Emergency Medicine Research: A Review of Resident Research Session #1

June 9, 2021

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Management of hyperkalemia with insulin and dextrose: Using a pharmacist developed order set to identify, monitor, and treat hypoglycemia

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Disclosure

- Authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation

Background

- Hyperkalemia is an electrolyte imbalance defined as a serum potassium level greater than 5.0 mmol/L[1]
  - Risk factors[2]
    - Renal impairment
    - Diabetes
    - Caucasian race
- Acute vs chronic hyperkalemia[3]

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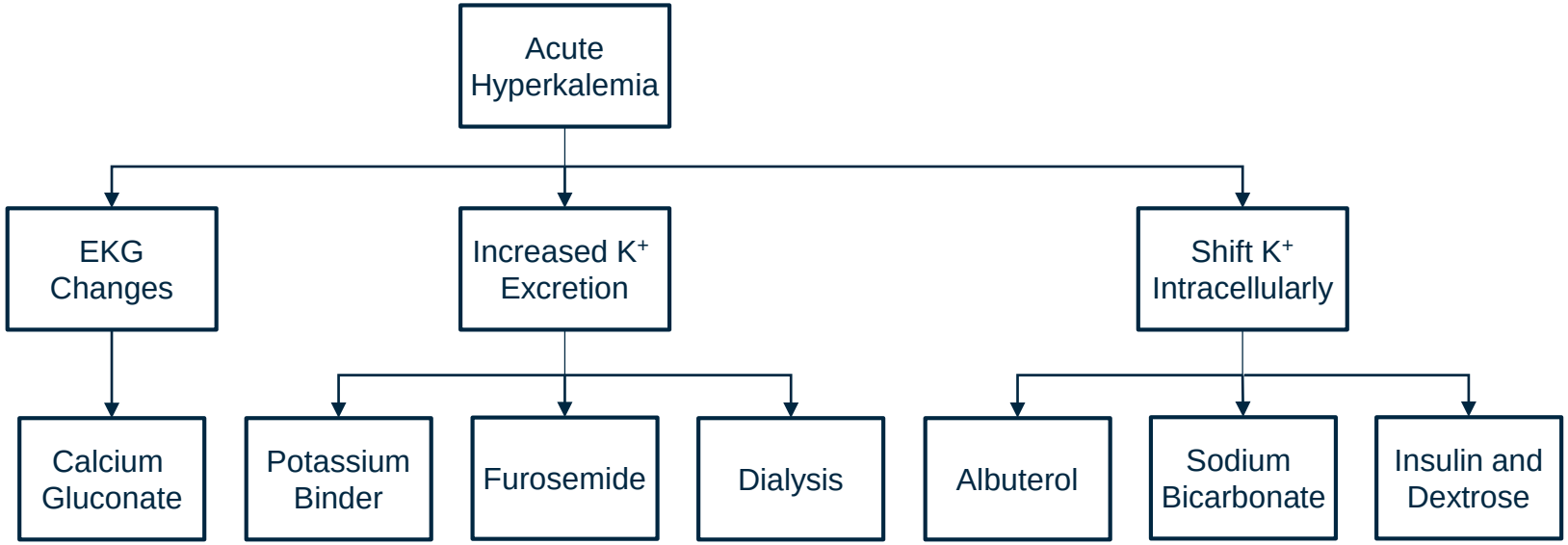
[1]Rosano GMC, et al. *Eur Heart J Cardiovasc Pharmacother.* 2018;4(3):180-188
[2]Kovesdy CP. *Kidney Int Suppl*. 2016;6(1):3-6
[3]Fried L, et al. *Kidney Int Suppl.* 2017;7(3):164-170

Background



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[4]Palmer BF, et al. *Mayo Clin Proc.* 2021;96(3):744-762

Risk of Insulin Therapy

- Hypoglycemia[5,6]
  - Occurrence within 3 to 6 hours
  - Increased length of hospital stay
  - Morbidity and mortality
- Incidence of hypoglycemia varies from 6% to 75%[5,6]
  - Pre-disposing factors[7]

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[5]Schaefers S, et al. *J Hosp Med*. 2012;7(3):239-242
[6]Boughton D. *J Hosp Med.* 2019;14(5):284-287
[7]Moussavi K, et al. *Crit Care Explor*. 2020;2(4):e0092

Objective

- Evaluate the impact of a pharmacist developed order set on identification and treatment of hypoglycemia secondary to the administration of insulin in patients presenting with hyperkalemia

Methods

Study design

- Single-center, retrospective, chart review pre- and post-protocol

Study period

- Pre-protocol: July 21, 2019 – August 10, 2020
- Post-protocol: August 11, 2020 – March 31, 2021

Methods

Inclusion criteria

- Patients ≥ 18 years old
  - Emergency department
  - Inpatient
- Serum potassium > 5.0 mmol/L

Exclusion criteria

- Patients with serum potassium > 5.0 mmol/L that did not receive treatment with insulin

Statistical analysis

- Descriptive statistics

Methods

Pre-Protocol Order Set
Albuterol Nebulizer Solution
Calcium Gluconate
Insulin Regular U-100
Dextrose 50% x 1 dose
Furosemide
Sodium Bicarbonate 8.4%
Sodium Polystyrene

Post-Protocol Order Set
Albuterol Nebulizer Solution
Calcium Gluconate
Insulin Regular U-100
Dextrose 50% (includes PRN low blood sugar)
Fingerstick Glucose Every Hour x 6
Furosemide
Sodium Bicarbonate 8.4%
Potassium Binder*

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*Potassium binders include sodium zirconium cyclosilicate, sodium polystyrene, patiromer calcium sorbitex

Endpoints

Primary

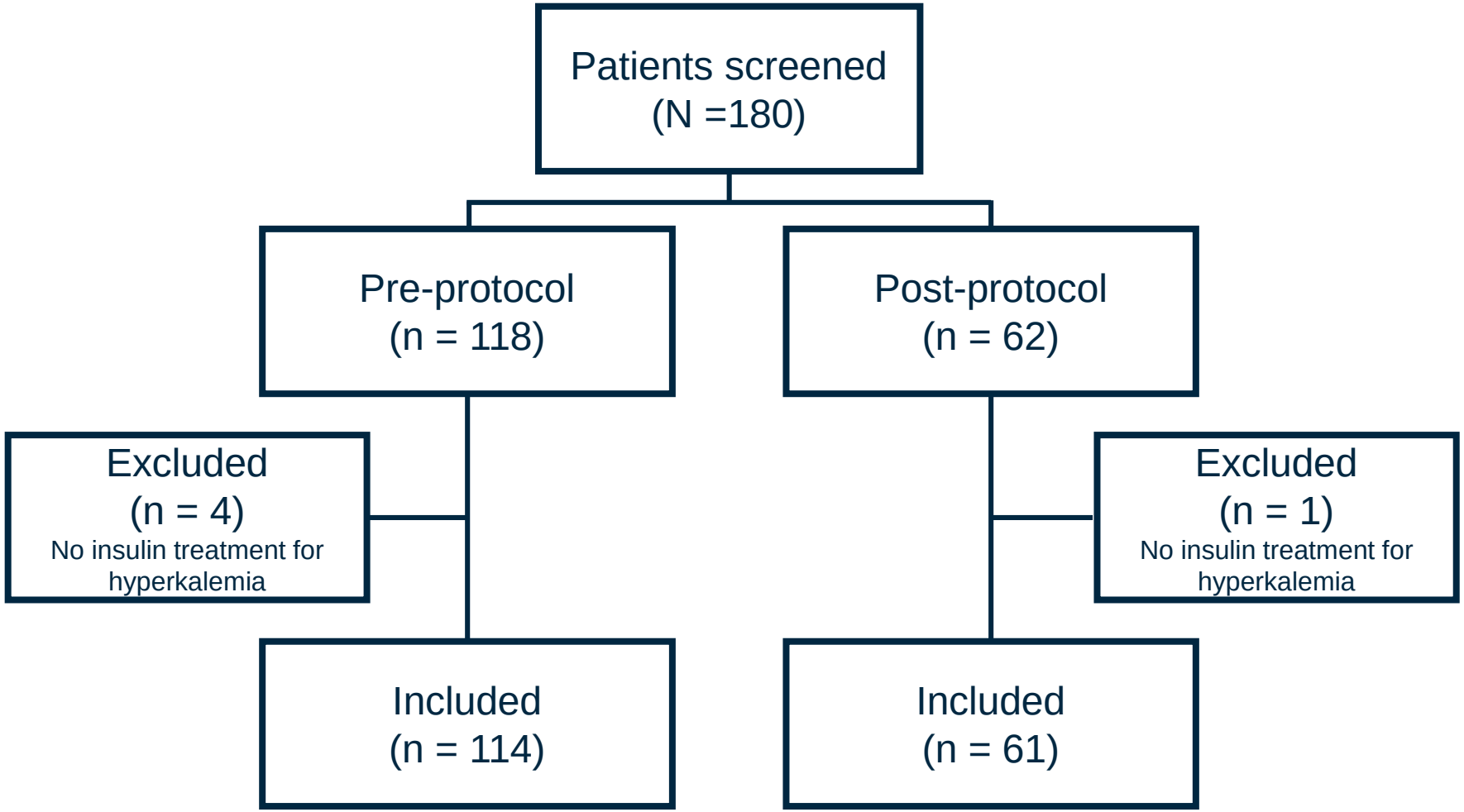
- Order set use
- Fingerstick glucose collection
- Incidence of hypoglycemia
  - Blood glucose ≤ 70 mg/dL

Endpoints

Secondary

- Total insulin dose administered
- Total dextrose dose administered
- Time to hypoglycemia
- Use of potassium binders
- Time to potassium in range
  - Serum potassium ≤ 5.0 mmol/L
- Time to potassium in range with insulin therapy alone
  - Serum potassium ≤ 5.0 mmol/L
- Patients who received additional treatment for hyperkalemia
  - Dialysis, potassium binders, albuterol, furosemide, sodium bicarbonate

Results



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Baseline Demographics

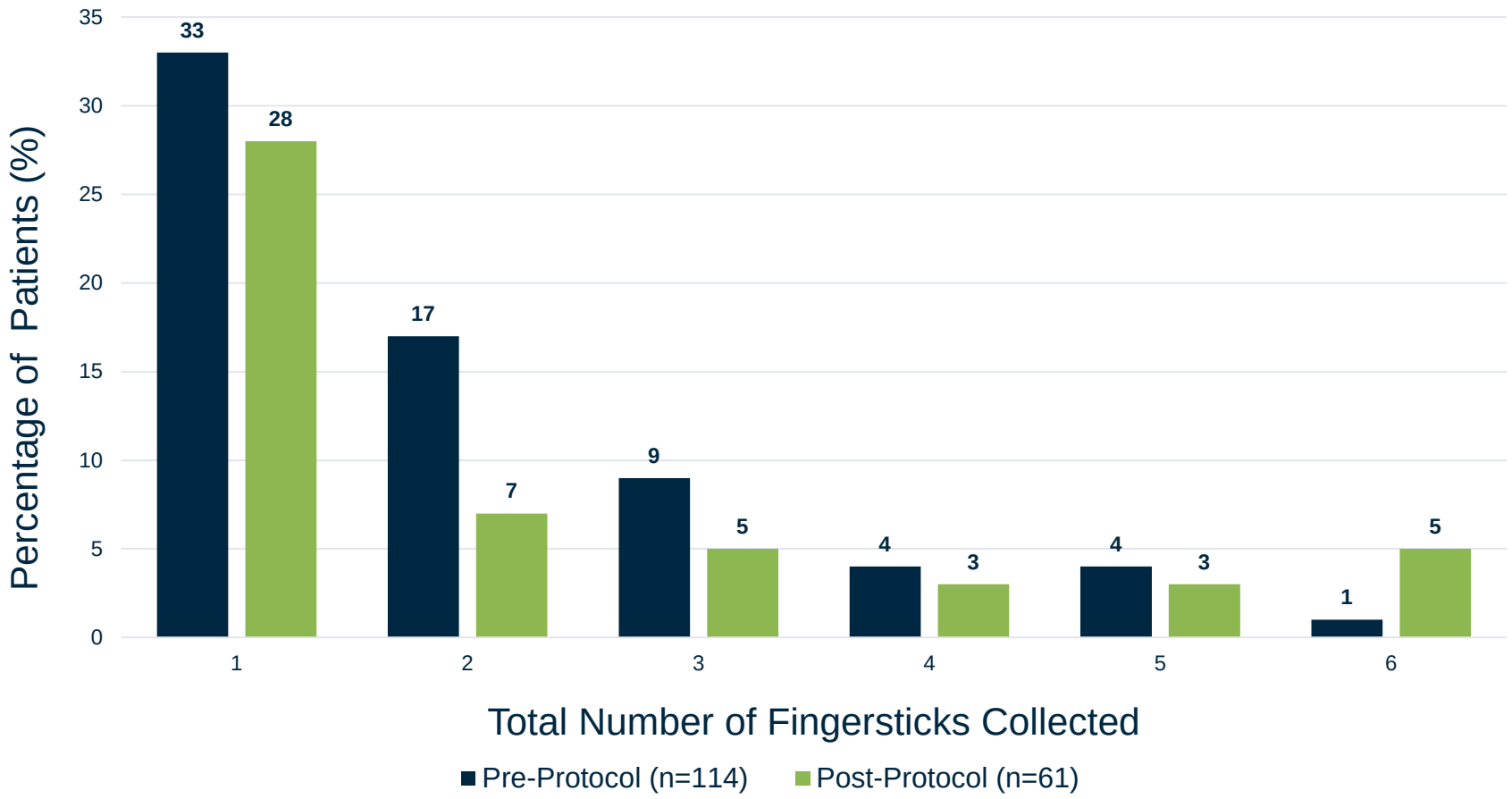
	Pre-Protocol (n=114)	Post-Protocol (n=61)
Age (years)*	61 (33-89)	63 (33-101)
Female, n (%)	50 (43)	20 (33)
History of diabetes, n (%)	68 (60)	39 (64)
Renal dysfunction, n (%)	53 (47)	26 (43)
Pre-treatment potassium (mmol/L)*	6.3 (5.2-8.8)	6.5 (5.1-9.1)
Pre-treatment glucose (mg/dL)*	148 (58-556)	138 (79-560)
Patients without pre-treatment glucose, n (%)	56 (49)	29 (48)

