Comparison of Sepsis Outcomes Between Countries to Illustrate the Impact of Case-mix Heterogeneity
A Case Study on Adult Medical Admissions in England and Brazil

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Objective: We tested the hypothesis that differences in generic and sepsis-specific patient characteristics explain the observed differences in sepsis outcomes between countries.

Methods: We studied first ICU episode for adult medical patients with sepsis admitted during 2013 using national data sources from England (ICNARC Case Mix Programme) and Brazil (ORCHESTRA study). After harmonizing relevant variables, the datasets were merged. Sepsis was defined as infection and ≥1 organ dysfunction (OD) (≥2 points) using a modified SOFA score to align with Sepsis-3. The primary outcome was acute hospital mortality. We used multilevel logistic regression models to evaluate the impact of country (Brazil vs England) on hospital mortality, after adjustment for generic (age, sex, comorbidities, admission source, time to ICU admission) and sepsis-specific (infection site, OD type and first order interactions) characteristics. We report risk-adjusted mortality stratified by admission source, time in hospital prior to ICU admission, infection site, and decile of predicted risk of death (from our regression model).

Results: Of medical ICU admissions, 30.7% (17,921/58,316) in England and 13.2% (4,505/34,150) in Brazil met the sepsis definition. The Brazil sepsis cohort was older and had greater prevalence of serious comorbidities and dependency when compared with England. Respiratory was the commonest infection site (England 61.8%, Brazil 50.7%). The commonest OD was respiratory in England (85.8%) and cardiovascular in Brazil (41.2%). Crude mortality was similar (England 39.3%, Brazil 41.4%). After adjusting for generic characteristics, Brazil had lower odds of mortality (OR 0.88 [0.75-1.02], p=0.089). However, after adding sepsis-specific characteristics, Brazil had higher risk-adjusted mortality (OR 1.22 [1.05-1.43]; p=0.01, AUROC= 0.78; Brier Score= 0.18). We observed statistically significant interactions in the full model when stratifying by time in hospital prior to ICU admission, infection site and deciles of predicted risk of death.

Conclusion: We show for the first time that generic and sepsis-specific patient characteristics explain observed differences in sepsis outcomes between countries.