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Prediction of HR/BP response to the spontaneous breathing trial by fluctuation dissipation theory MAN CHEN, Rice University — We applied the non-equilibrium fluctuation dissipation theorem to predict how critically-ill patients respond to treatment, based on both heart rate data and blood pressure data collected by standard hospital monitoring devices. The non-equilibrium fluctuation dissipation theorem relates the response of a system to a perturbation to the fluctuations in the stationary state of the system. It is shown that the response of patients to a standard procedure performed on patients, the spontaneous breathing trial (SBT), can be predicted by the non-equilibrium fluctuation dissipation approach. We classify patients into different groups according to the patients' characteristics. For each patient group, we extend the fluctuation dissipation theorem to predict interactions between blood pressure and beat-to-beat dynamics of heart rate in response to a perturbation (SBT), We also extract the form of the perturbation function directly from the physiological data, which may help to reduce the prediction error. We note this method is not limited to the analysis of the heart rate dynamics, but also can be applied to analyze the response of other physiological signals to other clinical interventions.

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