*Median (range)

Primary Endpoints

	Pre-Protocol (n=114)	Post-Protocol (n=61)
Order set use, n (%)	81 (71)	44 (72)
Fingerstick glucose collection, n (%)	76 (67)	52 (85)
Incidence of hypoglycemia, n (%)	11 (10)	8 (13)

Fingerstick Glucose Collection



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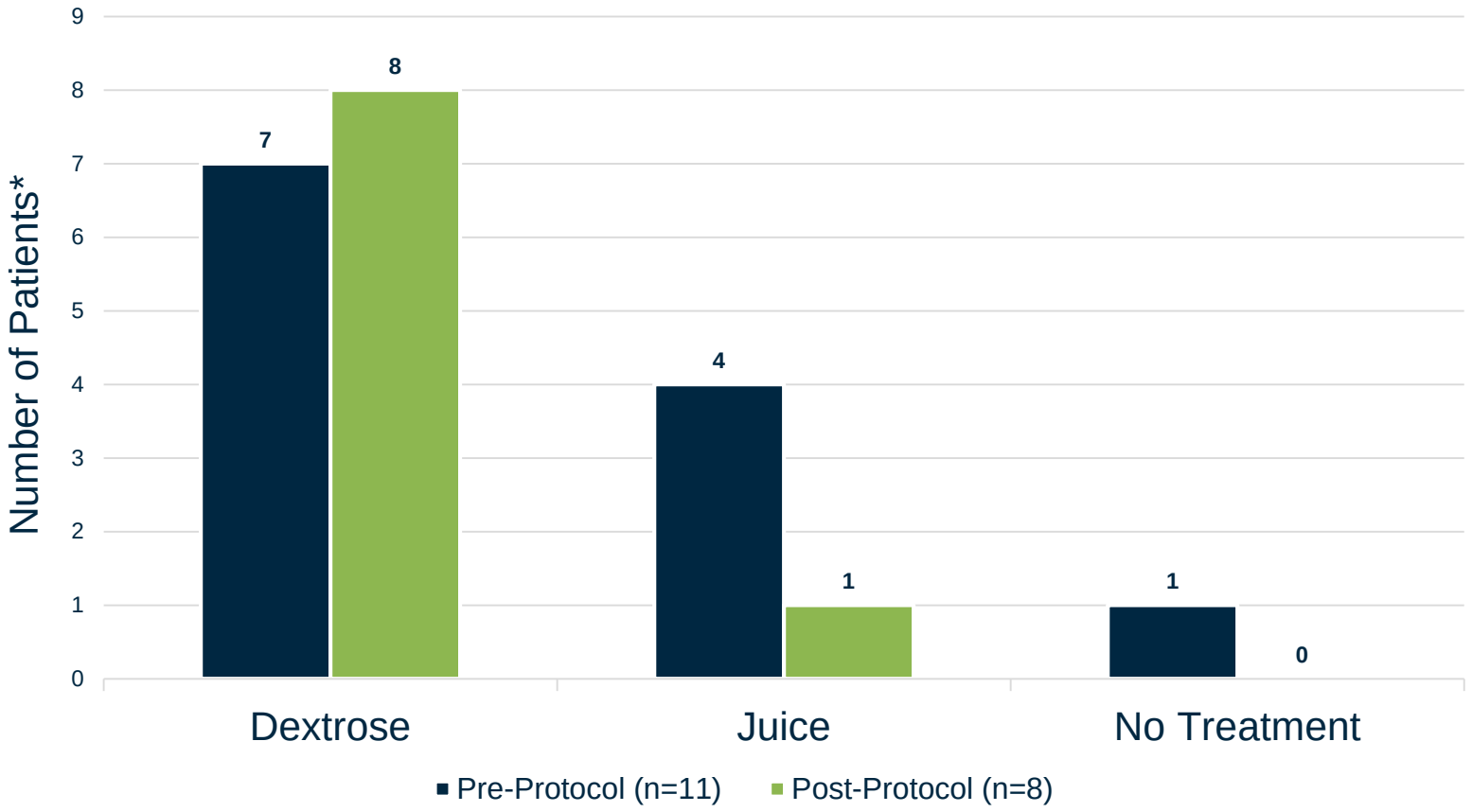
Hypoglycemia Management



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*Two patients received both dextrose and juice

Secondary Endpoints

	Pre-Protocol (n=114)	Post-Protocol (n=61)
Insulin dose administered (units)*	10 (4-40)	10 (5-40)
Dextrose dose administered (grams)*	25 (0-50)	25 (0-100)
Time to hypoglycemia (hours)*	1.8 (1.1-4.5)	2.5 (1.2-3.4)
Use of potassium binder, n (%)	42 (37)	37 (61)
Time to potassium in range (hours)*	14.9 (0.7-141.7)	22.3 (0.6-82.9)
Time to potassium in range with insulin therapy alone (hours)*	7.7 (3.1-109.8)	6.7 (4.5-11.4)
Patients who received additional treatment for hyperkalemia, n (%)	93 (82)	56 (92)

*Median (range)

Discussion

- Fingerstick collection increased
- Increased incidences of hypoglycemia
- Majority of patients who developed hypoglycemia had renal dysfunction

Limitations

- Single-center, small sample size
- Patients received additional insulin therapy
- Quantifying time to potassium in range
- Fingerstick glucose order reconciliation

Conclusions

- Modification of the hyperkalemia order set increased the amount of fingerstick collection
  - Identify and treat hypoglycemia

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Impact of a Multidisciplinary Sepsis Huddle in the ED

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Co-investigators: Hend Barry, PharmD, BCPS, BCCCP
and Eric Harvey, PharmD, MBA
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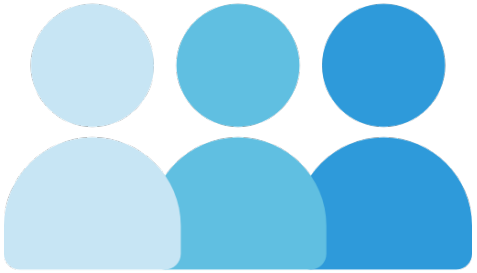
Learning objectives

Recognize	• The importance of prompt recognition and effective treatment of sepsis patients.
Explain	• The impact of a multidisciplinary sepsis huddle in the Emergency Department on the early identification and treatment of sepsis patients according to Surviving Sepsis Campaign (SSC) recommendations.

Background: Sepsis

Leading cause of death in hospitals



At least 1.7 million cases per year[1]

Sepsis bundle is the cornerstone of care and quality measures[2]

1-hour of antibiotic delay = 7.6% increase in mortality[3]

Background: 1-Hour Sepsis Bundle[4]

- Measuring of lactate level
- Obtaining blood cultures before antibiotic administration
- Administering broad-spectrum antibiotics
- Begin administration of 30 mL/kg crystalloid for hypotension or lactate ≥ 4 mmol/L
- Application of vasopressors if hypotensive during or after fluid resuscitation to maintain MAP ≥ 65 mmHg

Methods

Objective

- Evaluate the impact of a multidisciplinary sepsis huddle in the ED in early identification of sepsis patients as measured by the difference of code sepsis activation pre-implementation versus post-implementation of huddle

Setting

- Swedish Medical Center Ballard Campus, Emergency Department

Design

- Single center, retrospective cohort study

Inclusion Criteria

- Age ≥ 18 years old
- Pre-huddle: Patients were identified via Best Practice Advisory (BPA)
- Post-huddle: Sepsis huddle activation

