

Heart Rate Variability Markers as Correlates of Survival in Recipients of Hematopoietic Cell Transplantation

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OBJECTIVES: To assess pre-/post-transplantation changes in autonomic tone, as measured by heart rate variability (HRV), among patients undergoing hematopoietic cell transplantation (HCT) and to look at those changes as they relate to post-transplantation survival rates.

SAMPLE & SETTING: Data were derived from a sample of 27 English-speaking patients undergoing allogeneic or autologous HCT at Stanford University.

METHODS & VARIABLES: A survival analysis using the Kaplan–Meier estimator was employed to explore whether increased HRV would enhance survival probabilities over time among patients undergoing HCT.

RESULTS: An increased probability of survival was significantly related to increases in two HRV indexes: root mean square of successive differences and high frequency power.

IMPLICATIONS FOR NURSING: HRV may be a useful predictor of mortality among patients undergoing HCT. Interventions deliverable by nurses could be used to enhance HRV for patients identified as being at risk for early mortality.

KEYWORDS heart rate variability; hematopoietic cell transplantation; survival; intervention

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Hematologic cancer accounted for about 10% of all cancer deaths in the United States in 2017, and, on average, a person in the United States dies from hematologic cancer every nine minutes (Leukemia and Lymphoma Society, n.d.). For many malignant and nonmalignant hematologic diseases, the treatment of choice is hematopoietic cell transplantation (HCT). HCT has become a widely used, effective treatment, which has significantly increased overall survival rates for many patients (Bhatia et al., 2005, 2007; Socié et al., 1999). The Center for International Bone and Marrow Transplant Research estimated that in the United States, more than 20,000 individuals received HCT (allogeneic and autologous) in 2015, and this number continues to grow (D’Souza & Zhu, 2016). For some patients, a transplantation is key for longevity. However, the underlying mechanisms that predict mortality or survival following transplantation are not fully understood.

Conventional medical and demographic pre-transplantation risk factors that have been found to predict mortality in this patient population include age, disease status, Karnofsky Performance Status score (Sorrer et al., 2008), relapse following transplantation, and the Hematopoietic Cell Transplantation–Comorbidity Index score (Sorrer et al., 2005, 2008). However, to the current authors’ knowledge, researchers examining mortality among patients undergoing HCT have not studied the impact of autonomic nervous system functioning, which has been implicated in the progression of malignancies. One way of measuring autonomic functioning is through electrocardiogram assessment of heart rate variability (HRV). HRV specifically assesses the oscillations in the beat-to-beat intervals of consecutive heartbeats measured over a fixed time interval.