A COMPARISON OF WEIGHT-BASED VS TRADITIONAL NICARDIPINE DOSING FOR THE MANAGEMENT OF HYPERTENSIVE EMERGENCIES

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Disclosures

- **No conflicts of interest to disclose**

Background

- **Hypertensive Emergency**
  - **BP > 180/120 mmHg + target organ damage (neurologic, cardiovascular, renal, etc.)**
- **Target BP Goals**
  - **Vary by indication**
- **IV anti-hypertensives: Nicardipine**
  - **ACS, acute renal failure, ICH, ischemic stroke, etc.**
  - **Hypotension may be of concern**

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Hypertension. 2018;71(6):e13-e115.
J Cardiovasc Med. 2015;16:372-82. 3
J Stroke Cerebrovasc Dis. 2019;28(5):1168-1172.
Am J Emerg Med. 2012;30(6):981-9
J Crit Care. 2012;27(5):528.e7-14.

Background

- Current recommended/studied dosing
  - 5 mg/hr, titrated by 2.5 mg every 5-15 min up to max of 15 mg/hr
- BJC/CH dosing
  - 0.5-2.5 mcg/kg/min, titrated by 0.5 mcg/kg/min every 10 min
  - Internal data suggests decreased doses and incidence of hypotension
  - Published literature that the optimal rate may be related to weight in adults is scarce

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Hypertension. 2018;71(6):e13-e115.
J Crit Care. 2012;27(5):528.e7-14. .
J Stroke Cerebrovasc Dis. 2014;23(10):2780-7
Jpn Circ J. 1997;61(5):367-74.
J Neurosurg. 1994;80(5):788-96.

Background

- *Koga M et al. J Stroke Cerebrovasc Dis*. 2014.
  - Total nicardipine dose for ICH independently related to weight
- *Hirota Y et al. Jpn Circ J*. 1997.
  - "Optimal" dose for acute heart failure: 1.0 mcg/kg/min
- *Haley EC et al. J Neurosurg*. 1993 and 1994.
  - 2.5 mcg/kg/min decreased vasospasm for aneurysmal subarachnoid hemorrhage
  - Follow-up: no difference between 1.25 and 2.5 mcg/kg/min

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J Neurosurg. 1993;78(4):537-47.
J Neurosurg. 1994;80(5):788-96.
Jpn Circ J. 1997;61(5):367-74.
J Stroke Cerebrovasc Dis. 2014;23(10):2780-7

Research Question

How does weight-based nicardipine dosing (mcg/kg/min) compare to traditional dosing (mg/hr) for the treatment of hypertensive emergencies?

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Research Objective

The purpose of this study is to investigate if weight-based nicardipine dosing, when compared to traditional dosing, has an effect on efficacy, measured in time to target BP goal

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Methods: Design, IRB status and Groups

- **Retrospective, quasi-experimental chart review**
- **Approved by CH and STLCOP IRB**

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Methods

Primary Outcome

- Time to target BP (min)

Secondary Outcomes

- Incidence of hypotension (<90/60 mm Hg)
- Mean rate (mg/hr) and volume (mL) administered at goal BP
- Number of dose titrations
- Number of patients that reach max rate (15 mg/hr)

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Inclusion Criteria

- Age ≥18 years old
- Administered nicardipine for hypertensive emergency
- Achieved target BP goal (noted in medication order/chart)

Exclusion Criteria

- Pregnant or breastfeeding
- Administered any other IV anti-hypertensives during nicardipine infusion

Methods: Data Collection

- Medical Record Number
- Date of Birth
- Date of hospital admission
- Date of hospital discharge
- Discharge disposition
- Sex
- Location at time of index date
- Race
- Weight
- Height
- BMI
- Age
- SCr
- Albumin
- Allergies
- Indication for nicardipine
- Physician
- Nicardipine dose/rate
- Target BP goal
- BP readings
- Time to target BP
- Volume used to achieve target
- Hypotension
- Prior PO and IV anti-hypertensives
- Concomitant sedation medications
- Dose-titrations

