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

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Background

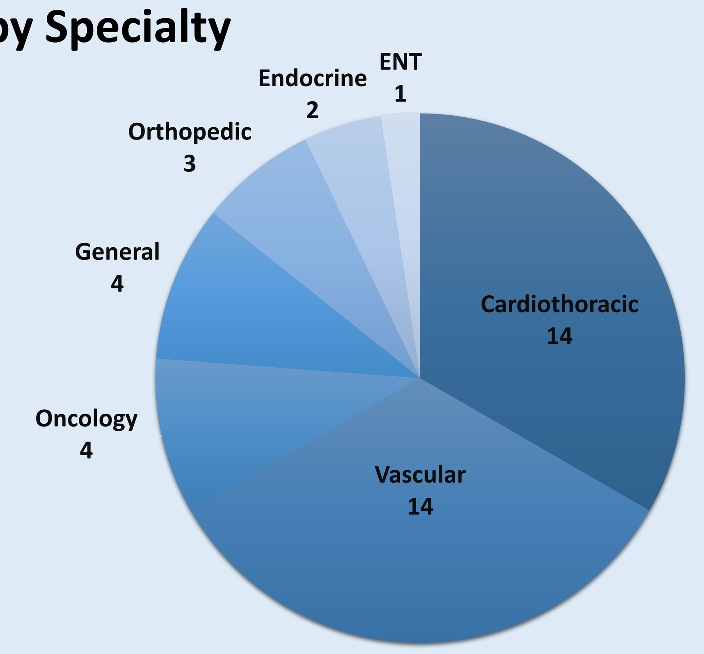
- Continuous BP monitoring is essential to intraoperative care, as hypotensive events can significantly increase the risk of AKI, MI, and mortality post-op[1,2] .
- The Hypotension Prediction Index (HPI) is a novel algorithm derived from machine learning that gives anesthesiologists the ability to predictive hypotensive events.
- The HPI derived from intra-arterial catheter monitoring has been shown to predict hypotensive events with sensitivity and specificity >80%[3] .
- 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 (as well as other hemodynamic variables), to see if it is viable tool for anesthesiologists to use when invasive monitoring is not indicated.

Methods

- 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 Pearson correlation analysis, Bland-Altman analysis, and analysis of concordance.

