

Ability of an arterial waveform analysis – derived Hypotension Prediction Index to predict future hypotensive events in surgical patients

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Objective

To assess the diagnostic ability of the Acumen Hypotension Prediction Index (HPI) algorithm and other hemodynamic variables in predicting impending hypotension.

Methods

Anonymized data from 255 fluid optimized patients (mean age 68 yrs) undergoing major surgery, including major abdominal, vascular and off-pump CABG from two European centers was collected prospectively. Predictive performance was evaluated using ROC analysis, including sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV). Data containing clinical interventions preventing hypotension were excluded from the analysis. (Hypotension being defined as a MAP <65 mmHg for ≥ 1 minute).

Main findings

The Hypotension Prediction Index predicted hypotension with a sensitivity and specificity of 85.8% (95% CI, 85.8%–85.9%) and 85.8% (95% CI, 85.8%–85.9%) 5 minutes before a hypotensive event (area under the curve, 0.926 [95% CI, 0.925–0.926]) The predictive performance of HPI is superior to that of CO, SV, MAP, PP, HR, SVV and Shock Index hypotension at the time of event (0 min) and 5, 10, and 15 min before its occurrence. HPI also performed better than change in MAP (Δ MAP) for predicting hypotension.

Additionally, 221 of 255 patients (86.7%) had ≥ 1 episode of hypotension. The median monitoring time per patient was 204 minutes with the cumulative duration of hypotension being 11 minutes (6% of monitoring time). The median number of events per patient was 4.

Comments

This study demonstrates that HPI is able to predict a hypotensive event up to 15 minutes before the event. HPI is superior in predicting hypotension compared to commonly measured hemodynamic variables. Hypotension occurred despite patients receiving goal directed fluid therapy, suggesting that BP control should be included in any perioperative treatment algorithm. This “real world” study confirms the HPI performance reported by Hatib et al., although slightly lower. The PPV in this study is a reflection of the real performance, as it excluded interventions preventing hypotension.



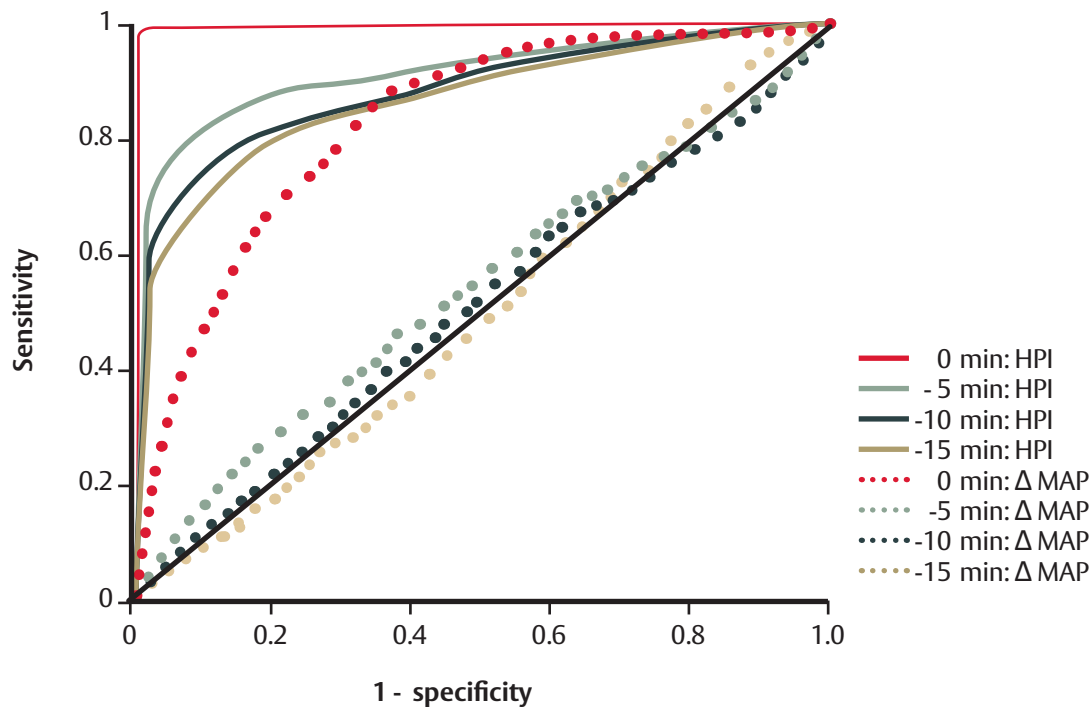
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Conclusion

HPI is able to predict hypotension, something that is not possible with other commonly measured hemodynamic variables. The results in this study are in line with those reported by Hatib et al. It is suggested to include BP control in perioperative treatment algorithms for goal directed therapy.

Figure

Receiver operating characteristic (ROC) curves for the HPI and Δ MAP over the previous 3 min for predicting hypotension at the time of event (0 min) and 5, 10, and 15 min before its occurrence. HPI indicates Hypotension Prediction Index; Δ MAP, change in mean arterial pressure.



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