Looking For Indicators Of Imminent Cardiovascular Collapse

Introduction
The mortality of an individual is a dichotomous variable having only 2 possible values, death or survival. Knowing that a group of severely injured trauma patients has a 70% expected mortality (21,286 trauma patients in the US each year) based on their monitored physiologic variables is helpful for things such as evaluating hospital care quality. Knowing that a patient is in that 70% mortality group is not the same as knowing whether the current standard of care treatment in that person will allow him or her to be one of the 64,286 survivors of the high risk group. Nor does it indicate whether current standard of care treatment will be inadequate to that patient’s needs, making him or her one of the 150,000 US trauma deaths per year. For high risk of death experimental resuscitation interventions to be clinically investigated without putting the 64,286 otherwise survivors at risk, it would be helpful to be able to definitively identify the 150,000 trauma patients in whom current standard of care treatments will be inadequate.

Methods
8 anesthetized (thiopental infusion, cephalic vein), ventilated (end-tidal PCO2, 30-35 mmHg for arterial PCO2, 35-40 mmHg at baseline), instrumented, purpose-bred hound dogs subjected to pressure induced severe hemorrhage, low-pressure stabilization, and resuscitation protocol

Results
2 non-survivors: 1 of 5 HBOC, died 117min into S, shown in red and 1 of 3 HSD, died 8min into S, shown in orange. Survivors values are shown in blue. Trend differences were apparent in the shown variables that were monitored every minute: arterial blood pressures, heart rates, and end-tidal PCO2 values – each separated shortly before death (5 to 8 minutes).

Discussion
- None of the examined physiologic variables provided definitive threshold values for impending cardiovascular collapse. This is despite the fact that threshold values of several of these variables are clinically used to indicate patient shock severity and group expected mortality.
- The distinctly different trends in the arterial blood pressure variables, heart rate, and end-tidal PCO2 are promising, though the lead time pre-death with each was short.

Next Steps:
- Using the variables that showed trend differences between survivors and non-survivors, we will search the entire data set of each survivor for similar trends (duration and direction) at any time during the experimental protocol.
- Using any variables remaining of interest following that search, we will use our past data with this protocol (both survivors and non-survivors' data) to determine the sensitivity and specificity of the trends for indicating impending cardiovascular collapse.

Reference

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