Effect of environment of care within PIRO sepsis model: is tele-health the answer for health policy?

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Introduction: As part of a more in-depth study that examined the effect of pre-existing health and acute illness characteristics on sepsis responses and outcomes in Intensive Care Unit (ICU), the purpose of this component was to determine the effect of Hospital and ICU admission source on risk of sepsis severity, mortality, and acutely acquired organ dysfunction (AAOD).

Environmental characteristics were examined as part of PIRO multivariate regression models that included socio-demographic and acute physiologic factors. Examination of environmental characteristics revealed: There were 10,232 cases of sepsis, of any severity, in the database analyzed. Of the 10,232 patients in this sample, 5,643 met criteria for sepsis only (55.1%), 2,321 met criteria for severe sepsis (22.7%) and 2,268 met criteria for septic shock (22.7%). Patients only exist in one sepsis comparison control group; therefore, the highest level of illness is the default grouping.

Figure 6 shows the proportion of each level of sepsis between the groups that were present-on-admission (POA) and those acquired during the hospital stay (non-POA). There was a significantly larger proportion of sepsis POA cases (89.2%) compared to non-POA (47.4%), severe sepsis POA (2%), non-POA (27.6%), septic shock POA (8%), non POA (25%).

Results: The vast majority of this sample arrived from the emergency department (91.1%). A chi-square test shows there is a significant difference in the mortality rates depending on the hospital admission source ($\chi^2$ = 26.535, p < 0.001). The rate is significantly higher for those transferred from another hospital (22.8%). The most frequent ICU admission source was the emergency room (50.4%) followed by a transfer from the floor (26.8%). A chi-square test shows there is a significant difference in the mortality rates depending on the ICU admission source ($\chi^2$ = 139.189, p < 0.001). The mortality rates are significantly higher for those coming from the floor (25.1%).

Those admitted to ICU from the floor had higher likelihood of having a more severe level of sepsis (OR = 1.19, p = 0.006, 95% CI = [1.09; 1.31]). Those transferred from other acute care centers had higher odds of expiring during their hospital stay (OR = 1.71, p = 0.006, 95% CI = [1.16; 2.52]). Those admitted to ICU from the floor had the greatest odds of expiring ($\chi^2$ = 4.8, p = 0.001, 95% CI = [1.31; 1.68]).

Those coming from the floor to ICU were more likely to develop AAOD (OR = 3.19, p = 0.000, 95% CI = [2.89; 3.53]), transfers from another hospital to ICU were more likely to develop AAOD (OR = 1.70, p = 0.006, 95% CI = [1.14; 2.40]), and those coming from a step-down unit were also more likely to develop AAOD (OR = 2.35, p = 0.000, 95% CI = [1.55; 3.55]).

Figure 1. Armaignac (2013) Adaptation of Symptom Management Theoretical Model to provide a framework to define, organize, and visualize interrelationships among sepsis Predisposition, Insult/Injury, Response, Organ Dysfunctions/Outcomes (PIRO) concepts

Method: Using Tele-health data we created a physiological and severity adjusted observational cohort obtained at 6 hospitals from 2008 to 2013 (N = 10,232; 5,643 sepsis, 2,321 severe sepsis, 2,268 septic shock).

Conclusions: In all prediction models, environmental characteristics were highly significant independent predictors of worse outcomes. The floor patients are the highest risk overall, for higher level of sepsis, mortality, to develop AAOD, and are least likely to go home. Diurnal conclusion is that if a patient did not expire or go home; the remaining 60% did not recover to health. A key recommendation is to examine what happens after discharge disposition.