Exclusion Criteria

- Patients determined to not have sepsis

Methods: Outcomes

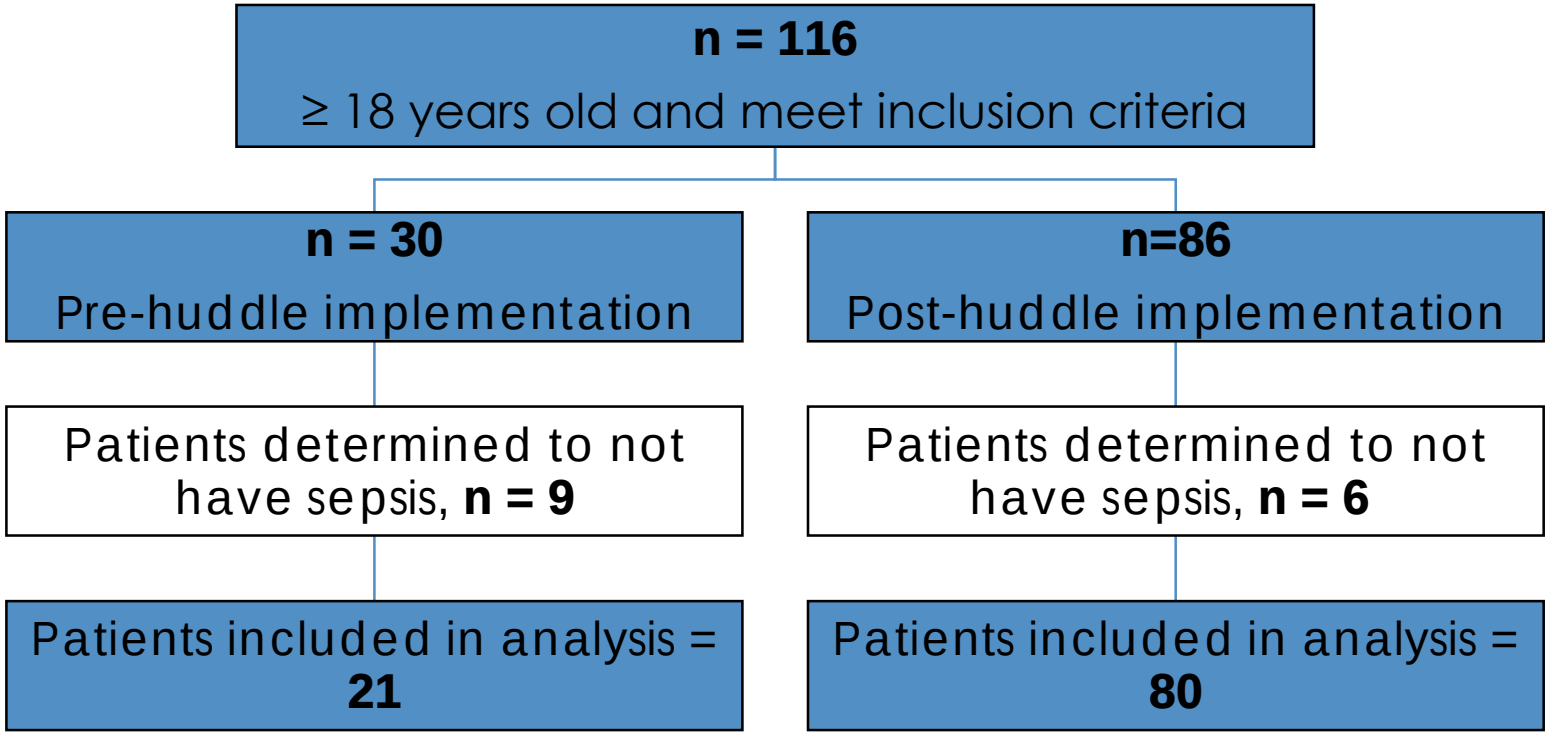
Primary

- Difference in code sepsis activation

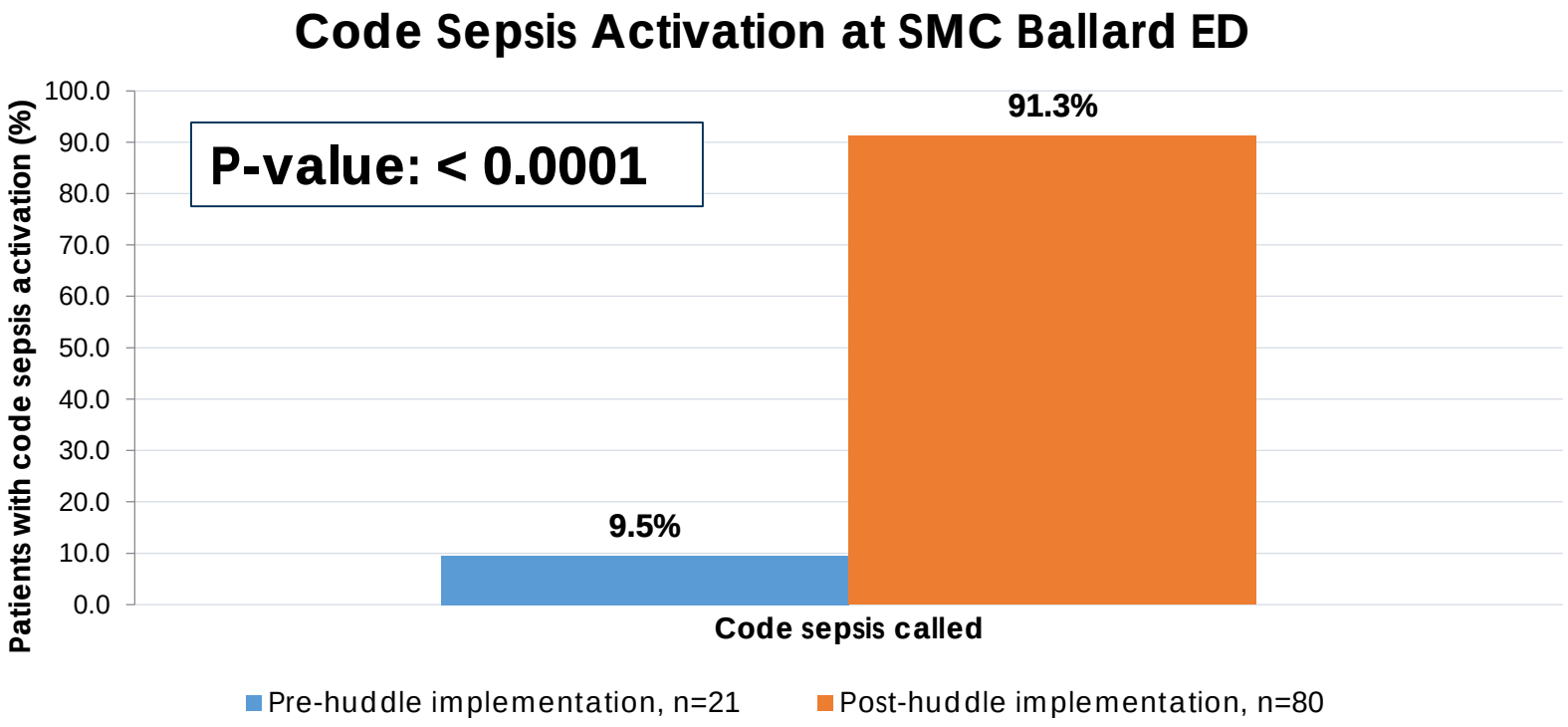
Secondary

- Completion of 1-hour sepsis bundle from time zero

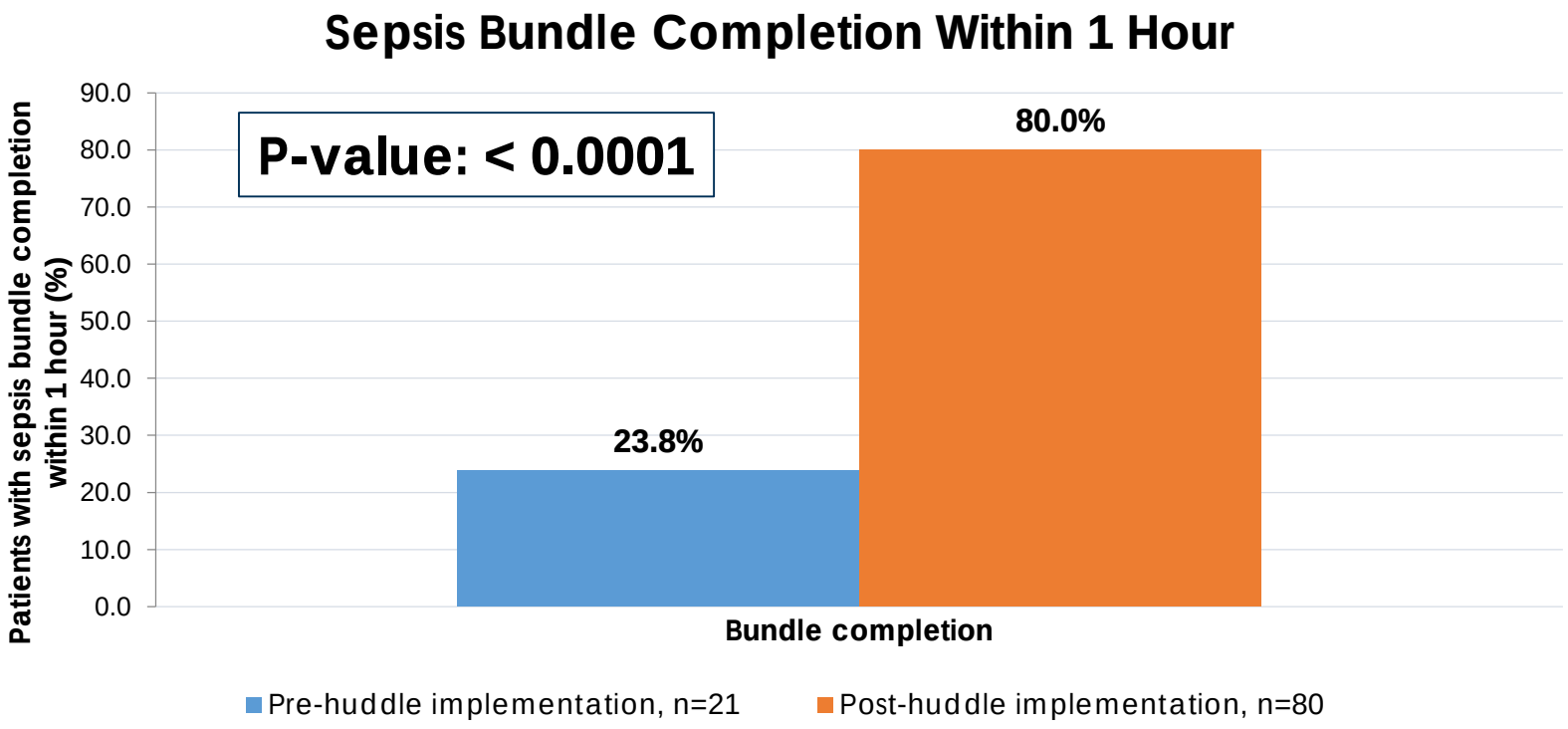
Results: Patient Selection



Results: Code Sepsis



Results: Sepsis Bundle



Discussion

- The sepsis huddle significantly improved early identification of sepsis patients based on the increase in code sepsis activation.
- The sepsis huddle significantly improved bundle completion within 1 hour.
- Next step is expansion into other Swedish Medical Center campuses.

Discussion

Strengths

- First study to evaluate impact of sepsis huddle on early identification of sepsis patients

Limitations

- Small sample size
- Single center
- Observational study

Conclusion

A multidisciplinary sepsis huddle in the emergency department is effective for **early identification** of sepsis patients and **improves sepsis bundle compliance**.

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FIXED VERSUS CONVENTIONAL DOSING OF 4-FACTOR PROTHROMBIN COMPLEX CONCENTRATE IN URGENT WARFARIN REVERSAL

ERIN GORDON, PHARMD
PGY-2 Emergency Medicine Resident
OhioHealth Grant Medical Center

WEIGHT BASED / CONVENTIONAL DOSING

- FDA approved dosing – not based on dose-finding studies
- Optimal dosing remains unclear

Patient Characteristics	Dose of 4F-PCC
INR 2.0 - 3.9	25 units/kg (max 2,500 units)
INR 4 - 5.9	35 units/kg (max 3,500 units)
INR > 6.0	50 units/kg (max 5,000 units)

Lower Doses: → Similar efficacy? → Reduce thromboembolic complications? → Reduce costs to patients & health system?

FIXED DOSING PROTOCOL

Patient Characteristics	Dose of 4F-PCC
INR ≤ 7.5 & TBW ≤ 100 kg	1,500 units
INR > 7.5 OR TBW > 100 kg	2,000 units

OhioHealth protocol based on the best available literature

METHODS

Inclusion

- Age 18+
- Received 4F-PCC for warfarin reversal due to severe bleeding or need for urgent procedure
- Presented to OhioHealth GMC during study time frame

Exclusion

- Given 4F-PCC for reversal of any drug besides warfarin
- Missing pre- or post-infusion INR data

Conventional dose cohort

Jan. 1, 2019 – Dec. 31, 2019

Protocol change

Fixed dose cohort

Jan. 1, 2020 – Dec. 31, 2020

RESULTS

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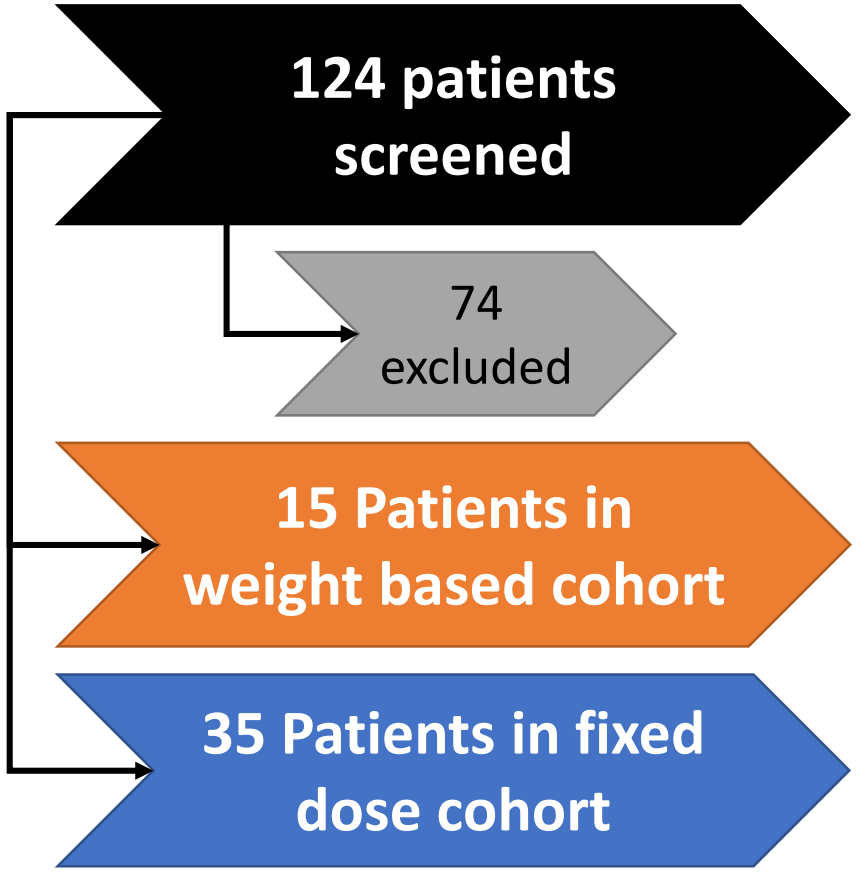
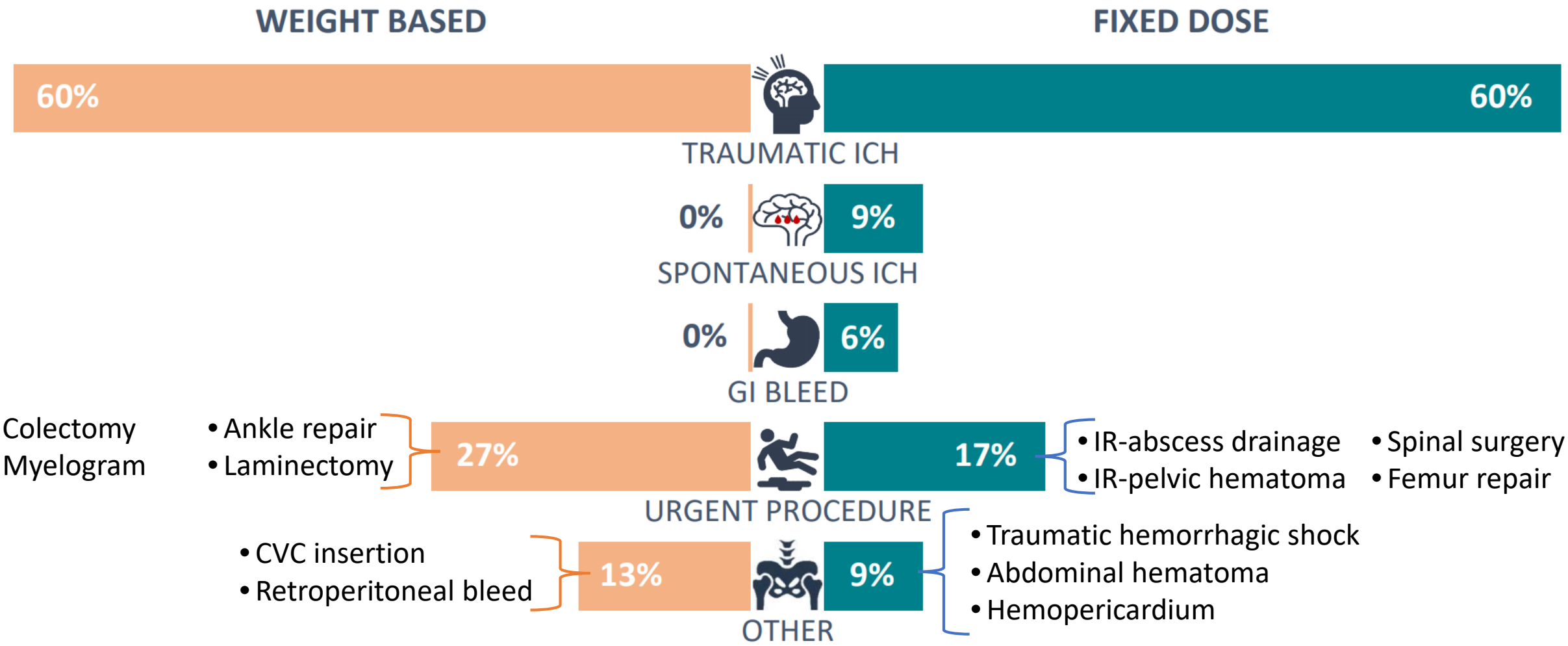
STUDY POPULATION

