# Hypotension Prediction Index:
# Correlations between Invasive and Non-invasive Pressure Inputs

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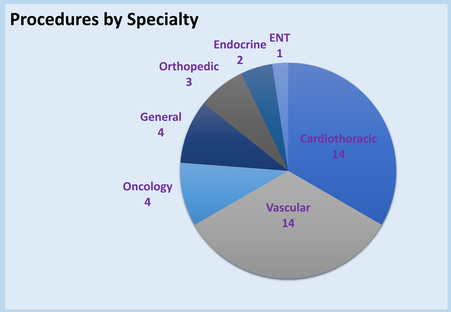
## Background

- Continuous BP monitoring is essential to intraoperative care, as hypotensive events can significantly increase the risk of AKI, MI, and mortality post-op[1,2] .
- The Hypotension Prediction Index (HPI) is a novel algorithm derived from machine learning that gives anesthesiologists the ability to predictive hypotensive events.
- The HPI derived from intra-arterial catheter monitoring has been shown to predict hypotensive events with sensitivity and specificity >80%[3] .
- However, the utility and accuracy of the HPI when derived from non-invasive monitoring techniques, such the ClearSight finger cuff, have yet to be examined.
- This study seeks to compare the intra-arterial catheter-derived HPI vs the ClearSight finger cuff-derived HPI, to see if it is viable tool for anesthesiologists to use when non-invasive monitoring is not indicated.

## Methods

- Obtained IRB approval for research on human subjects.
- Recorded patients' hemodynamics concurrently with both invasive (intra-arterial) and non-invasive (ClearSight) monitoring.
- Each monitoring system was connected to a Hemosphere monitor with the HPI software.
- Data collected from the ClearSight system was compared to corresponding intra-arterial waveform data using Bland-Altman and Pearson correlation analysis.

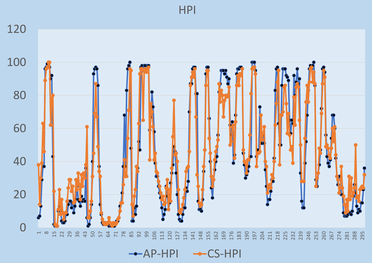
## Results



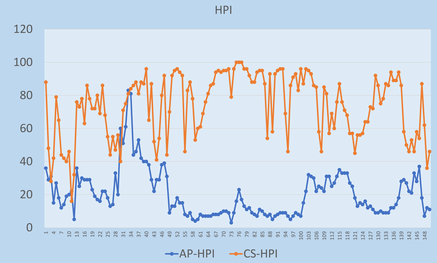

**Demographics**

| # OF PATIENTS | AGE | HEIGHT | WEIGHT | SEX |
|---|---|---|---|---|
| 42 | 66.7 ± 17.2 | 170.9 ± 10.7 | 87 ± 22.5 | 59.5% M, 40.5% F |

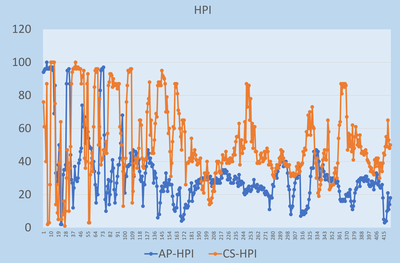
### The Good



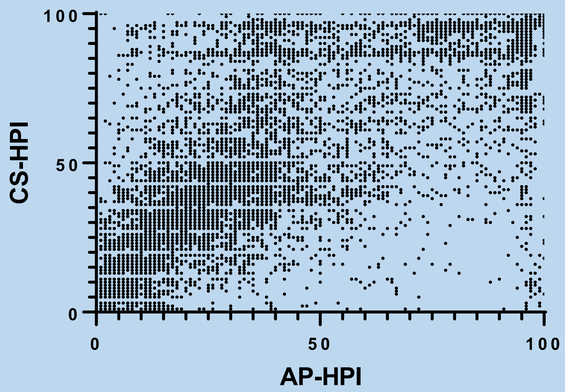

### The Bad




### The Ugly

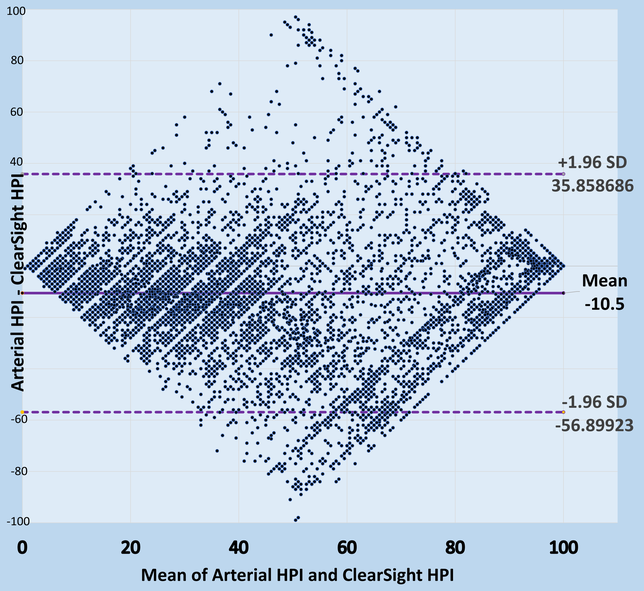



### Correlation




| r | 0.7128 |
|---|---|
| 95% CI | 0.7019 to 0.7235 |
| $r^2$ | 0.5081 |

### Bland-Altman Analysis

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## Discussion

- Bias of -10.5
- 95% LOA ±46.4
- Differences between ClearSight vs. Intra-arterial HPI becomes less pronounced at the extremes and more pronounced at values between 35-80.
- Reasonably good Pearson Correlation between 2 HPIs.

## Next Steps

- Analysis of concordance.
- Repeat correlation and B-A analysis with 5-min interval data to buffer for lag and response time.

## References

1. Salmasi V, Maheshwari K, Yang D, et al. Relationship between intraoperative hypotension, defined by either reduction from baseline or absolute thresholds, and acute kidney and myocardial injury after noncardiac surgery: a retrospective cohort analysis. *Anesthesiology*. 2017;126:47–65.
2. Walsh M, Devereaux PJ, Garg AX, et al. Relationship between intraoperative mean arterial pressure and clinical outcomes after noncardiac surgery: toward an empirical definition of hypotension. *Anesthesiology*. 2013;119:507–515.
3. James Davies S, Tilma Vistisen S, Jian Z, et al. Ability of an Arterial Waveform Analysis-Derived Hypotension Prediction Index to Predict Future Hypotensive Events in Surgical Patients. *Perioperative Medicine*. 2020;130:352-359.

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