May 16th, 9:00 AM - 10:00 AM

Plenary Talk: Nonlinear dynamics of cardiovascular control in end-stage renal disease patients

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Patients with end-stage renal disease (ESRD) on long-term dialysis therapy die predominantly due to cardiovascular causes. Many risk factors for arrhythmias and sudden cardiac death in these patients are related to cardiovascular control adaptations, as a consequence of chronic hyperactivity of their sympathetic nervous system. We have studied such cardiovascular adaptations through time series analysis of heart rate variability (HRV) and a mathematical model. HRV analysis with different linear and nonlinear methods show that although sympathetic predominance affects the dynamical HRV behavior, these patients have a preserved capacity of response to cardiovascular stimuli such as active standing and hemodialysis. Numerical simulations in a mathematical model of short-term cardiovascular control showed that cardiovascular stability in ESRD requires specific adaptations associated with sympathetic hyperactivity (increased arterial stiffness, faster heart rate, and longer baroreflex delay). We will discuss how these adaptations help to preserve hemodynamic stability, but by inducing less variability to the cardiovascular system, such stability is more fragile in ESRD patients compared to healthy subjects.