
Age	Severe Frailty
Female	Aortic Stenosis
Cerebrovascular Disease	Left Ventricular Ejection Fraction
Peripheral Arterial Disease	Systolic Blood Pressure
Chronic Lung Disease	ST-Elevation MI
Prior PCI	Surgery not Recommended
Diabetes	NYHA Class
CKD Stage	Cardiac Arrest
Cardiovascular Instability and PCI Status	Cardiac Arrest and Responsive
Salvage PCI or Refractory Cardiogenic Shock	Cardiac Arrest and Unresponsive
Cardiogenic Shock (not refractory) without Salvage PCI	In-stent Thrombosis
Cardiovascular Instability without Cardiogenic Shock/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

Bedside Model
Age
CKD Stage
Cardiovascular Instability and PCI Status
Salvage PCI or Refractory Cardiogenic Shock
Cardiogenic Shock (not refractory) without Salvage PCI
Cardiovascular Instability without Cardiogenic Shock/Salvage PCI
Emergency PCI without Cardiogenic Shock/Cardiovascular Instability
Urgent PCI without Cardiogenic Shock/Cardiovascular Instability
Cardiac Arrest
Cardiac Arrest and Responsive
Cardiac Arrest and Unresponsive

Model Type

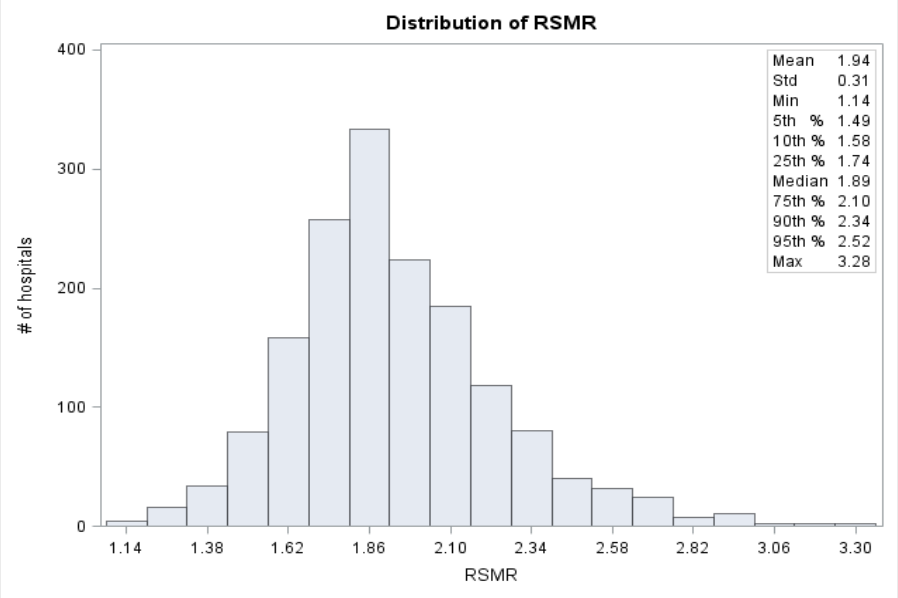
This proposed mortality model (with a binary outcome) is a multivariate hierarchical logistic regression model.

Model Performance

Model discrimination was excellent in the validation dataset for predicting in-hospital mortality (full model: c-statistic = 0.943; bedside model: c-statistic 0.925). The full model also performed very well within clinically important subgroups with reported c-statistic values ranging from 0.859 – 0.926.

Performance Estimates

Distribution of Hospital Risk-Standardized Mortality Rates (All PCI Patients)



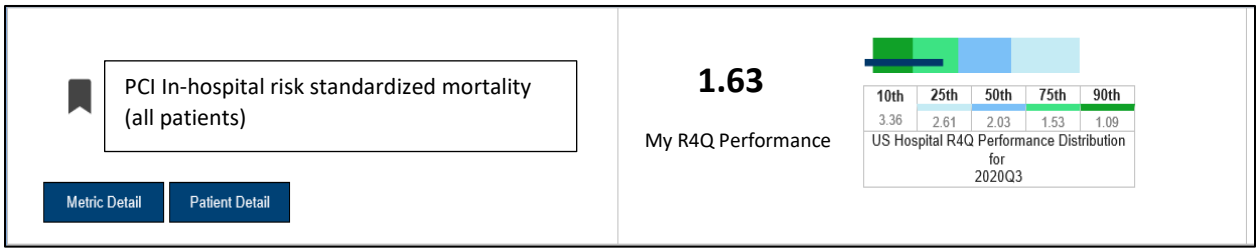
Proposed Metrics

In efforts to support both facility level quality improvement efforts and public reporting programs, the workgroup has proposed the four reporting cohorts. The cohorts include:

1. PCI In-hospital Risk-standardized mortality (all patients)
2. PCI In-hospital Risk-standardized mortality (STEMI patients excluded)
3. PCI In-hospital Risk-standardized mortality (STEMI patients without cardiogenic shock/cardiac arrest)
4. PCI In-hospital Risk-standardized mortality (all patients without cardiogenic shock/arrest) – ACC may seek National Quality Forum (NQF) endorsement

Draft Metrics and Detail lines

Executive Summary View - example



Detail Lines - example

The proposal includes the reporting of both the risk-standardized and risk-adjusted values for the new metrics in the detail lines. This aligns with the currently reported detail lines for both risk-standardized bleeding and risk-adjusted bleeding.

Risk-Standardized Mortality (all patients)
Eligible Patients
Observed mortality
Risk-standardized mortality ratio
PCI In-hospital risk-standardized mortality (all patients)
Lower 95% confidence interval
Upper 95% confidence interval
Risk-Adjusted Mortality (all patients)
Eligible patients
Observed mortality (among eligible)
Expected mortality (among eligible)
Observed/Expected mortality ratio
PCI In-hospital risk-adjusted mortality (all patients)
Registry aggregate observed mortality rate (%)
Lower 95% confidence interval
Upper 95% confidence interval