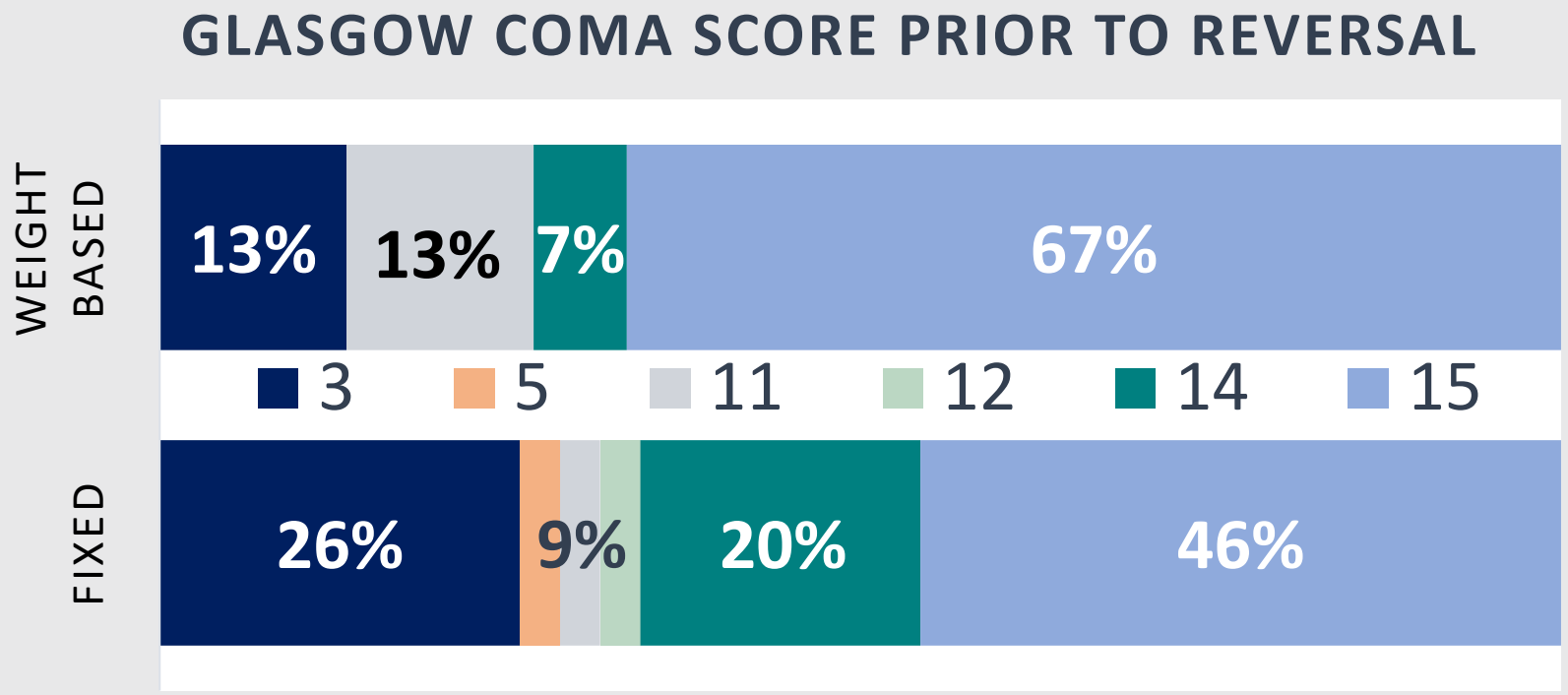


Characteristics	Weight Based (n = 15)	Fixed Dosed (n = 35)
Male, n (%)	10 (66.7)	18 (51.4)
Age, mean ± sd	70.9 ± 14.6	74.4 ± 10.0
Indication for warfarin, n (%)		
Atrial Fibrillation	9 (60.0)	26 (74.3)
DVT/PE	3 (20.0)	7 (20.0)
Other	3 (20.0)	2 (5.7)
INR goal, n (%)		
2.0-3.0	14 (93.3)	33 (94.3)

