

# A SUPPORT VECTOR MACHINE TO PREDICT IMPENDING PRE-SYNCOPE FROM HEMODYNAMIC DERIVED SIGNALS DURING PROGRESSIVE CENTRAL HYPOVOLEMIA

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**Introduction:** Hypovolemic shock is characterized by a critically reduced central blood volume (CBV). Traditional parameters do not predict onset of hypovolemic shock. We hypothesized that a machine learning model detects more subtle changes within hemodynamic signals that predict impending pre-syncope as an expression of a critically reduced CBV.

**Methods:** In 42 healthy subjects we provoked pre-syncope by reducing CBV using continuous lower body negative pressure. Next to blood pressure and heart rate, we introduced a new set of blood pressure wave features. We trained a support vector machine to predict time remaining till pre-syncope using a leave-one-out method. We expressed the model performance as absolute error and a squared correlation coefficient ( $r^2$ ).

**Results:** In 72% of the predictions the model followed the decreasing time remaining towards pre-syncope. Mean  $r^2$  was 0.43 [0.13 - 0.64]. In 13 subjects the model predicted pre-syncope with a median error of -49 seconds [-312 -27].

**Conclusion:** The model detects a trend towards pre-syncope conforming to a worsening condition of subjects in a controlled progressive hypovolemia setting, but cannot pinpoint the onset of pre-syncope exactly. Future research may reveal the most valuable input feature and allow for testing current models during real hemorrhage.

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