Results

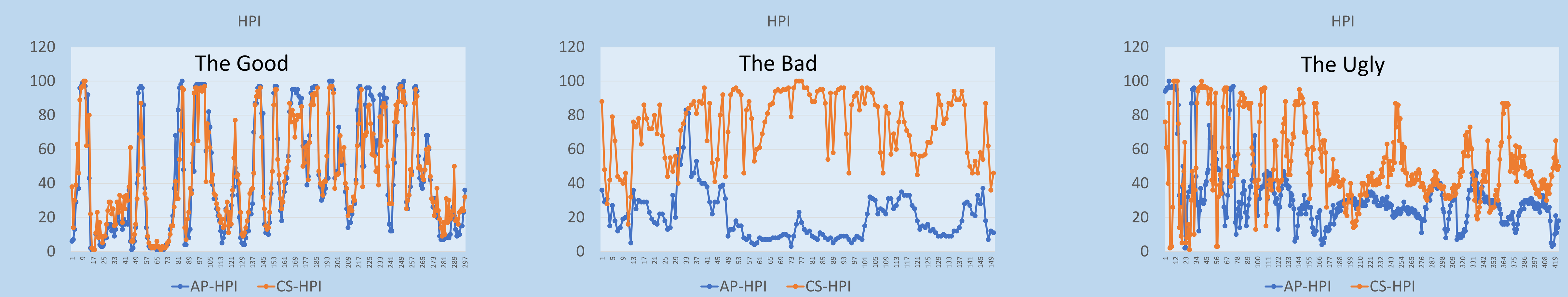
Procedures by Specialty



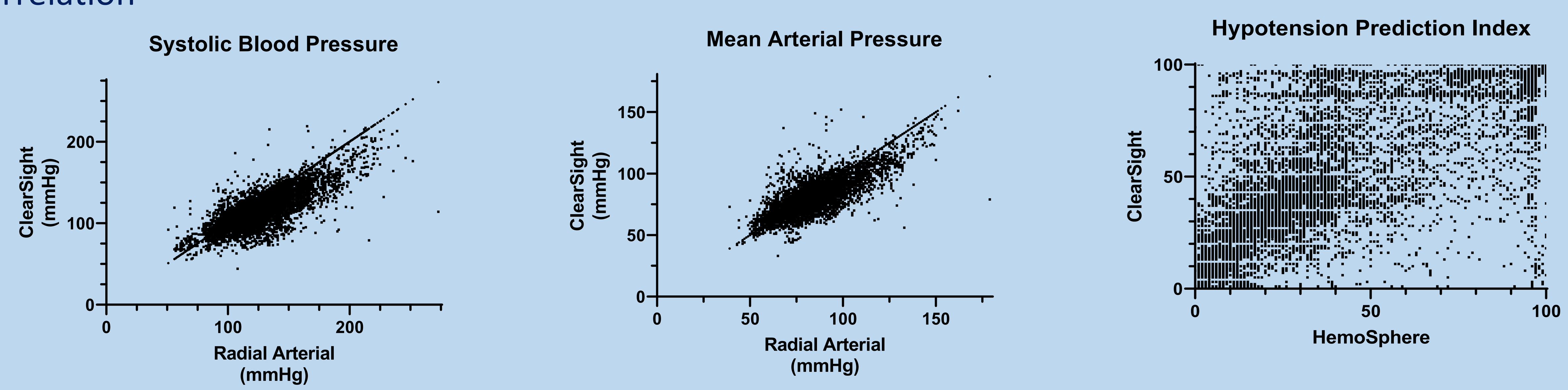
Demographics

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

Raw Data (HPI)

