

Hypotension Prediction Index (HPI)

General Overview

Edwards Lifesciences has a heritage of partnering with clinicians to bring advancements in patient care to the market. That heritage is at the core of the Acumen Hypotension Prediction Index (HPI) software. Developed in partnership with clinicians across the world and the first in a new category of products, Acumen Hypotension Prediction Index software offers the only predictive monitoring parameter for hypotension that is available in the United States.

In non-cardiac surgery patients, research findings have revealed strong associations between intraoperative hypotension and elevated risk of both acute kidney injury (AKI) and myocardial injury after non-cardiac surgery (MINS).

MINS — the most common cardiovascular complication that occurs after noncardiac surgery — is the leading cause of mortality within one month following surgery. It is a substantial public health issue.

HPI detects the likelihood of a hypotensive event before the event occurs, and provides you with insights to understand the root cause and inform a potential course of action for your patient.

The HPI parameter displays as a value ranging from 0 to 100, with higher values indicating higher likelihood of a hypotensive event.*

The proprietary algorithm — developed using data from almost 59,000 hypotensive events and over 144,000 non-hypotensive events — coupled with machine learning techniques detects potential hypotensive trending of a patient's mean arterial pressure (MAP). The HPI parameter value is updated every 20 seconds, providing continuous predictive insights into developing hypotensive events.

The higher the value of the HPI parameter, the greater the likelihood a hypotensive event will occur.

The diagnostic performance of the HPI parameter was assessed through clinical validation studies:

Summary of Clinical Validation Studies	Specificity ^a	Positive Predictive Value (PPV) ^b	Sensitivity ^c	Negative Predictive Value (NPV) ^d
52 Patients	99.8	99.9	83.7	75.1
204 Patients	99.4	98.3	65.8	84.9

The full table of Results of Clinical Validation studies may be found in Table 16–17 in the Operator's Manual.

a. Specificity: ratio of true negatives to total number of non-events (negatives) with a negative defined as a data point that is at least 20 minutes away from any hypotensive event

b. $PPV = \frac{\text{True Positives (TP)}}{\text{All Positive Test Results (TP + FP)}}$

c. Sensitivity: ratio of true positives to total number of events (positives) with positive defined as data point that is at most 5 minutes prior to a hypotensive event.

d. $NPV = \frac{\text{True Negatives (TN)}}{\text{All Negative Test Results (TN + FN)}}$

The HPI high alert popup alerts you when your patient is trending toward or experiencing a hypotensive event.

If the HPI parameter value exceeds 85 for two consecutive 20-second updates or reaches 100 at any time, the HPI high alert popup window will appear, prompting you to review the patient hemodynamics using the HPI secondary screen.

If your patient is trending toward a hypotensive event, or is experiencing a hypotensive event, you may want to investigate the root cause in order to proactively inform a potential course of action. The advanced hemodynamic pressure and flow parameters provided on the HPI secondary screen allow you an opportunity to investigate and identify the root cause of potentially developing hypotensive events.

The HPI secondary screen is accessed through the HPI high alert popup, by touching the HPI Information Bar when enabled, by pressing the button on the HPI Key Parameter, or at any time through the Clinical Actions menu on the monitor. A clinically essential element of the Hypotension Prediction Index software, the HPI secondary screen displays consolidated values for patient parameters of MAP, CO, SVR, PR, SV, and SVV as well as two additional indicators of contractility and afterload to provide a complete hemodynamic profile of the patient. The advanced hemodynamic parameters on the secondary screen are arranged visually by preload, contractility, and afterload.

Using these advanced hemodynamic parameters can provide you potential insights into the cause of a hypotensive event.