

# Exploring Accuracy and Precision of Noninvasive and Intra-Arterial Blood Pressure Measurement in Neurocritical Care Patients

Fatima Claire Herrera, SN; Kathrina Siaron, RN BSN CCRN; Jennifer Wilson, DNP RN CPN; Sonja Stutzman, PhD; DaiWai Olson, PhD RN CCRN FNCS

## Purpose

- The purpose of this study is to describe the accuracy and precision of noninvasive and intra-arterial blood pressure measurements in neurocritical care patients.

## Background/Problem

- Inconsistencies with blood pressure (BP) readings due to inter-observer variability, equipment, the skills and competency of the clinician, and other physiological factors can lead to inappropriate clinical decision making.
- Despite the use of BP monitoring across patient populations, research on the accuracy and precision of BP remains limited.
- A university hospital conducted a study that explored the consistency of patients' BP readings from different locations.
- This sub-study further explored BP accuracy and precision, utilizing existing data.

## Methodology

- This is a planned secondary analysis from a prospective, non-randomized observational study.
- A search for sources of literature that defined what an accurate BP is and which location to take the BP on was conducted.
- A 12x12 Pearson Correlation Matrix was created through the CORR procedure to display precision of BP measurements from the CATNIP data.



## Accuracy

refers to how close something is to its true value.

## Precision

refers to how approximate values are to one another.

