Monitoring System for Forecasting Hypotensive Episodes

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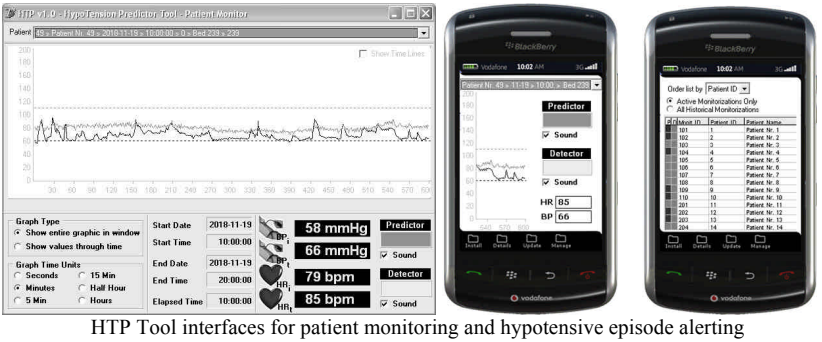
In critical care, hypotension (HT) may cause serious disorders, inducing severe or even lethal events. Recent studies report an increase of mortality in HT prone patients needing critical care, such as hemodialysis. If predicted in advance, staff could take action to minimize its effects or even avoid its occurrence. Most medical systems focus on monitoring and detecting current patient status, rather than finding biosignal trends or predicting patient's future status. Hence, predicting HT episodes in advance remains a challenge.



HTP Tool interfaces for patient monitoring and hypotensive episode alerting

We present a system tool that includes a real-time database for storing all patient's historical blood pressure (BP) and heart rate (HR) data, and provide applications capable of continuously monitoring each patient's status and predicting if a HT episode will probably occur during the next 60 minutes. Our system also enables medical staff mobility, using personal devices such as mobile phones/PDA's for continuous monitoring and alert purposes (see Figure). Cardiac adjustment (CA) – the heart's autonomous biological ability to modify its HR – is common for studied cases. As known, future BP values depend on the most recent past BP values, matching linearity representations when timespan of analysis is short (<=60 minutes). After thoroughly analyzing research data, we found that when a patient's heart is capable of rising its initial HR at least 20%, its CA can avoid BP values falling into HT situations. To forecast HT episodes, we developed an algorithm based on these assumptions, using linear regression on BP and HR for predicting each patient's HT status for the next 60 minutes. Our experiments, using the Physionet Challenge 2009 data, shows an accuracy of 98% in HT and non-HT prediction, scoring 49 out of 50, outperforming the 2009 challenge's winning proposal.