Category :**Brain: cerebro-vascular accidents**

A60 - ***Machine learning for detection of changes in cerebral perfusion***

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Introduction:

Detection of cerebral ischemia in the unconscious patient is challenging for clinicians. Patients treated in the ICU or operating room (OR) are continuously monitored with several parameters, yielding large amounts of physiological data. We hypothesize that a machine learning (ML) algorithm can detect events with cerebral hypoperfusion and ischemia in patients in the ICU or OR.

Methods:

In a first of a three-phase observational study with the aim of training a ML-algorithm to predict and detect cerebral ischemia using data collected from bedside monitors, we studied patients undergoing carotid endarterectomy. Patients were monitored with SpO2, continuous ABP, ECG, near-infrared spectrometry (NIRS), and electroencephalography. Data was exported to a computer, cleaned, and labelled. The perioperative period was divided into 7 events. Feature extraction of the data was done in Python programming environment. Heart rate variability parameters were extracted from the ECG. We quantified all variables per minute. This provided us with a large matrix of all features for each minute (data point). The data points were then labelled with the event name. The feature matrix was used to train a random forest algorithm.

Results:

Nine patients were included in a pilot study. Recognition of the clinical events was achieved with an accuracy of 82-98%, precision (specificity) 86-98%, and recall (sensitivity) 87-98%. Accuracy was not affected when NIRS-values were excluded from analysis. Using decision tree or support vector machine algorithms yielded similar results.

Conclusion:

It is possible for a ML-algorithm to differ between clinical events, including clamping of the carotid arteries, in a controlled environment. Artificial intelligence and ML can help utilize big data generated in the ICU and OR. We will continue our research to help develop models able to aid clinicians detect cerebral ischemia in real-time, using data generated from bedside monitors.