

Physiologic Patients' Response to Fluid Administration in Intensive Care Unit

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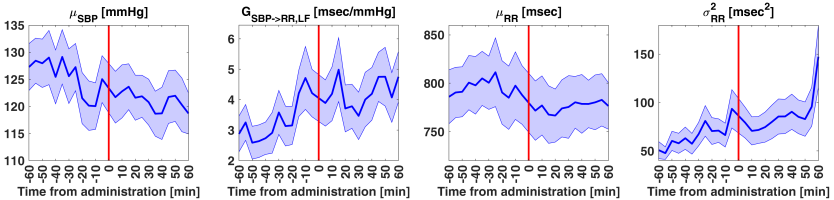
Introduction: Cardiovascular instability is common in patients admitted to the intensive care unit (ICU). Although aggressive fluid administration, the cornerstone of resuscitation, has been associated with higher mortality and morbidity, its effects on the cardiovascular system have not been fully explored.

Goal: This study aims at characterizing the response to fluid intervention of survived ICU patients without other ongoing treatments.

Methods: Before and after the first administration of fluids, one hour of electrocardiogram and arterial blood pressure recordings were extracted from 51 patients (MIMIC-III database, PhysioNet), to evaluate the induced changes in cardiovascular and autonomic indices from beat-to-beat analyses of RR and systolic blood pressure (SBP) time series, by applying a point process framework for the time-varying estimation of the proposed indices. Friedman test was used to test the presence of a treatment effect 1-hour before and after the administration.

Results: After fluid therapy initiation the following significant trends were observed: reduction in systolic pressure ($\mu_{SBP} : p < 0.001$), decrease in RR interval ($\mu_{RR} : p = 0.010$) and increase in variance ($\sigma^2 : p < 0.001$), baroreflex ($G_{SBP \rightarrow RR, LF} : p < 0.001$), and RR and SBP low frequency powers ($S_{RR, LF} : p < 0.001$, $S_{SBP, LF} : p = 0.006$). Trends are shown in Figure.

Conclusions: Results point at an increased functionality of autonomic control as suggested by increased baroreflex feedback and higher low frequency power, possibly mediated by changes in vascular properties, thus bringing patients to a more stable health state.



Observed trends (median \pm median absolute deviation error) before and after fluid administration (red line) .