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Methods: Data Analysis

- **T-tests**
  - **Primary outcome: time to target BP goal**
  - **Secondary outcomes: Volume of drug administered to achieve target blood pressure, the number of dose titrations needed, and the mean rate in mg/hr when target BP is achieved.**
- **Chi-Squared**
  - **Number of patients that reached the max dose of 15 mg/hr and incidence of hypotension**
- **Alpha = 0.05**

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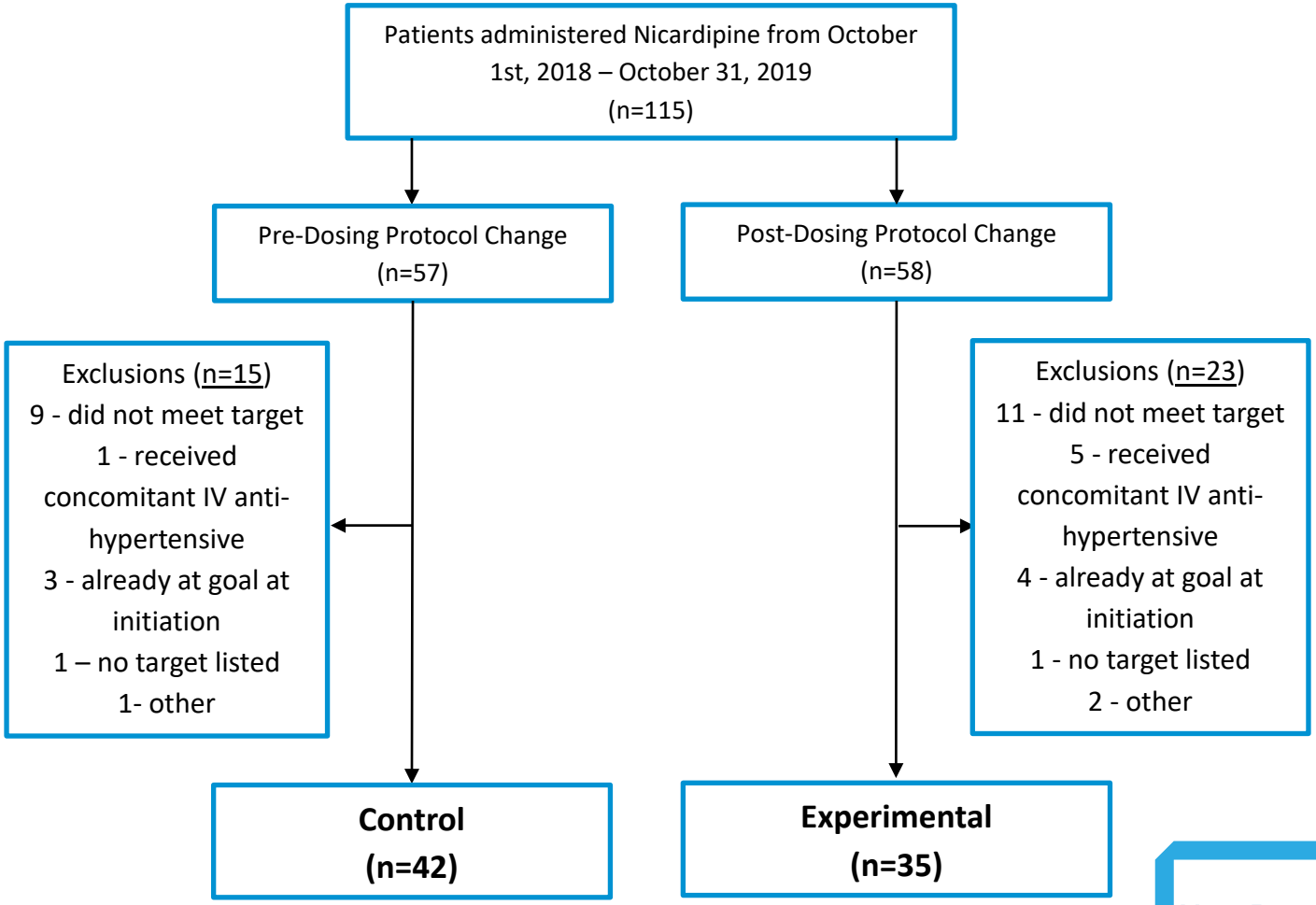
Results



