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A Continuous Real-Time Analytic for Predicting Instability in Acute Care Rapid Response Team Activations

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Abstract : A reliable, real-time, and non-invasive system that can identify patients at risk for hemodynamic instability is needed to aid clinicians in their efforts to anticipate patient deterioration and initiate early interventions. The purpose of this pilot study was to explore the clinical capabilities of a real-time analytic from a single lead of an electrocardiograph to correctly distinguish between rapid response team (RRT) activations due to hemodynamic (H-RRT) and non-hemodynamic (NH-RRT) causes, as well as predict H-RRT cases with actionable lead times. The study consisted of a single center, retrospective cohort of 21 patients with RRT activations from step-down and telemetry units. Through electronic health record review and blinded to the analytic’s output, each patient was categorized by clinicians into H-RRT and NH-RRT cases. The analytic output and the categorization were compared. The prediction lead time prior to the RRT call was calculated. The analytic correctly distinguished between H-RRT and NH-RRT cases with 100% accuracy, demonstrating 100% positive and negative predictive values, and 100% sensitivity and specificity. In H-RRT cases, the analytic detected hemodynamic deterioration with a median lead time of 9.5 hours prior to the RRT call (range 14 minutes to 52 hours). The study demonstrates that an electrocardiogram (ECG) based analytic has the potential for providing clinical decision and monitoring support for caregivers to identify at risk patients within a clinically relevant timeframe allowing for increased vigilance and early interventional support to reduce the chances of continued patient deterioration.

Keywords : critical care, early warning systems, emergency medicine, heart rate variability, hemodynamic instability, rapid response team
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