INDICATIONS FOR REVERSAL



STUDY POPULATION



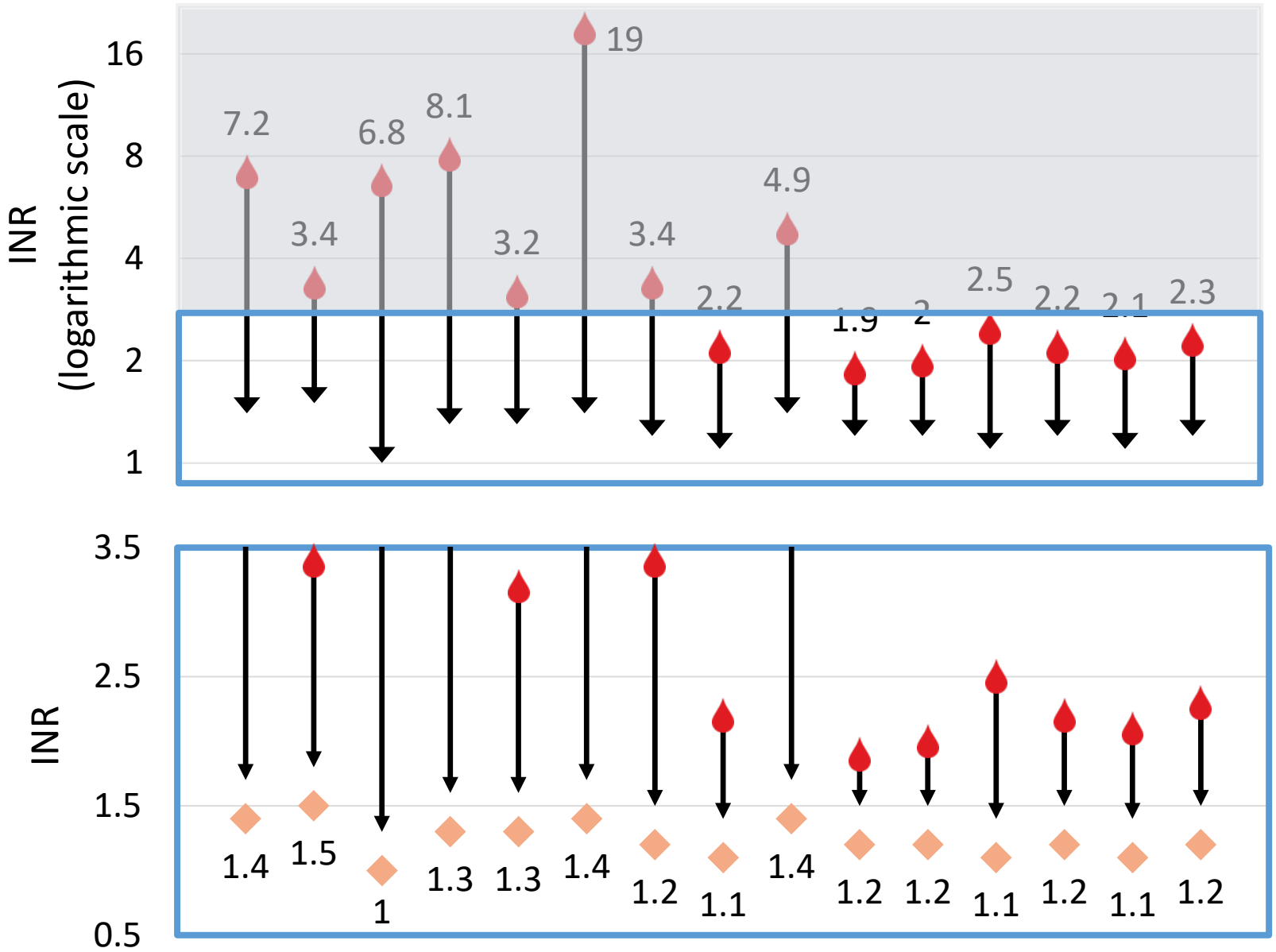
OUTCOMES

Primary

- Post-infusion

INR ≤ 1.5

WEIGHT BASED INR CHANGE

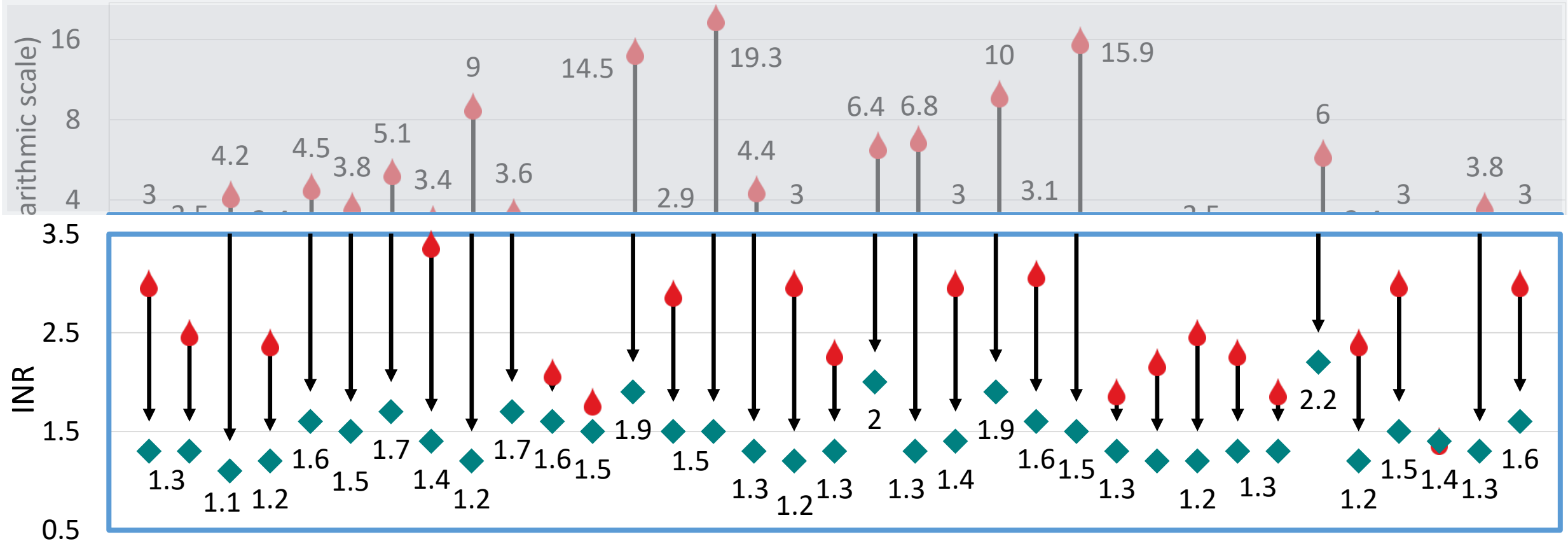


OUTCOMES

Primary

- Post-infusion INR ≤ 1.5

FIXED DOSE INR CHANGE

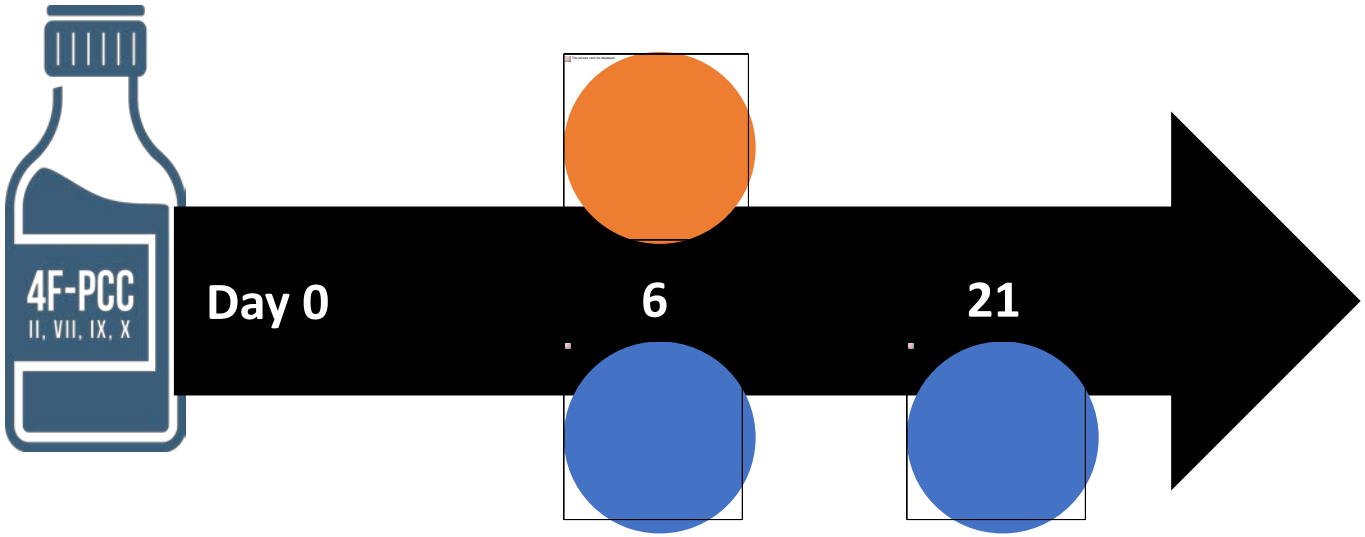


OUTCOMES

Safety

- Thromboembolic events
- Mortality

THROMBOEMBOLIC COMPLICATIONS



IN-HOSPITAL MORTALITY

13%

N=2	Mortality	N=12
8 days	Time from admit until death	15 days
4.7	INR prior to reversal	3.8
9	GCS prior to reversal	6
1.3	Post infusion INR	1.4

4%

OUTCOMES

Economic

- Cost to health system
- Cost to patient
- Time to infusion

FIXED DOSING

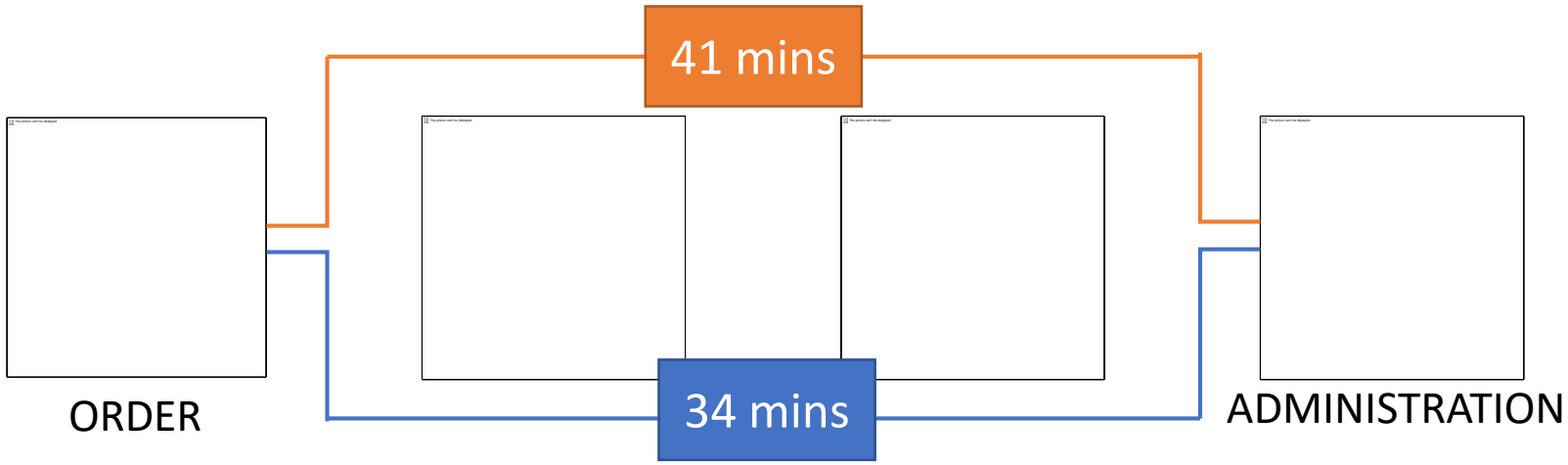
4F-PCC dose was reduced on average by 964 units

P=0.007

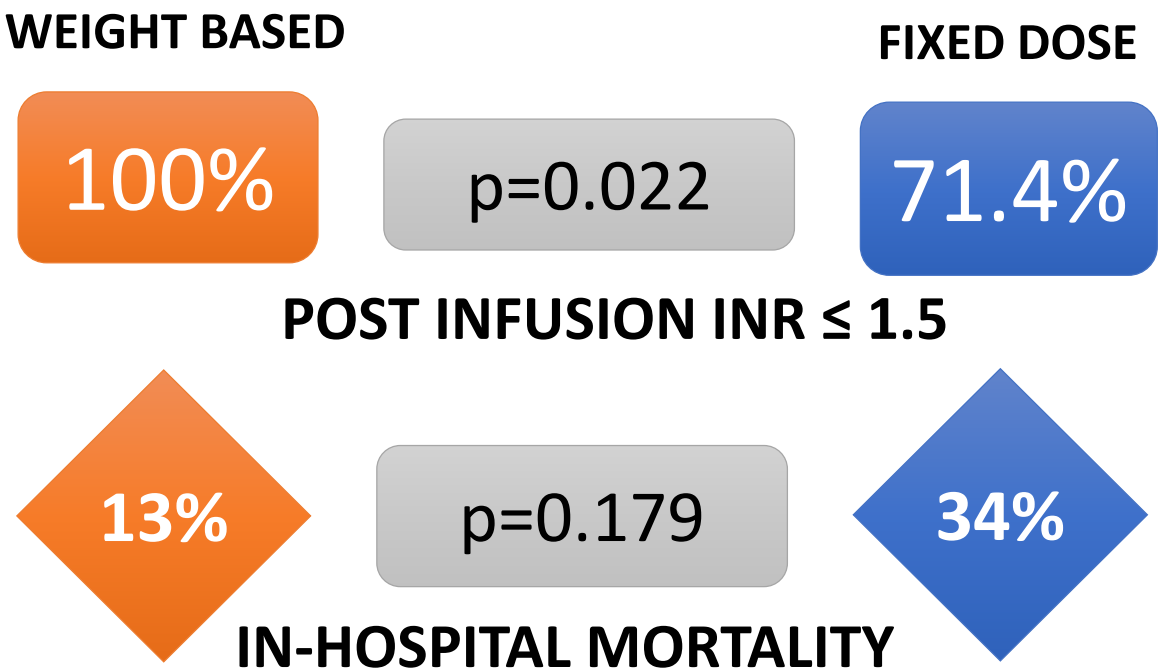
$

Drug costs were reduced on average by $6,400 per patient

P=0.009



DISCUSSION



- Differences in severity of presentation
  - Initial GCS: 15 (11-15) vs. 14 (3-15)
- INR goal may not be a true surrogate for hemostasis
  - Of the 14 patients that died, only 2 did not achieve initial INR goal
- No patients in this study received a supplemental dose of 4F-PCC

CONCLUSIONS

- Fixed dosing appears to not achieve an INR ≤ 1.5 as frequently as weight based dosing
  - This is difficult to interpret in the setting of unequal sample sizes as well as baseline severity
- No significant difference in complications or mortality
- Fixed dosing was associated with lower drug exposure and costs
- This study demonstrates comparable results to other small retrospective studies
  - Unique population of traumatically injured patients

Comparing the Effect of Prehospital Intravenous and Intranasal Midazolam Dosing on Prehospital and Emergency Room Seizure Recurrence

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MAY 25, 2021

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Background

- Intravenous (IV) lorazepam and intramuscular (IM) midazolam are guideline recommended first-line treatment options for prehospital seizures
- IV and intranasal (IN) midazolam are also valid treatment options per Los Angeles County Department of Public Health (LAC DPH) treatment protocols
- There is no strong evidence to support IV or IN midazolam use for prehospital seizure cessation
- This creates a significant disconnect between current practice and guideline recommendations
- The following study adds to a growing body of literature investigating the impact of prehospital IV and IN midazolam dosing for seizure on inpatient clinical outcomes

Objective

Objective

- To directly compare the efficacy and safety of prehospital IV and IN midazolam on prehospital and emergency department (ED) seizure recurrence

Primary Outcome

- Rate of seizure recurrence between IV and IN midazolam within 120 minutes of ED arrival

Secondary Outcomes

- Rescue AED administration, ADRs, intubations ICU admission, time to seizure recurrence, and adherence to protocolized midazolam dosing

Methods

Design

- Retrospective, observational cohort study

Setting

- Huntington Hospital between January 2016 and July 2020

Population

- **Inclusion Criteria:** Adult and pediatric patients transported by Pasadena Fire Department with documented administration of IV or IN midazolam for active seizure
- **Exclusion Criteria:** Patients who are pregnant, <1 month of age, in police custody, or have incomplete prehospital records

Methods

Treatment

- Protocolized midazolam dose is defined per LAC DPH seizure protocols
- Adult patients receive midazolam 5mg IV/IN (may repeat x1)
- Pediatric patients receive midazolam 0.1 mg/kg IV or 0.2 mg/kg IN (may repeat x1)
- To allow for 10% error, this study accepted 0.18-0.22 mg/kg IN and 0.09-0.11 mg/kg IV as per protocol dosing

Statistical Analysis

- Mann Whitney U test was used to assess continuous data and Fisher's exact test for categorical data

Results

Baseline Characteristics	IV group N=66	IN group N=44	P-value
Male, n	38 (58%)	30 (68%)	0.3184
Age, median (IQR), years	58 (35-72)	56 (26-63)	0.1083
Weight, median (IQR), kg	68 (55-79)	75 (63-90)	**0.0352**
PMH Seizure, n	31 (47%)	29 (66%)	0.0545
Etiology			
Epilepsy, n	35 (53%)	23 (52%)	0.9999
TBI, n	10 (12%)	4 (9%)	0.3981
Other, n	21 (32%)	17 (39%)	0.5406

PMH = past medical history; TBI = traumatic brain injury; IQR = interquartile

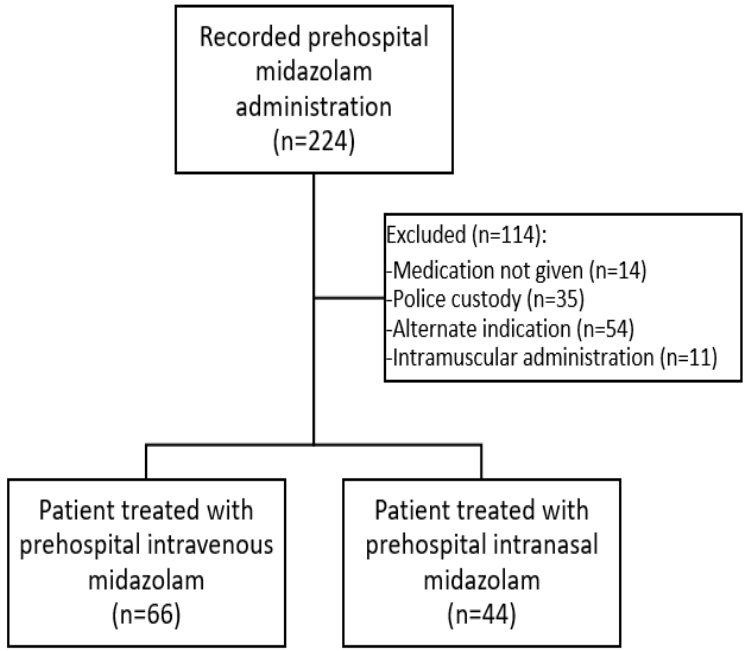

Figure 1. Patients receiving prehospital midazolam

Results

Outcomes	IV group N=66	IN group N=44	P-value
Recurrent Seizure, n	21 (31.8%)	14 (31.8%)	0.9999
Rescue AED, n	24 (36.4%)	21 (47.7%)	0.2436
ICU Admission, n	21 (31.8%)	12 (27.3%)	0.6746
Intubation, n	19 (28.8%)	11 (25.0%)	0.8273
ADRs, n	21 (31.8%)	14 (31.8%)	0.9999
Time to Seizure Recurrence, median (IQR)	34 min (21-53)	19 min (10-32)	**0.0487**
Deviations from Protocol, n	25 (38.5%)	4 (9.3%)	**0.0008**

AED = antiepileptic drug; ICU = intensive care unit; ADRs = adverse drug reactions, IQR = interquartile

Limitations

- Retrospective chart review
- Population size
- Unable to assess IM midazolam
- Limited to Pasadena, California
- Baseline weight significantly higher in IN group
- Prehospital IN administration technique

Conclusion

- Seizure recurrence rates were similar between IV and IN
- Time to seizure recurrence was significantly shorter in the IN group which likely highlights the 93% of patients who received subtherapeutic IN weight-based dosing
- Higher weight-based dosing in both groups led to improved clinical outcomes and no increase in ADRs
- There is a clear disconnect between guideline recommendations and prehospital practice
- Further research should focus on identifying the most effective IV midazolam dose and revising current prehospital protocols to allow for higher initial IN doses

Disclosure & References

The authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.