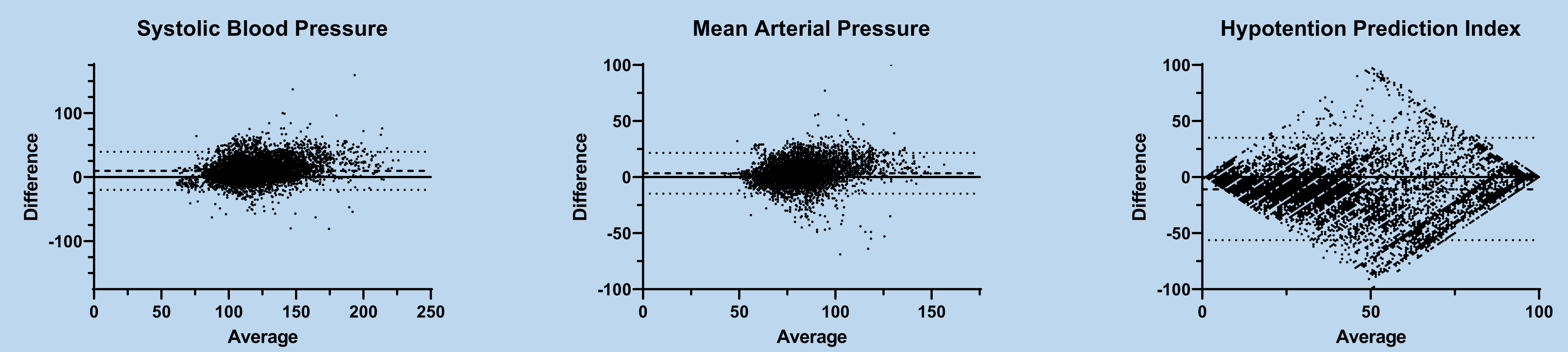


Correlation



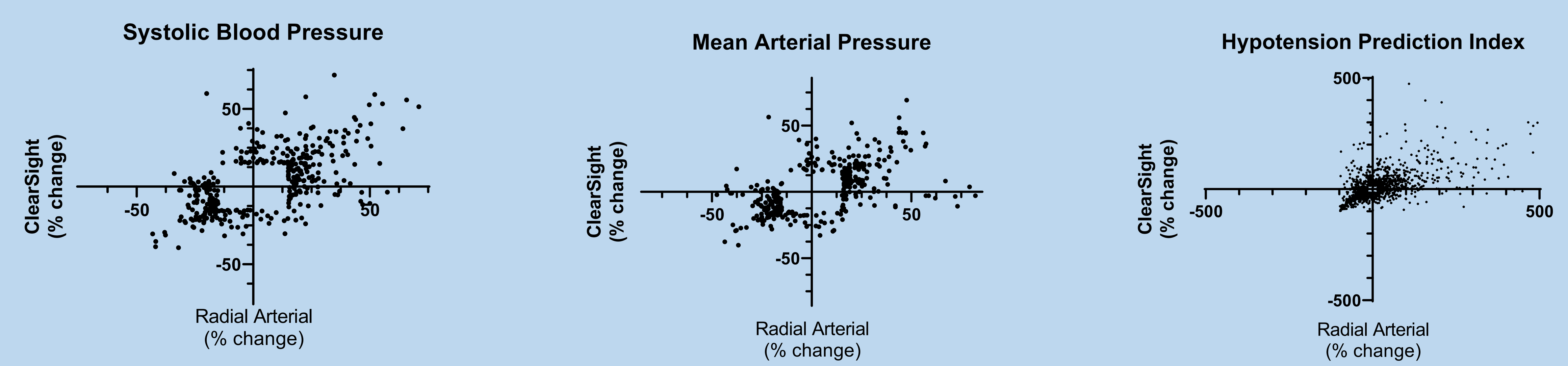
	Systolic Blood Pressure	Mean Arterial Pressure	Hypotension Prediction Index
r	0.78	0.77	0.72
95% CI	0.77 to 0.78	0.76 to 0.78	0.71 to 0.73
r^2	0.60	0.59	0.52

Bland-Altman



	Systolic Blood Pressure	Mean Arterial Pressure	Hypotension Prediction Index
Bias	+9.8	+3.4	-11
95% LOA	± 30	± 19	± 46

Concordance



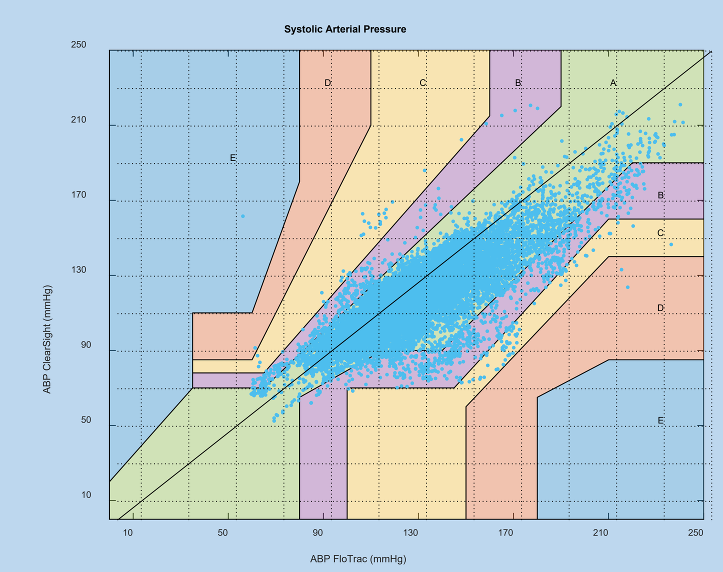
	Systolic Blood Pressure	Mean Arterial Pressure	Hypotension Prediction Index
Percent Concordance	77%	78%	72%

Discussion

- Correlation between HPI values is strong with r value > 0.7.
- Bland-Altman: Differences between ClearSight vs. Intra-arterial HPI becomes less pronounced at the extremes and more pronounced at values between 35-80.
- Strong correlation & percent concordance between ClearSight and Intra-arterial MAP and Systolic Pressure.
- Overall, the ClearSight finger cuff presents as a promising monitoring system that compares well to the gold standard for hemodynamic monitoring with some drawbacks, including occasionally lacking reliability and producing significant noise.

Next Steps

- Expanding analysis to include full range of 11 hemodynamic variables including CO, SV, SVV, Eadyn, and PPV.
- Error grid analysis



References

1. Salmasi V, Maheshwari K, Yang D, et al. *Anesthesiology*. 2017;126:47–65.
2. Walsh M, Devereaux PJ, Garg AX, et al. *Anesthesiology*. 2013;119:507–515.
3. James Davies S, Tilma Vistisen S, Jian Z, et al. *Perioperative Medicine*. 2020;130:352-359.

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