

## Evaluation of the Analytic for Hemodynamic Instability as a Prediction Tool for Early Identification of Patient Deterioration

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**Abstract :** Unrecognized or delayed identification of patient deterioration is a key cause of in-hospitals adverse events. Clinicians rely on vital signs monitoring to recognize patient deterioration. However, due to ever increasing nursing workloads and the manual effort required, vital signs tend to be measured and recorded intermittently, and inconsistently causing large gaps during patient monitoring. Additionally, during deterioration, the body's autonomic nervous system activates compensatory mechanisms causing the vital signs to be lagging indicators of underlying hemodynamic decline. This study analyzes the predictive efficacy of the Analytic for Hemodynamic Instability (AHI) system, an automated tool that was designed to help clinicians in early identification of deteriorating patients. The lead time analysis in this retrospective observational study assesses how far in advance AHI predicted deterioration prior to the start of an episode of hemodynamic instability (HI) becoming evident through vital signs? Results indicate that of the 362 episodes of HI in this study, 308 episodes (85%) were correctly predicted by the AHI system with a median lead time of 57 minutes and an average of 4 hours (240.5 minutes). Of the 54 episodes not predicted, AHI detected 45 of them while the episode of HI was ongoing. Of the 9 undetected, 5 were not detected by AHI due to either missing or noisy input ECG data during the episode of HI. In total, AHI was able to either predict or detect 98.9% of all episodes of HI in this study. These results suggest that AHI could provide an additional 'pair of eyes' on patients, continuously filling the monitoring gaps and consequently giving the patient care team the ability to be far more proactive in patient monitoring and adverse event management.

**Keywords :** clinical deterioration prediction, decision support system, early warning system, hemodynamic status, physiologic monitoring

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