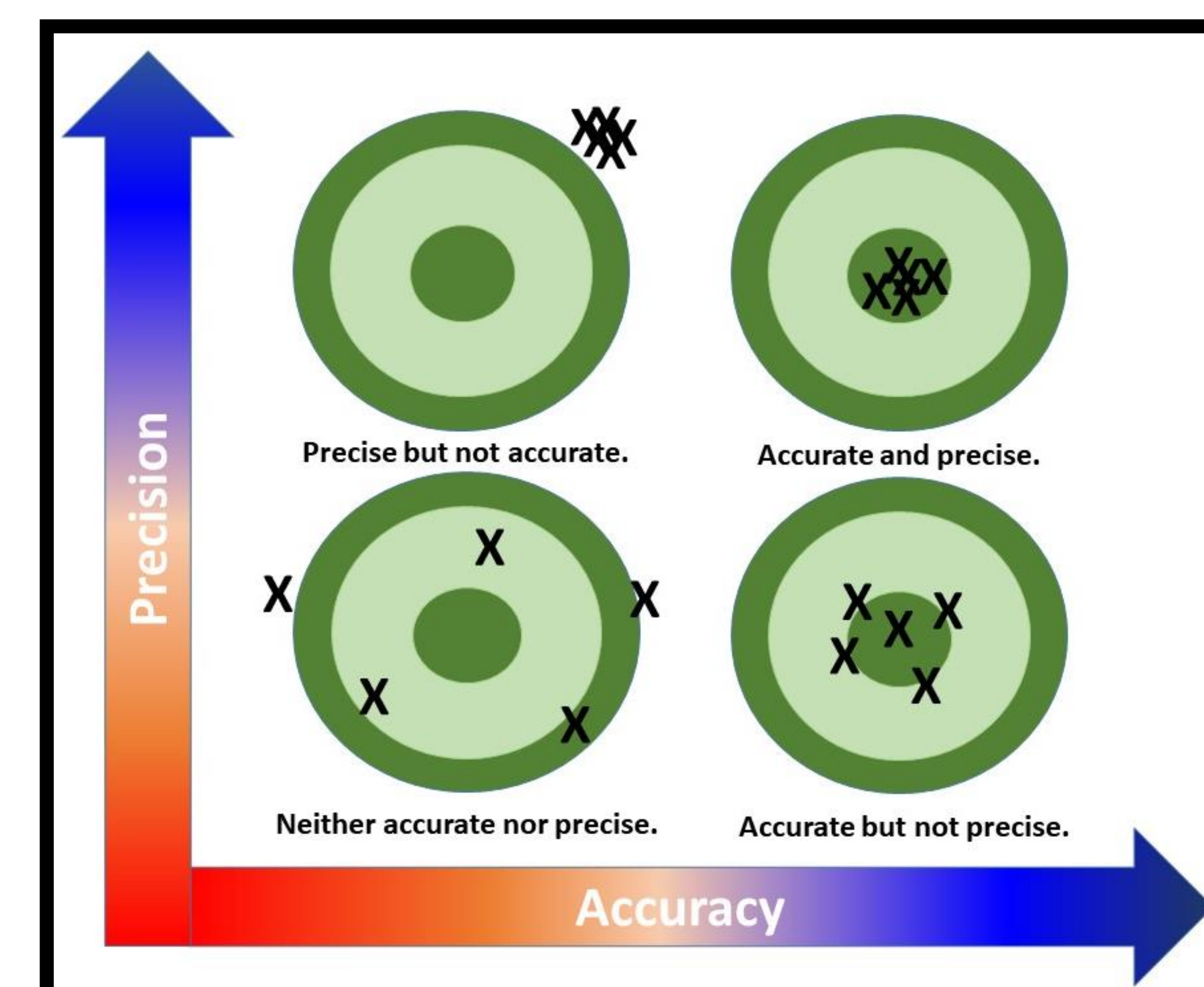
## Results

	Systolic Blood Pressures					Diastolic Blood Pressures					Mean Arterial Pressures				
	LA_sys	RA_sys	LW_sys	RW_sys	ART_sys	LA_dia	RA_dia	LW_dia	RW_dia	ART_dia	LA_map	RA_map	LW_map	RW_map	ART_map
LA_sys	1	0.82613 <.0001	0.73829 <.0001	0.80961 <.0001	0.77489 <.0001	0.55045 <.0001	0.48717 <.0001	0.4429 <.0001	0.4623 <.0001	0.271 <.0001	0.7471 <.0001	0.67057 <.0001	0.6023 <.0001	0.65878 <.0001	0.54697 <.0001
RA_sys	0.82613 <.0001	1	0.66706 <.0001	0.85952 <.0001	0.836 <.0001	0.38741 <.0001	0.41554 <.0001	0.31028 <.0001	0.41433 <.0001	0.57163 <.0001	0.54709 <.0001	0.66254 <.0001	0.46995 <.0001	0.63302 <.0001	0.77237 <.0001
LW_sys	0.73829 <.0001	0.66706 <.0001	1	0.82908 <.0001	0.82908 <.0001	0.49856 <.0001	0.58251 <.0001	0.55217 <.0001	0.60209 <.0001	0.40228 <.0001	0.56778 <.0001	0.68188 <.0001	0.76042 <.0001	0.76279 <.0001	0.87488 <.0001
RW_sys	0.80961 <.0001	0.85952 <.0001	0.82908 <.0001	1	0.88299 <.0001	0.41352 <.0001	0.46297 <.0001	0.41501 <.0001	0.48592 <.0001	0.18089 <.0001	0.56239 <.0001	0.67719 <.0001	0.58988 <.0001	0.73365 <.0001	0.52087 <.0001
ART_sys	0.77489 <.0001	0.836 <.0001	0.82908 <.0001	0.88299 <.0001	1	0.36213 <.0001	0.38284 <.0001	0.30141 <.0001	0.40089 <.0001	0.57957 <.0001	0.61052 <.0001	0.61052 <.0001	0.64952 <.0001	0.71033 <.0001	0.71033 <.0001
LA_dia	0.55045 <.0001	0.38741 <.0001	0.49856 <.0001	0.41352 <.0001	0.36213 <.0001	1	0.77383 <.0001	0.8261 <.0001	0.77603 <.0001	0.52405 <.0001	0.94703 <.0001	0.74153 <.0001	0.83191 <.0001	0.73815 <.0001	0.60932 <.0001
RA_dia	0.48717 <.0001	0.41554 <.0001	0.58251 <.0001	0.46297 <.0001	0.38284 <.0001	0.77383 <.0001	1	0.81069 <.0001	0.76376 <.0001	0.63461 <.0001	0.74308 <.0001	0.94146 <.0001	0.82238 <.0001	0.77421 <.0001	0.69267 <.0001
LW_dia	0.4429 <.0001	0.31028 <.0001	0.55217 <.0001	0.41501 <.0001	0.41501 <.0001	0.8261 <.0001	0.81069 <.0001	1	0.84015 <.0001	0.51105 <.0001	0.7698 <.0001	0.72514 <.0001	0.94858 <.0001	0.81422 <.0001	0.44596 <.0001
RW_dia	0.4623 <.0001	0.41433 <.0001	0.60209 <.0001	0.48592 <.0001	0.30141 <.0001	0.77603 <.0001	0.76376 <.0001	0.84015 <.0001	1	0.35597 <.0001	0.7229 <.0001	0.73057 <.0001	0.83805 <.0001	0.93741 <.0001	0.4881 <.0001
ART_dia	0.271 <.0001	0.57163 <.0001	0.40228 <.0001	0.18089 <.0001	0.52405 <.0001	0.63461 <.0001	0.51105 <.0001	0.35597 <.0001	0.7229 <.0001	1	0.45041 <.0001	0.64675 <.0001	0.42844 <.0001	0.32422 <.0001	0.87994 <.0001
