
Personalized medicine merges genetics, physiology, and outcome with patient care. In the intensive care unit (ICU), identification of patients for whom standard of care is suboptimal may be difficult because of the variation in morbidity and mortality in this patient population. Decreased heart rate (HR) variability has been associated with increased mortality and morbidity in trauma and other critically ill populations and has been used as a biomarker for autonomic nervous system dysfunction. Genetic variations in α-1A and β-2 adrenergic receptors (ADRA1A, ADRB2) have been associated with changes in smooth muscle tone in various tissues and implicated in bronchial hyperresponsiveness, metabolic syndrome, and other disorders.

In this retrospective study, complexity data and genetic samples were collected from a cohort of 644 ICU admissions to a level 1 trauma center. Two autonomic nervous system receptor polymorphisms (rs1048101, alpha ADRA1A and rs1042714, beta ADRB2) were genotyped, and HR multiscale entropy was measured over 6-h intervals (21,600 HR data points/interval/patient). Further analyses examined the relationship of genotypes, complexity, and probability of survival, an acuity score incorporating age, injury mechanism/severity, and admission vitals, to risk of death.

Ninety-three patients (15%) died before hospital discharge. Nonsurvivors were older and more severely injured with significantly lower HR variability at early, middle, and late portions of ICU stay (median multiscale entropy at least 25% less in nonsurvivors, P < 0.001). Nonsurvivors also had a significantly lower incidence of the GG ADRB2 genotype (8 vs. 18%, P < 0.001) and higher proportion of the CC ADRB2 genotype (P = 0.028). The GG ADRB2 genotype carried approximately a threefold decrease in mortality odds (odds ratio, 0.33) independent of significant effects in HR multiscale entropy (odds ratio, 0.93; P < 0.001) and probability of survival (odds ratio, 0.22; P < 0.001).

**Interpretation**

Trauma patients with decreased HR variability and lower incidence of the GG ADRB2 genotype of the adrenoreceptor had increased mortality odds. These data suggest that adrenoceptor genotype might impact mortality risk in these patients after trauma. Additional studies assessing the effects of different polymorphisms will be required to validate this association.

Suggested by: Joseph F. Antognini, M.D.


Sedation and analgesia are often used to reduce pain, anxiety, and other complications associated with mechanical ventilation. However, excessive sedation is associated with longer length of stay in the ICU and duration of mechanical ventilation. Furthermore, sedation may also be associated with long-term psychologic complications, such as delusions, memory loss, stress, anxiety, depression, and symptoms of posttraumatic stress disorder (PTSD). Previously, depth of sedation was associated with these symptoms.

To assess the effects of sedation depth on mental health outcomes, adult patients admitted to the ICU requiring mechanical ventilation were randomized to receive either light (patient awake and cooperative) or deep sedation (patient asleep, awakening upon physical stimulation) in this randomized, open-label, controlled trial at a single tertiary care center. Self-reported measures of PTSD, anxiety, and depression were collected at ICU discharge and 4 weeks later. The primary outcomes were symptoms of PTSD, anxiety, and depression 4 weeks after ICU discharge.

Of 137 patients enrolled, 129 patients were included in the analysis and received either light (n = 65) or deep (n = 64) sedation. Patients in the deep sedation group had higher daily cumulative doses of opioids. Although, a similar proportion of patients met the symptom criteria for presumptive diagnosis of PTSD at the 4-week follow-up, patients in the deep sedation group tended to have more PTSD symptoms (P = 0.07). The deep sedation group had more trouble remembering the event (37 vs. 14%; P = 0.02) and had more disturbing memories of the ICU (18 vs. 4%; P = 0.05). Patients in the light sedation group were ventilated on an average of 1 day less and remained in the ICU for 1.5 days less. However, the occurrence of anxiety and depression, incidence of adverse events, and mortality were similar in the two groups.

**Interpretation**

In this study, light sedation did not seem to be more harmful in terms of mental health outcomes when compared with deep sedation. Further studies should be undertaken that examine psychologic outcomes between sedation levels in patients with a longer duration of...
mechanical ventilation, higher disease severity, and tested later after ICU study discharge.

Suggested by: Bernard De Jonghe, M.D.

