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# Score Big for Decreasing Mortality: ICD Risk Score Model

Linda Francaviglia

Rachel Petersen

Maria Stone

M. Eyman Mortada

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included nongender-based (<15 ml/beat), gender-based (<15 ml/beat for males and <10 ml/beat for females) and < 80% of O<sub>2</sub> pulse based on five different definitions of predicted VO<sub>2</sub> max. The optimal cutoff obtained was then used to create the composite criterion. For the purpose of evaluating this composite criterion, the study population was recategorized as: noncardiac group (n=18), normal patients according to the composite criterion; or cardiac group (n=13), abnormal patients according to the composite criterion. Patients who were normal by only one component of the composite criterion were categorized as borderline (n=23). Data were analyzed against the comprehensive CPX test by first excluding the borderline patients and then by including them with either the cardiac or noncardiac group.

**Results:** The 6-variable algorithm performed well against comprehensive CPX test in discriminating cardiac from noncardiac causes of dyspnea, with 94% sensitivity, 92% specificity, 84% positive predictive value (PPV), 97% negative predictive value (NPV) and 93% accuracy. The results remained consistent for gender and referral source. O<sub>2</sub> pulse, as defined by Wasserman, had the highest accuracy, specificity and PPV and therefore was used to define the composite criterion. The composite criterion had an accuracy of 87%, PPV of 77%, NPV of 94%, sensitivity of 91% and specificity of 85%, when borderline patients were excluded. Including borderline patients in the cardiac group (n=36) improved sensitivity (94%) and maintained NPV (94%) but greatly decreased specificity (46%), PPV (44%) and accuracy (61%), whereas including these patients in the noncardiac group (n=41) improved specificity (92%) and maintained similar PPV (77%) and accuracy (81%) but decreased sensitivity (59%) and NPV (83%).

**Conclusion:** This is the first study to validate a diagnostic algorithm for patients undergoing CPX testing as well as demonstrate that a simplified 6-variable algorithm applied by a cardiologist without prior CPX experience is quite accurate to evaluate the optimal O<sub>2</sub> pulse value at peak stress for discrimination of cardiac and noncardiac causes, and to provide the operating test characteristics for the common clinical practice of using composite criterion to diagnose cardiac versus noncardiac causes of dyspnea.

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### **SELECT ABSTRACTS**

#### **Score Big for Decreasing Mortality: ICD Risk Score Model**

Linda Francaviglia, Rachel Petersen, Maria Stone, M. Eymann Mortada

*Departments of Cardiovascular Data Services and Quality Management, Aurora Cardiovascular Services, Aurora Health Care*

**Background:** Aurora Health Care, a system of 14 acute care hospitals in eastern Wisconsin, has been a long-time

participant in the American College of Cardiology's National Cardiovascular Data Registries, submitting data to its ICD Registry™ since 2005. Our system's implantable cardioverter-defibrillator (ICD) procedure volume averages 930 cases annually. During 2012 we experienced an increase in in-hospital mortality/morbidity for ICD cases.

**Purpose:** A single-center study examining in-hospital mortality/morbidity post-ICD implant before and after changes in practice and patient selection.

**Methods:** ICD implants and generator changes discharged from January 1, 2009, to December 31, 2012, were included in developing a risk model predicting in-hospital mortality/morbidity. The risk score was shared with physicians for clinical input. A point system was developed, including those factors with highest risk. Using the defined factors, a risk score > 14 was used to indicate those at highest risk for morbidity/mortality. The risk score model was fit on the development group (2009–2012), and then re-run for the intervention cohort from January 1, 2013, to June 30, 2014. Logistic regression was used in the risk model development and validation. Continuous variables were compared using Student's t-test, and categorical variables were compared using chi-square test.

**Results:** From 2009 to 2012, 3,417 ICD implants and generator changes were performed and included in risk model development. Of those, 200 (5.9%) patients were indicated as high risk with a score > 14. From January 2013 to June 2014, 1,057 implants and generator changes were performed, with 41 (3.4%) patients indicated as high risk with a score > 14. In the development phase, mean age was 67 years and 70% of patients were male. Post-model development, mean age was 66 years with 72% male. For patients indicated as high risk, in-hospital mortality/morbidity dropped from 20 (10%) to 2 (4.9%), though the decrease was not statistically significant (P=0.39).

**Conclusion:** Awareness of high-risk patients and changes in patient selection can lead to improvement in in-hospital mortality/morbidity among those high-risk patients. Although the improvement was not statistically significant, this was most likely due to low volumes and we will continue to monitor outcomes among these patients.

#### **Geographic Distribution of Infant Death During Birth Hospitalization and Maternal Group B *Streptococcus* Colonization: Eastern Wisconsin**

Jessica J.F. Kram, Dennis J. Baumgardner, Kiley A. Bernhard, Melissa A. Lemke

*Center for Urban Population Health; Department of Family Medicine, Aurora UW Medical Group; TRIUMPH, University of Wisconsin-Madison*

**Background:** Neonatal death rate in the United States is 4/1,000 live births; infant death rate is 6/1,000. Group B *Streptococcus* (GBS) may be transmitted from a colonized mother (rates vary from 15% to 35%) to the newborn during a vaginal delivery, and may contribute to neonatal death.