Analytics for Early Detection of Patient Deterioration

Millions of patients go to hospitals each year with potentially life-threatening conditions. Traditional monitoring of vital signs such as blood pressure and pulse rate do not allow clinicians to predict deterioration, which can lead to serious complications, including death.

A University of Michigan team, including Ashwin Belle, Ph.D., Kayvan Najarian, Ph.D., Rodney Daniels, M.D., Mark Salamango, M.S., and Kevin Ward, M.D., has developed AHI (Analytic for Hemodynamic Instability), a computer-aided diagnostic that offers advanced analysis of the electrocardiogram waveform coupled with machine learning. AHI is capable of recognizing changes in cardiovascular and respiratory function that are associated with life-threatening instability in significant time periods before changes in traditional vital signs occur. Recognition and alerting care providers to these changes will allow timely interventions that are essential in treating patients.

Trove Analytics Inc.

The AHI technology has been licensed to Trove Analytics Inc., a digital health predictive analytics company initially targeting the field of emergency and critical care. The company uses streamed physiological data from bedside and/or wearable devices to generate and present insight on previously unobtainable patient physiologic trends to allow clinicians to intervene early before major catastrophic health events occur. The new Ann Arbor startup was formed based on intellectual property developed within the Michigan Center for Integrative Research in Critical Care (MCIRCC).
Continuous electrocardiogram analysis offers advanced prediction of patient deterioration

Significant Need
Current methods of monitoring do not provide early predictive and actionable information that would enable clinicians to perform early interventions for patients with critical or potentially critical conditions like sepsis or stroke, which would help reduce death and disability.

Compelling Science
Analytic for Hemodynamic Instability (AHI) technology uses new signal processing and machine learning science to monitor the state of a patient’s autonomic nervous system, which controls vital physiologic functions such as blood pressure and breathing, through the analysis of heart rate variability—the variation in time interval between heartbeats.

Competitive Advantage
AHI utilizes only a single lead of electrocardiogram data sampled at low but continuous collection frequencies. Because it’s compatible with any monitor in the clinical or outpatient setting, it has the potential to be scaled across an entire health ecosystem ranging from the Intensive Care Unit and Emergency Department to general hospital wards and the home.

MTRAC Project Key Milestones
Testing of AHI on multiple human physiologic data bases, within and outside the University of Michigan experiencing significant hemodynamic changes
Testing on patient cohorts experiencing need for life-saving interventions
Assess technology transfer and commercialization options, including starting a new company

Overall Commercialization
U.S. Patent filed
The technology will follow the 510(k) pathway
Launch new company, Trove Analytics Inc.

Commercialization Strategy
MCIRCC and the UM have now licensed the technology to the startup company Trove Analytics Inc., which will oversee all commercialization activities moving forward

Product Launch Strategy
With the help of MTRAC funding, our technology will allow physicians and caregivers to be alerted to impending problems and perform interventions necessary to prevent life-threatening physiologic deterioration, thereby improving patient care, saving lives and improving resource utilization.

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