Cleveland Clinic Innovations

PRODUCT
Non-linear cardiovascular critical care scoring system for improved patient risk classification

INDICATION
Cardiac critical care inpatient monitoring

VALUE PROPOSITION
Identify deterioration risk for clinical intervention

INTELLECTUAL PROPERTY
Patent pending

DEVELOPMENT STAGE
Prospective Validation Study

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IDF# 2019-035

Severity of Illness Scoring System (SASS)

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PROBLEM/OPPORTUNITY
In-hospital cardiac arrests remain a major cause of death and morbidity in pediatric and adult hospitalized patients. In the United States, approximately 290,000 in-hospital cardiac arrests occur each year in adult patients with a 75% hospital mortality. In children, about 6,000 cardiac arrest events occur per year with 51% hospital mortality. Early recognition of clinical deterioration coupled with preventive interventions reduce cardiac arrests and improve outcomes.

SOLUTION/PRODUCT
SASS is a Situational Awareness Scoring System (SASS) real-time, cardiac arrest risk assessment scoring system for critical care patients to identify patient deterioration to the clinical team, facilitating timely interventions. SASS uses electronic medical record (EMR) clinical data, including vital signs, medications, respiratory support, and laboratory data to generate a non-linear risk score to predict two events, cardiac arrest or the need for extracorporeal membrane oxygenation (ECMO). SASS has been adapted for various critical care settings and patient populations ranging from pediatrics to adults. Based on retrospective data, SASS has demonstrated discriminatory performance for patients who went into cardiac arrest or needed ECMO. Prospective validation is pending.

In the adult CVICU, for which 302 events and control time intervals were analyzed, the SASS score (at 6-hours prior to the event) demonstrated an AUC of 0.91 with a sensitivity of 84% and specificity of 84% using 45 as the non-linear score cutoff value. The odds ratio for an event was 1.5 for every 10 unit increase in the maximum SASS score.

Clinical Scenario	Clinical Variables	SASS Score	Example of Linear Score
Healthy State	No abnormal vitals	0	0
Respiratory Distress	Tachypnea, Hypoxemia, Tachycardia	20	3
Septic Shock	Tachycardia, Hypotension, Tachypnea, Fever, Lactic Acidosis	64	5
Imminent Cardiac Arrest	Bradycardia, Hypotension, Hypoxemia, Respiratory Acidosis, Hypothermia, Lactic Acidosis, Vasopressors, Mechanical Ventilation	316	8

By using SASS, ICU staff can appropriately prioritize the immediacy of intervention among critically ill patients to prevent cardiac arrest and to proactively prepare for the need for ECMO, up to 6 hours prior to an event.