1. Glauser T, Shinnar S, Gloss D, et al. Evidence-Based Guideline: Treatment of Convulsive Status Epilepticus in Children and Adults: Report of the Guideline Committee of the American Epilepsy Society. Epilepsy Currents, Vol. 16, No. 1; January 2016 pp. 48–61.
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Thank you

- Diana Park, PharmD, BCCCP
  - Emergency Medicine Pharmacy Residency Primary Preceptor
- Huntington Memorial Hospital
- American Society of Health-System Pharmacists

- Questions?
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  - @GabiHern

Huntington Hospital

Improvement of Antibiotic Prescribing for Outpatient Community Acquired Pneumonia in the Emergency Department

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Fern Pruss, PharmD, BCPS

Madison Iman, PharmD

Lauren Ladd, PharmD

Crystal Laudermilk, PharmD

Disclosure

Disclosure statement: these individuals have the following to disclose concerning possible financial or personal relationships with commercial entities (or their competitors) that may be referenced in this presentation.

- Resident: nothing to disclose
  Sarah Jesse, PharmD

- Project director and advisors: nothing to disclose
  Patrick Blankenship, PharmD, BCPS
  Fern Pruss, PharmD, BCPS
  Madison Iman, PharmD
  Lauren Ladd, PharmD
  Crystal Laudermilk, PharmD

Background

Antimicrobial Therapy for Outpatient CAP		
	2007 Guidelines	**2019 Guidelines**
No Comorbidities	Macrolide **OR** Doxycycline	Amoxicillin **OR** Doxycycline **OR** Macrolide*
*if local resistance to *S. pneumoniae* < 25%		

❖Blount Memorial Hospital (BMH) Interventions:

- Discharge pathway optimization/implementation
  - Discharge 1-2-3™ software
- Physician-led education to ED providers

Metlay JP, et al. Am J Respir Crit Car Med. 2019.

Study Purpose & Objectives

Measure the impact of a discharge pathway and provider education on rates of appropriate antibiotic prescribing for outpatient CAP treated in the BMH ED.

Primary

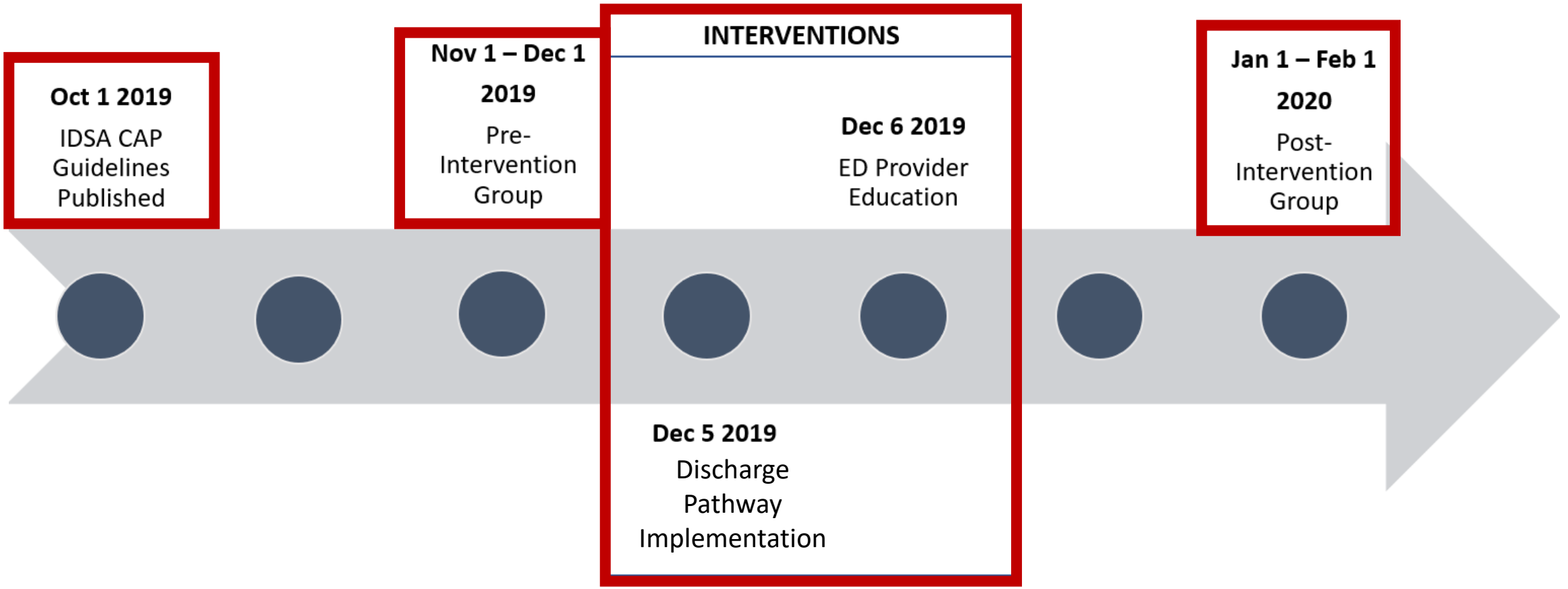
- Evaluate the difference in rates of appropriate antibiotic prescribing before and after the intervention period

Secondary

- Compare the rates of treatment failure and severe treatment-associated adverse events

Methodology

IRB-approved, single-center, retrospective, pre-post analysis



Methodology

Inclusion Criteria

- Primary discharge diagnosis of CAP
- Discharged home from ED during prespecified time periods
- Received an antibiotic prescription for CAP

Exclusion Criteria

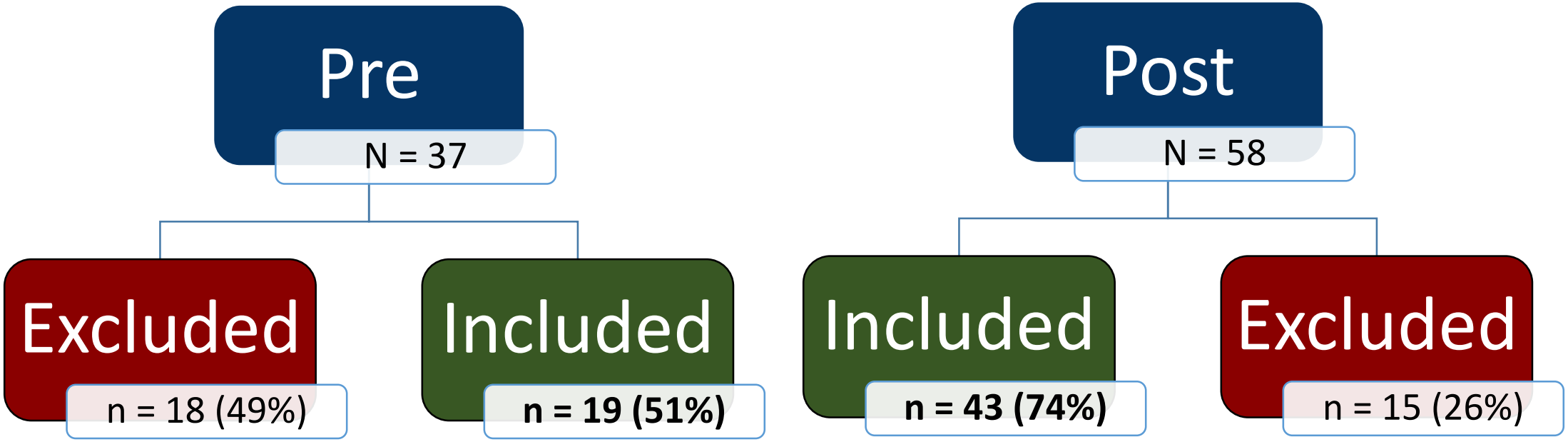
- < 18 years old
- Immunocompromised
- Already receiving antibiotics
- Missing documentation of discharge antibiotic therapy

Methodology

Data and Statistics

- Patient identification
  - ICD-10 codes
- Data collected
  - Patient demographics and comorbid disease states
  - Discharge prescription information
- Statistical analyses
  - Descriptive statistics for baseline characteristics
  - Fisher's Exact Test & 95% CI for primary outcomes

Results


Pre
N = 37
Excluded
n = 18 (49%)
Included
n = 19 (51%)
Post
N = 58
Included
n = 43 (74%)
Excluded
n = 15 (26%)

Results

Baseline Characteristics

Characteristic	Pre (n = 19)	Post (n = 43)
Female, No. (%)	16 (84)	26 (60)
Age, Median	47	49
BMI, Median	27.5	32
Comorbidity - Any, No. (%)	16 (84)	33 (77)
Hypertension	8 (42)	18 (42)
Diabetes	3 (16)	10 (23)
CHF	0 (0)	4 (9)
CAD	0 (0)	2 (5)
COPD	1 (5)	6 (14)
Asthma	2 (11)	4 (9)
Chronic Liver Disease	2 (11)	5 (12)
Chronic Kidney Disease	0 (0)	2 (5)

Results

Primary Outcome - Overall Appropriateness

Outcome	Pre (n = 19)	Post (n = 43)	Δ	95 % CI	P-value
Appropriate Therapy, No. (%)	3 (16)	13 (30)	14 % ↑	-0.07 to 0.35	0.19

Results

Secondary Outcome – Treatment Failure

Outcome	Pre (n = 19)	Post (n = 43)	95 % CI	P-value
Treatment Failure, No. (%)	1 (5)	3 (7)	-0.10 to 0.14	0.64

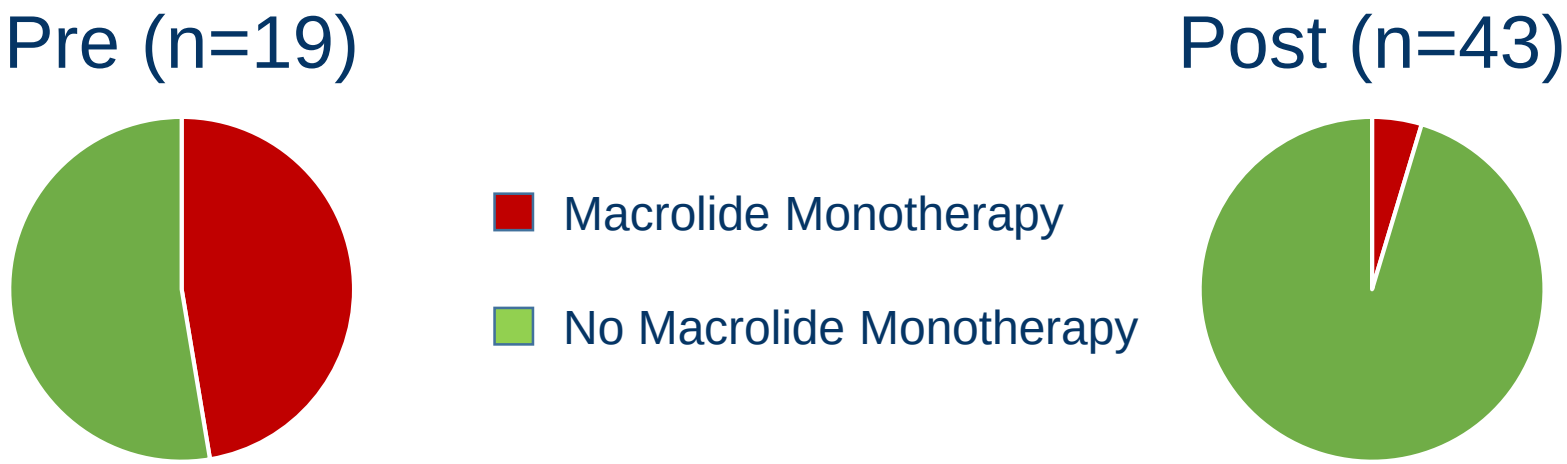
Secondary Outcome – Severe Treatment-Associated Adverse Events

- None

Results

Post hoc analyses – Macrolide Monotherapy

Outcome	Pre (n = 19)	Post (n = 43)	Δ	95% CI	P-value
Macrolide Monotherapy, No. (%)	9 (47)	2 (4)	**43% ↓**	0.2 to 0.7	<0.01



Results Summary & Discussion

- Improvement seen in overall rates of appropriate prescribing
  - 16% vs. 30%
- Statistically significant decrease in macrolide monotherapy
  - 47% vs. 4%
- No major differences in treatment failures
  - 1 patient in the pre-group and 3 in the post-group (5% vs 7%)
- No observance of any severe treatment-associated adverse events

Limitations

- Small sample size
  - Unequal cohorts
  - 2 months of data – uncertain durability of interventions
- Only BMH data
  - Unable to determine if admitted to another facility/ED
  - No access to outpatient prescription fill data
  - Only assessed for adverse events that would have resulted in another ED visit or hospital admission

Conclusions & Future Directions

- Implementation of a discharge pathway + provider education was associated with a nonsignificant increase in appropriate prescribing for outpatient CAP treated in the ED
- Further analyses/interventions should be explored

References

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GraphPad QuickCalcs Web-site. Accessed Feb 2021.


