Cleveland Clinic Innovations

PRODUCT
Intracranial Pressure Using Non-Invasive Monitor and Machine Learning

INDICATION
Neurosurgery, ICP, non-invasive monitoring

VALUE PROPOSITION
- Beneficial for patients who are not indicated for invasive monitoring methods.
- Lower risk of complication, including central nervous system infection and intracranial hemorrhage
- A non-invasive device would potentially expand indication of use.

DEVELOPMENT STAGE
Proof of concept study

INTELLECTUAL PROPERTY
Patent Pending

PARTNERING OPPORTUNITY
Development and commercialization partnership

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Non-Invasive Intracranial Pressure Monitoring

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PROBLEM/OPPORTUNITY

Intracranial Pressure (ICP) monitoring is of paramount importance in diseases like intracranial hemorrhages, traumatic brain injury, subarachnoid hemorrhages, malignant infarction, cerebral edema and infections of the central nervous system. Invasive ICP monitoring devices provide a numerical value that clinicians can use to inform care decisions. Currently manufactured non-invasive ICP monitor device and accompanying software does not provide a "number" but instead offers waveform analysis of ICP trends. There is a need for a non-invasive device/software that provides a direct numerical value of ICP that clinicians can use to inform care decisions, especially for patients who are not indicated for invasive monitoring methods.

SOLUTION/PRODUCT

Our product is an analytical package comprising sequential application of signal pre-processing and transformation, followed by a machine learning algorithm trained on real patient data. This product draws on additional patient data such as heart rate and blood pressure and yield a more direct and reliable estimate of the true ICP from waveforms generated by existing non-invasive devices. In a proof-of-concept study, pulse amplitude index (PAx), a descriptor of cerebrovascular reactivity, has been correlated with amplitude of the ICP waveform. PAx calculated by conventional (invasive) and noninvasive ICP monitoring are in strong agreement with statistical significance.