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Results: Patient Characteristics

	All (n=77)	Control (n=42)	Experimental (n=35)	
Age	57	57	57	
Gender (F)	46 (60%)	23 (55%)	23 (65%)	
Race (African-American)	68 (88%)	38 (90%)	30 (86%)	
Weight (kg)	85.40	90.38	79.44	
BMI	29.70	31.53	27.51	**p=0.03**
SCr	3.43	3.49	3.35	
Albumin	3.82	3.57	4.12	**p=0.0001**
Location **ED** **Stepdown** **ICU**	 48 (62%) 19 9	 28 (67%) 6 7	 20 (57%) 13 2	

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Results: Patient Characteristics

	All (n=77)	Control (n=42)	Experimental (n=35)
Indication			
Pulm edema	20	10	10
Ischemic stroke	18	8	10
ICH	12	6	6
Home anti-hypertensives			
Any	55	29	26
CCB	32	18	14
≥2	48	26	22
Prior IV			
Any	52	27	25
Labetalol	28	16	12
Hydralazine	25	12	13

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Results: Patient Characteristics

	All (n=77)	Control (n=42)	Experimental (n=35)
Initial SBP	193	194	192
Initial MAP	136	134	138
SBP at Target	153	153	153
MAP at Target	106	105	107
Initial Rate (mg/hr)	3.42	4.06	2.67
Discharge Disposition			
Home	45	28	17
Transfer	16	8	8
Expired	3	2	1

p=0.0002

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Results: Patient Characteristics

Listed Target BP Goals by Frequency				
SBP 170-180	**18**	MAP 60-70	2	<180/105
SBP 130-140	14	SBP < 170	2	MAP < 110
SBP 175-185	5	<150/80	1	MAP 70-110
175-185/ 100-110	5	170-180/ 100-105		Decrease in MAP by 20
SBP < 160	4	170-180/105		SBP < 110
SBP < 140	3	<160/85		SBP < 190
MAP 100-110	3	<170/95		SBP 100-110
MAP 70-90	3	<180/100		SBP 130-160
MAP 120-130	2	SBP 150-160		SBP 160-170

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Results

Primary Outcome

- No significant difference between strategies for time to target BP
  - 143 min vs. 156 min (95% CI: -113 to 87; p=0.795)

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Results: Secondary Outcomes

	Control	Experimental
Rate at target (mg/hr)	5.98	5.01
Volume required for target (mL)	126.71	119.45
Peripheral only	132.61	125.28
Dose Titrations (median)	1	1
≥1	23	20
≥2	14	10
Patients that reached max rate	2	1
Incidence of Hypotension	0	2

p=0.20

p=0.88

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Discussion

- **No significant differences found for any of our outcomes**
  - **Wide confidence interval/range of time to target BP, likely due to similarly broad range of listed target BPs**
- **Lower BMI in the experimental group, but weight was not significantly different**
- **Lower initial rate in the experimental group, but no difference seen in rate when met target BP**
  - **There was not an increase in titrations, though**
- **Low incidence of hypotension**
  - **Risk mitigated when titrated correctly**

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Strengths

- Very limited data in this area
- Objective evaluation of protocol change
- Real-world observation and critique of nicardipine use at this institution

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Limitations

- Retrospective, non-randomized, single-center
- All indications and settings (ED, ICU, etc.)
  - Inconsistent use and targets
- Prior IV anti-hypertensives - possible confounder
- Small sample size - limited analysis and scope
- Limited external validity due to variability

Future Directions

Larger sample size	Assess goals/ indications	Provider/RN feedback
• Enhance analysis • Limit targets, locations and/or indications	• Nicardipine appropriate for listed indication? • Target BP appropriate for indication?	• Preference for either strategy? • Education on appropriate and standard goals/use for indication and setting

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QUESTIONS?

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