Thank You!
Questions?
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Assessment of the Time to First Antibiotic Dose for Patients Presenting with Febrile Neutropenia in the Emergency Department

Kristin Liveris, PharmD
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June 9, 2021

Background

Fever is often the first sign of an underlying infection in patients undergoing cytotoxic chemotherapy.

This complication of cytotoxic chemotherapy carries a high mortality rate, especially for patients with multiple comorbidities.

Due to increased mortality in these patients, various guidelines have endorsed prompt delivery of broad spectrum antibiotics after presentation.

Many of these patients present to the Emergency Department after detecting a fever at home.

Several factors and logistic barriers to care make the prompt initiation of broad spectrum antibiotics difficult in the Emergency Department.

Objective

To determine compliance to National Comprehensive Cancer Network (NCCN) and Infectious Disease Society of America (IDSA) febrile neutropenia guidelines in regard to first antibiotic dose, appropriate empiric antibiotic selection, and appropriate blood collection for culture results.

Methodology

- Single-center retrospective chart review
  - Catholic Health Initiatives (CHI) Memoria
    - 369 bed, community-based hospital

- Inclusion Criteria
  - Age > 18 years old
  - Cytotoxic chemotherapy within prior 30-
- Exclusion Criteria
  - Direct admission
  - Neutropenia attributed to other causes
  - Subjective fever, not confirmed upon triage

Baseline Characteristics

Category	N	%
Gender		
Female	10	45%
Male	12	54%
Age (in years)		
40—50	2	9%
50—60	1	4%
60—70	6	27%
70—80	11	50%
80—90	2	9%
Cancer Type		
AML	4	18%
APL	1	4%
Breast Cancer	6	27%
Lung Cancer	3	13%
Lymphoma	4	18%
Myelodysplastic Syndrome	3	13%
Neuroendocrine Carcinoma	1	4%

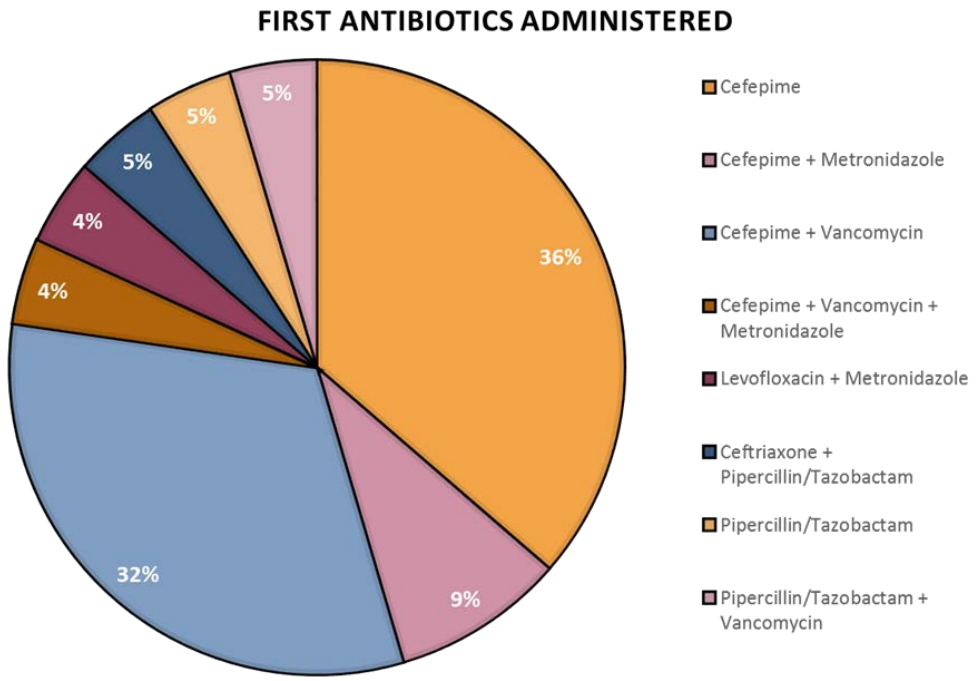
Results

35 admissions for Febrile Neutropenia during study

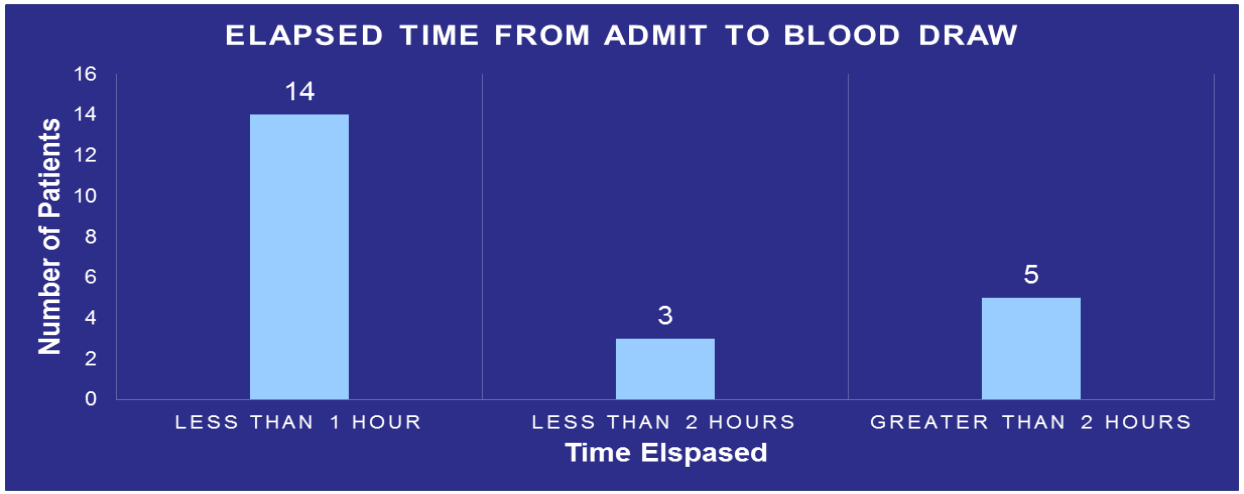
3 patients excluded with Febrile Neutropenia attributed to a cause other than chemotherapy

10 Patients excluded due to subjective fever not confirmed at admission

22 Patients included



Results



Time To First Antibiotic Administration		
Average Time to First Antibiotic Administration	3 hours, 34 minutes	Patients that received antibiotics within 90 minutes = 4 (18%)
Median Time to First Antibiotic Administration	2 hours, 19 minutes	

Conclusions

- Labs were drawn within one hour for 63% of patients. Only 18% of patients received antibiotics within 90 minutes of presentation.
- The most common antibiotic used for the empiric treatment of febrile neutropenia was cefepime.
- Most patients received appropriate broad-spectrum antibiotics.
- Educational opportunity exists for prompt initiation of laboratory blood draws and delivery of broad-spectrum antibiotics in these patients.

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UNIVERSITY OF IOWA HEALTH CARE

Evaluation of prophylactic antibiotics for open fractures in trauma patients

Briana Negaard, PharmD

PGY2 Emergency Medicine Pharmacy Resident

June 3, 2021

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CHANGING LIVES.®

Disclosures

- Research Team
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  - Brett Faine, PharmD, MS
  - Poorani Sekar, MD
  - Morgan Kimball, PharmD Candidate
  - Caelee Batterson, PharmD Candidate
  - Anne Zepeski, PharmD, BCPS
- Research Site: University of Iowa Hospitals & Clinics
- No financial interest or affiliation concerning material discussed in this presentation

Background – Gustilo-Anderson Classification

- Open fracture – fractured bone is exposed to the external environment via a traumatic violation of the skin/soft tissue

	Type I	Type II	Type III	Type III with Contamination
Wound Size	< 1 cm	1-10 cm	> 10 cm	> 10 cm
Soft Tissue Damage	Minimal	Moderate	Extensive	Extensive
Vascular Injury	No	No	Possible	Possible
Incidence of Wound Infections	0-2%	2-10%	10-50%	

Indian J Orthop. 2008 Oct;42(4):377-86
J Bone Joint Surg Am. 1990 Feb;72(2):299-304
Clin Orthop Relat Res. 2012 Nov; 470(11): 3270–3274

Background – Institutional Protocol

Fracture	Antibiotic	Duration
Type I and II	**Cefazolin** 2 g (3 g if >120 kg) • Severe beta-lactam allergy: Clindamycin 900 mg	24 hours
Type III	**Cefazolin** 2 g (3 g if >120 kg) + **Gentamicin** 5 mg/kg • Severe beta-lactam allergy: Clindamycin 900 mg + Gentamicin 5 mg/kg	72 hours or 24 hours after wound closure, whichever is shortest
Type III with gross contamination	**Cefazolin** 2 g (3 g if >120 kg) + **Gentamicin** 5 mg/kg + **Penicillin G** 5 million unit bolus then 18 million units/24 hr infusion • Severe beta-lactam allergy: Clindamycin 900 mg + Gentamicin 5 mg/kg	72 hours or 24 hours after wound closure, whichever is shortest
If known MRSA colonization: add vancomycin Administer antibiotic(s) within **1 hour** of presentation to ED		

Methods

- Purpose: assess the use of prophylactic antibiotics for open fractures in trauma patients at our institution
- Retrospective observational cohort study
  - Trauma patients presenting to the ED from 1/1/17 to 8/19/20

Inclusion:

- Long-bone fracture
- ICD-10 diagnosis code including “open fracture”

Exclusion:

- <18 years old
- Transferred from an outside facility
- Discharged directly from the ED

Outcomes

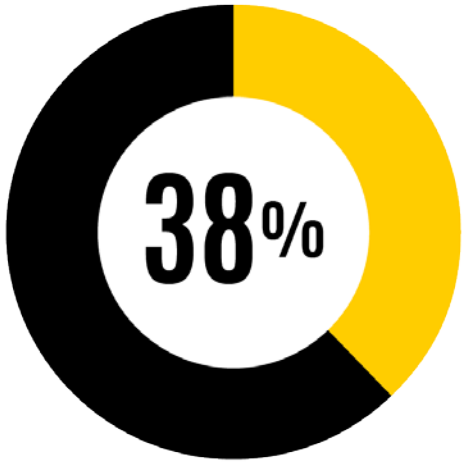
Primary Outcome

- Adherence rate to the prophylactic antibiotic protocol
  - Adherence = correct antibiotic and dose within goal time

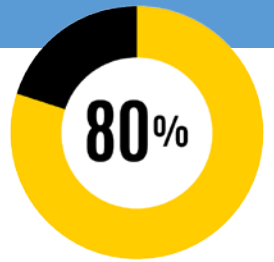
Secondary Outcomes

- Duration of antibiotic therapy
- Open fracture infections at 90 days

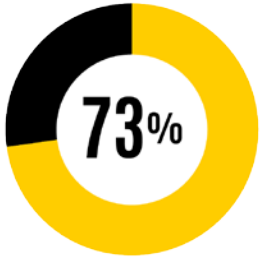
Results – Protocol Adherence



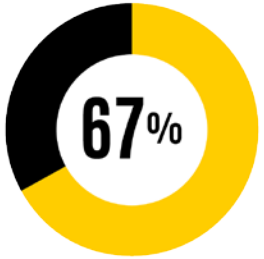
Overall Protocol Adherence (n=44)



Correct Antibiotic Selection (n=93)



