Mathematical Model to Predict Mortality from Early Onset Pneumonia in Acute Myocardial Infarction

Baljepally, Samaya (School: Bearden High School)

Purpose: Acute Myocardial Infarction (AMI) affects > 1 million people, kills ~ 400,000/year and costs > 300 Billion dollars. Some patients with AMI die from various causes, one of which is Early Onset Pneumonia (EOP). I developed a simple prediction model to identify patients at risk of dying from EOP after AMI. Methods: A retrospective review of 1620 emergency procedures between August 2015-October 2018 yielded 1004 Acute Myocardial Infarctions of which 101 developed EOP. Of these, 14 variables were compared and analyzed between 77 who survived and 24 who died. Data: Statistical analysis revealed 3 highly significant variables ($p < 0.0001$): Diabetes, Contrast Induced Nephropathy (CIN) and Ejection Fraction (EF). We found a 2.5 times increased chance of death from EOP in AMI. With an AUC of 0.90 and overall accuracy of 87%, our 3 variable model accurately predicts in-hospital mortality from EOP in AMI. Additionally, a novel rule based risk score was developed that can easily stratify patients as low, intermediate and high risk. Conclusions: Our model and a proposed app is extremely useful in easily identifying AMI patients ‘at risk’ of in-hospital death from EOP, thereby allowing for early treatment, which may decrease costs, duration of hospitalization, neurological deterioration and possibly death in developed nations. The proportional impact of our model will likely be even greater in developing countries, where pneumonia is much more common and the incidence of myocardial infarction is significantly rising.

Awards Won: