

Clinical Evidence Series

Correlating data from different sensors to increase the positive predictive value of alarms: an empiric assessment



What's different

Instead of relying on single-parameter threshold alarms, this study evaluated multi-sensor alarm definitions that correlate physiologic signals to mirror clinical reasoning and suppress artifact-driven alerts.



Interpretation

Correlating data across sensors can improve the clinical relevance of certain alarms, particularly hemodynamically significant tachyarrhythmias, while highlighting that performance depends on sensor availability, signal quality, and event prevalence.



Key takeaways

Correlated alarm definitions achieved high positive predictive value for selected scenarios, including SVT with hypotension (PPV = 0.80) and cardiogenic shock (PPV = 0.81).



Objectives

Evaluate whether multi-sensor correlation improves alarm positive predictive value in the ICU.



Intervention

Philips Advanced Event Surveillance software was programmed to identify five clinically significant scenarios:

Detected scenarios	
(scenario name)	(detect what?)
SVT + BP	Onset of paroxysmal atrial fibrillation
Vtach + BP	Ventricular tachycardia with low blood pressure
LV Shock	Left ventricular shock (cardiogenic shock pattern)
TPX & TPND	Tamponade or tension pneumothorax (obstructive shock pattern)
Hypovl	Hypovolemia

Alarms were generated only when correlated abnormalities occurred across required sensors. A clinician reviewed all triggered alarms to categorize events as true or false and calculate PPV.

*SVT (supraventricular tachycardia) + BP and Vtach + BP require an arterial line and EKG, LV shock and TPX and TPND require a pulmonary artery catheter and arterial line, and Hypovl requires a CVP monitor.



Setting

A 10-bed cardiothoracic intensive care unit at a tertiary academic medical center.



Results

Alarm scenario	True positives	False positives	PPV
SVT + BP	170	39	0.81
Vtach + BP	1	0	1.00
Left ventricular shock	34	8	0.81
Tamponade	1	23	0.04
Hypovolemia	8	21	0.27

*PPV, positive predictive value.

Bitan Y, O'Connor MF. Correlating data from different sensors to increase the positive predictive value of alarms: an empiric assessment. F1000Res. 2012;1:45. doi: 10.12688/f1000research.1-45.v1