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Development of Tele-ICU multidimensional severity adjusted PIRO sepsis model (Winner of Critical Care Medicine’s Administration Specialty Award!)

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Donna Lee Armaignac, Carlos Valle, Julie Lamoureux, Louis Gidel, Xiaorong Mei, and Emir Veledar
Development of Tele-ICU Multidimensional Severity Adjusted PIRO Sepsis Model
Predisposition, Insult/Injury, Response, Organ Dysfunction /Outcomes (PIRO)
Donna Lee Armaignac PhD, RN-CN, CCNS, CCRN; Carlos A. Valle RT; Julie A. Lamoureux DMD, MS; Louis T. Gidel PhD, MD; Xiaorang Mei MS IT; Emir Veledar PhD

Introduction: The purpose of this study was to determine the effect of pre-existing health and acute illness characteristics on sepsis responses and outcomes in Intensive Care Unit (ICU) patients by leveraging data acquisition technology in large complex data bases, specifically inputs from Tele-ICU technology.

Hypothesis: Contributions of person level and pre-existing health and acute illness characteristics will estimate risk of sepsis severity, mortality, and acutely acquired organ dysfunction (AAOD).

Materials and Methods: Observational cohort obtained at 6 hospitals from 2008 to 2013 (n = 10,232; 5,643 sepsis, 2,321 severe sepsis, 2,268 septic shock). Sampling method was validated with a subset of patients against a retrospective chart review (validity coefficient 0.88, 95% CI 0.71; 0.94) blinded against a retrospective chart review (validity coefficient 0.88, 95% CI 0.71; 0.94) blinded against a retrospective chart review (validity coefficient 0.88, 95% CI 0.71; 0.94) blinded against a retrospective chart review (validity coefficient 0.88, 95% CI 0.71; 0.94) blinded against a retrospective chart review (validity coefficient 0.88, 95% CI 0.71; 0.94) blinded against a retrospective chart review (validity coefficient 0.88, 95% CI 0.71; 0.94)

Results: Hispanics higher risk sepsis severity (OR 1.16 p <.000). Although, endemic population was predominantly Hispanic 55.6% (white and black Hispanics), Hispanics have not been reported as the most vulnerable race. Although age was significantly associated with mortality (p = .001), it was not included multivariate models, contrary to sepsis literature; perhaps the difference in this study was due to more in depth information yielded stronger predictors or age is included in APACHE scores.

Conclusions: Complexity of big healthcare data provides solid basis to illuminate less frequently studied variables to identify disease sub-types using partitional and hierarchical clustering methods to heuristically uncover apriori differences and create PIRO sepsis risk models. Building a team is of utmost importance. Researcher and field specialist must collaborate closely with IT including engineers, database, and data warehouse professionals. Biostatisticians and Telehealth Data Analyst/Architect are vital members of the team.

To achieve future goals, we plan to continue to develop: Data mining methods to handle high dimensionality and large data volumes to advance novel predictors from mathematical models and computational intelligence.