LA_map	0.7471 <.0001	0.54709 <.0001	0.56778 <.0001	0.56239 <.0001	0.57957 <.0001	0.94703 <.0001	0.74308 <.0001	0.7698 <.0001	0.7229 <.0001	0.45041 <.0001	1	0.77927 <.0001	0.82083 <.0001	0.7648 <.0001	0.66446 <.0001
RA_map	0.67057 <.0001	0.66254 <.0001	0.68188 <.0001	0.67719 <.0001	0.61052 <.0001	0.74153 <.0001	0.94146 <.0001	0.72514 <.0001	0.73057 <.0001	0.64675 <.0001	0.77927 <.0001	1	0.79657 <.0001	0.83358 <.0001	0.79141 <.0001
LW_map	0.6023 <.0001	0.46995 <.0001	0.76042 <.0001	0.58988 <.0001	0.73365 <.0001	0.73815 <.0001	0.60932 <.0001	0.83191 <.0001	0.82238 <.0001	0.94858 <.0001	0.83805 <.0001	0.93741 <.0001	1	0.87569 <.0001	0.36208 <.0001
RW_map	0.52087 <.0001	0.63302 <.0001	0.76279 <.0001	0.73365 <.0001	0.64952 <.0001	0.71033 <.0001	0.69267 <.0001	0.44596 <.0001	0.4881 <.0001	0.87994 <.0001	0.66446 <.0001	0.79141 <.0001	0.83208 <.0001	1	0.62846 <.0001
ART_map	0.54697 <.0001	0.77237 <.0001	0.87488 <.0001	0.52087 <.0001	0.71033 <.0001	0.60932 <.0001	0.69267 <.0001	0.44596 <.0001	0.4881 <.0001	0.87994 <.0001	0.66446 <.0001	0.79141 <.0001	0.83208 <.0001	0.62846 <.0001	1
Correlation	1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0				

- The diastolic BPs and the mean arterial pressures (MAPs) for each have a stronger correlation with each other.
- Pearson correlation coefficients for systolic BP ranged from -0.0245 to 0.8823; diastolic BP ranged from -0.0226 to 0.8402 and MAP ranged from -0.0749 to 0.9486.
- For the diastolic blood pressures in the correlation matrix, the arterial diastolic BP and the left wrist (LW) systolic BP have the weakest correlation.
- There is no agreed upon best practice for BP site selection.

## Discussion

- BP can be taken in either arm or either wrist, and no one site can be recommended given the statistically significantly different Pearson Correlation Coefficients.
- There is very limited precision between arterial line and non-invasive blood pressure (NIBP) measurements.



## Recommendations for Future Research

- The parent study was conducted in a single center. A recommendation for further research would be to incorporate this study with multiple centers.
- Another recommendation would be to look into multiple populations and not only neurocritical care patients.

## References

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