The effect of daily bathing with chlorhexidine on the acquisition of methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant Enterococcus (VRE), and healthcare-associated bloodstream infections: Results of a quasi-experimental multicenter trial. Crit Care Med 2009; 37:1858–65

Nearly 20% of patients admitted to ICUs develop a healthcare-associated infection during their stay, many of which are multidrug resistant (e.g., methicillin-resistant Staphylococcus aureus [MRSA] and vancomycin-resistant Enterococcus [VRE]). The spread of multidrug-resistant organisms within the ICU results in substantial morbidity, mortality, increased length of stay, and increased costs of patient care. This multicenter, before and after, intervention study was completed in six ICUs at four academic centers and performed by the Center for Disease Control and Prevention Epicenters program. The incidence of MRSA and VRE colonization and bloodstream infections were measured during a period of bathing with a routine soap for 6 months and the results were then compared with a 6-month period where all admitted patients received daily bathing with a chlorhexidine-containing solution.

A total of 5,293 patients were admitted during the study period, and 11,333 surveillance cultures were performed. Acquisition of MRSA significantly decreased by 32% (5.04 vs. 3.44 cases/1,000 patient days, \( P = 0.046 \)), acquisition of VRE significantly decreased by 50% (4.35 vs. 2.19 cases/1,000 patient days, \( P = 0.008 \)), and VRE bacteremia was significantly reduced (\( P = 0.02 \)) after the introduction of daily chlorhexidine bathing. Among patients in the ICU for at least 10 days, fewer patients acquired MRSA in the chlorhexidine group compared with the baseline group (4.37 vs. 9.93%). VRE-colonized patients who bathed with chlorhexidine had a lower risk of developing VRE bacteremia (relative rate [RR] 3.35; 95% confidence interval, 1.13–9.87; \( P = 0.035 \)), suggesting that the reductions in the level of colonization led to the observed reductions in bloodstream infections.

Interpretation
Bloodstream infections strike as many as one in five patients in hospital ICUs; increased hospital costs occur and mortality may be as great as 25%. Chlorhexidine has excellent antimicrobial activity against MRSA and VRE. Although this was not a randomized controlled trial, and thus has methodological limitations, this intervention may have an important impact on healthcare in ICU patients.

Suggested by: Timothy J. Brennan, Ph.D., M.D.


In-hospital cardiac arrest is a guide to assess racial disparities in care and cardiac outcomes, because occurrence is linked to process of care, clinical appropriateness of treatment in eligible patients is standardized, and access or compliance is unlikely to confound the results.

Data from the National Registry of Cardiopulmonary Resuscitation, a large prospective registry of patients with in-hospital cardiac arrest, were used to examine the potential differences in survival in patients with in-hospital cardiac arrest because of ventricular arrhythmia. In this cohort study, 10,011 (18.8% black and 81.2% white) consecutive patients with cardiac arrests were enrolled at 274 hospitals. Survival to hospital discharge, successful resuscitation from initial arrest, and postresuscitation survival were assessed.

Rates of survival to discharge were lower for black patients (25.2%) than for white patients (37.4%; unadjusted RR, 0.73). Racial differences significantly narrowed after adjustment for patient characteristics (adjusted RR, 0.81; \( P < 0.001 \)) and hospital site (adjusted RR, 0.89; \( P = 0.002 \)). Lower rates of survival to discharge for blacks reflected lower rates of both successful resuscitation (55.8 vs. 67.4% for whites; unadjusted RR, 0.84) and postresuscitation survival (45.2 vs. 55.5% for whites; unadjusted RR, 0.85). Adjustment for the hospital site explained a substantial portion of the racial differences in successful resuscitation (adjusted RR, 0.92; \( P < 0.001 \)) and eliminated the racial differences in postresuscitation survival (adjusted RR, 0.99; \( P = 0.68 \)).

Interpretation
Medical and socioeconomic influence may account for disparities in survival between races. This study provides the background for improving postcardiac arrest survival in minority patients by advancing cardiopulmonary resuscitation performance and improving equipment in specific medical centers.

Suggested by: Jean Mantz, M.D., Ph.D.

Perioperative Medicine
J. Lance Lichtor, M.D., and Joseph F. Antognini, M.D., Editors


Payers and regulators are currently assessing ways to reduce the variability in hospital mortality associated with inpatient surgery. These include incentive plans to increase compliance with evidence-based practices and withholding of payment for preventable complications. In addition, the variation in response to patients with major complications may also contribute to variable rates of death.