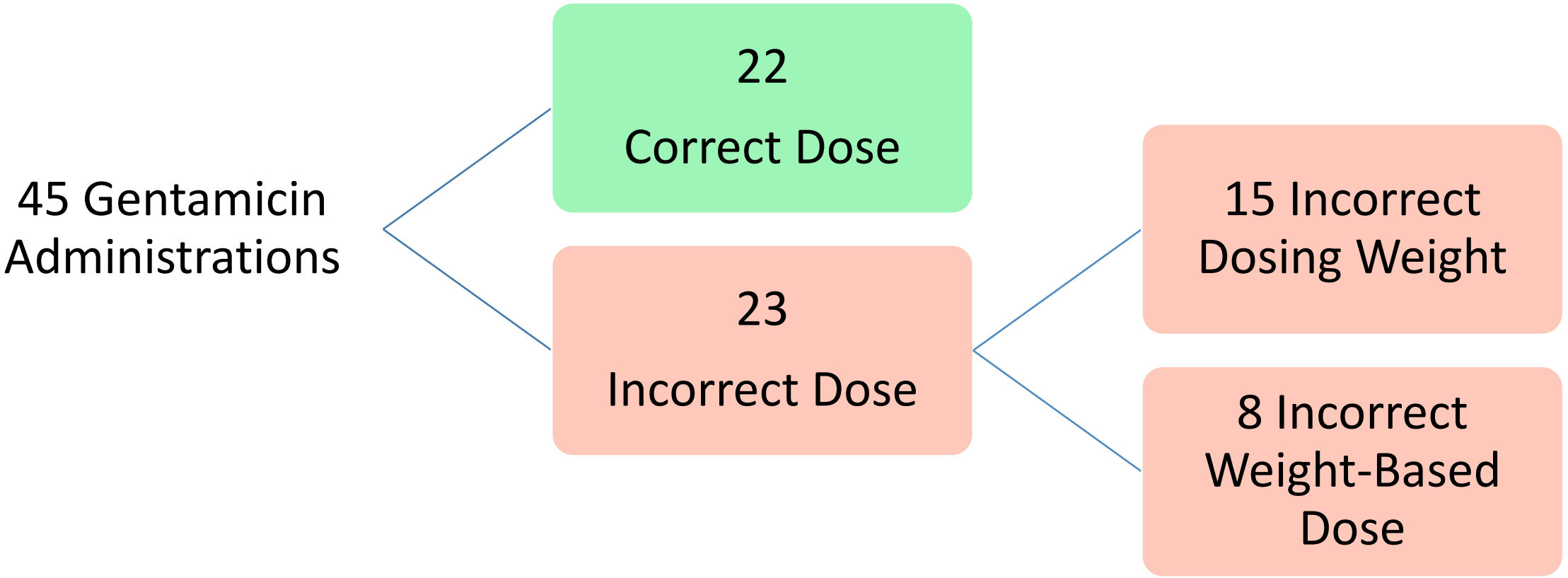
Correct Antibiotic Dose (n=85)



Time to Initiation within 1 Hour (n=78)

Results – Gentamicin

Median time to gentamicin i administration = 1:46



Results – Wound Infections

15 Wound Infections at 90 Days

Fracture Type		Protocol Adherence	
Type I/II: **4**	Type III: **11**	Yes: **5**	No: **10**

Discussion

Medication Availability

- Cefazolin administered first in 98%
  - Cefazolin stocked in ED
- Gentamicin and penicillin G not stocked in ED
  - Can lead to potential delays in treatment

Familiarity with Medication

- Low utilization of gentamicin and penicillin G in the ED
- Gentamicin
  - Specific dosing weight

Discussion

Fracture Type	Example 1	Example 2	Example 3	Current UIHC Protocol
Type I and II	Cefazolin	Cefazolin	Cefazolin	Cefazolin
Type III	Ceftriaxone	Ceftriaxone	Piperacillin/Tazobactam	Cefazolin + Gentamicin
Type III with gross contamination	Ceftriaxone + Metronidazole	Ceftriaxone + Metronidazole + Penicillin G	Piperacillin/Tazobactam	Cefazolin + Gentamicin + Penicillin G
Type III with standing water contamination	Piperacillin/Tazobactam	Piperacillin/Tazobactam	Piperacillin/Tazobactam	Cefazolin + Gentamicin

Limitations

- Retrospective study
- Single center study
- Large number of excluded patients that were transferred to our institution
- Did not power our study to evaluate for changes in outcomes

Conclusion

Our antibiotic prophylaxis guidelines were followed in the minority of patients which was largely driven by **time to first antibiotic**

Factors identified that may contribute to delays in antibiotic administration include **antibiotic accessibility** and **familiarity** with antibiotic dosing and administration

Vasopressor Initial Dosing Impact on Survival and Cardiac Re-Arrest Likelihood

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FROEDTERT & THE MEDICAL COLLEGE OF WISCONSIN

FROEDTERT HOSPITAL

JUNE 2021

Froedtert & Medical College of Wisconsin

Background

- In the United States, cardiac arrest occurs in approximately **350,000** patients each year outside the hospital setting
- Current ACLS guidelines recommend maintaining a mean arterial pressure (MAP) of **≥65mmHg** once ROSC is achieved
- A general starting dose of **0.05-0.5 mcg/kg/min** for norepinephrine (NE) and epinephrine (EPI) infusions is recommended
- Risks to both **aggressive** and **cautious** initial dosing of vasopressors

Background

- Risks of aggressive initial dosing of vasopressors

Peripheral Ischemia	Malignant Hypertension	Cardiac Dysrhythmias

- Risks of cautious initial dosing of vasopressors

Inadequate hemodynamic support	Cardiac re-arrest	Increased mortality rate

Project Outcomes

Primary Outcome

- Incidence of cardiac re-arrest within one hour of initiating vasopressor

Secondary Outcomes

- Need for second vasopressor in ED
- Percent of MAPs at goal in ED
- Incidence of malignant hypertension (SBP≥180mmHg) in ED
- Incidence of arrhythmia after vasopressor initiation
- Survival to ICU admission
- Survival to hospital discharge

Methods

- Study design
  - Single center, retrospective medical record analysis
  - Patients sorted into one of four groups based on initial dose of NE or EPI

LOW	MEDIUM
<0.25 mcg/kg/min	0.25 – 0.49 mcg/kg/min
HIGH	**VERY HIGH**
0.5 – 0.99 mcg/kg/min	≥1 mcg/kg/min

- Study period: November 2015 to November 2020 to align with a single ACLS cycle

Methods

- Study design
  - Single center, retrospective medical record analysis
  - Patients sorted into one of four groups based on initial dose of NE or EPI

LOW	MEDIUM
<0.25 mcg/kg/min	0.25 – 0.49 mcg/kg/min
HIGH	**VERY HIGH**
0.5 – 0.99 mcg/kg/min	≥1 mcg/kg/min

- Study period: November 2015 to November 2020 to align with a single ACLS cycle

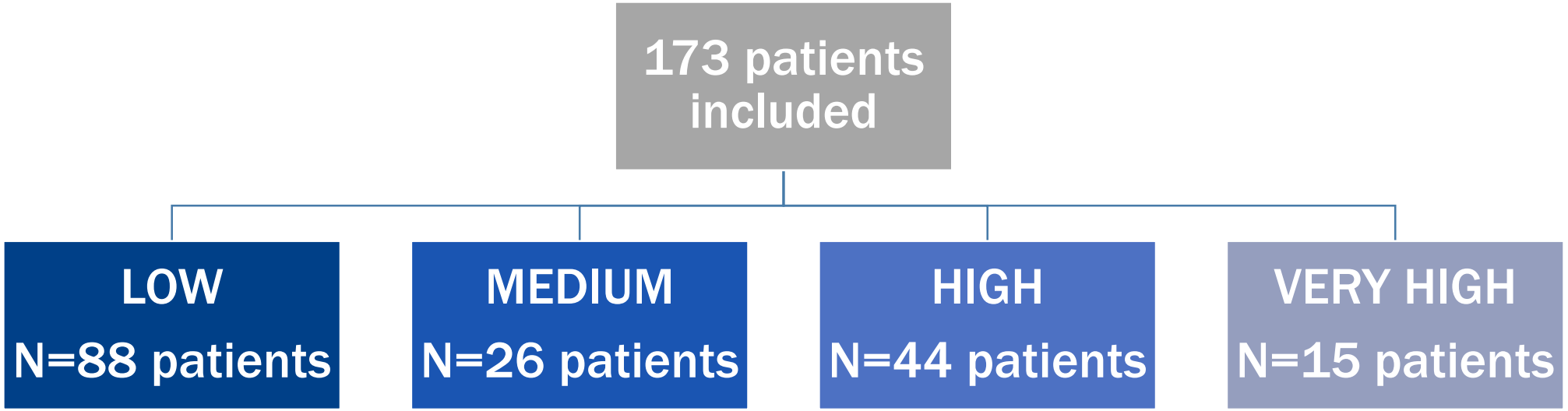
Inclusion Criteria (all 4 criteria must be met)

- Age ≥18 years
- Cardiac arrest prior to arrival or within the ED
- ROSC achieved
- Started on NE or EPI infusion within1 hour post-ROSC

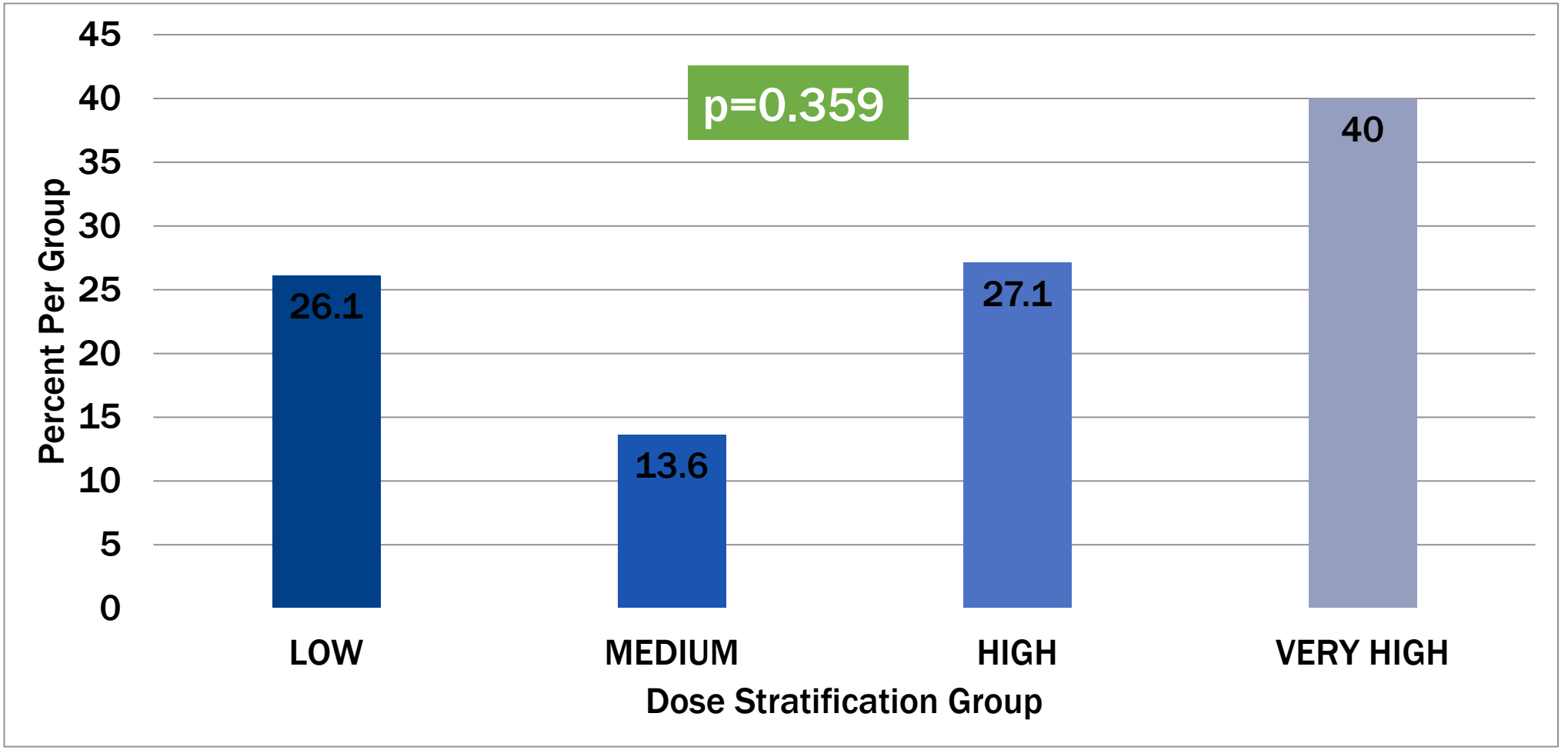
Exclusion Criteria (any criteria may be met)

- Age <18 years
- Pregnant
- Do not resuscitate (DNR) status
- Transfer from another institution
- Vasopressor started >1 hours post-ROSC
- Any vasopressor started prior to ED arrival

Results



Results



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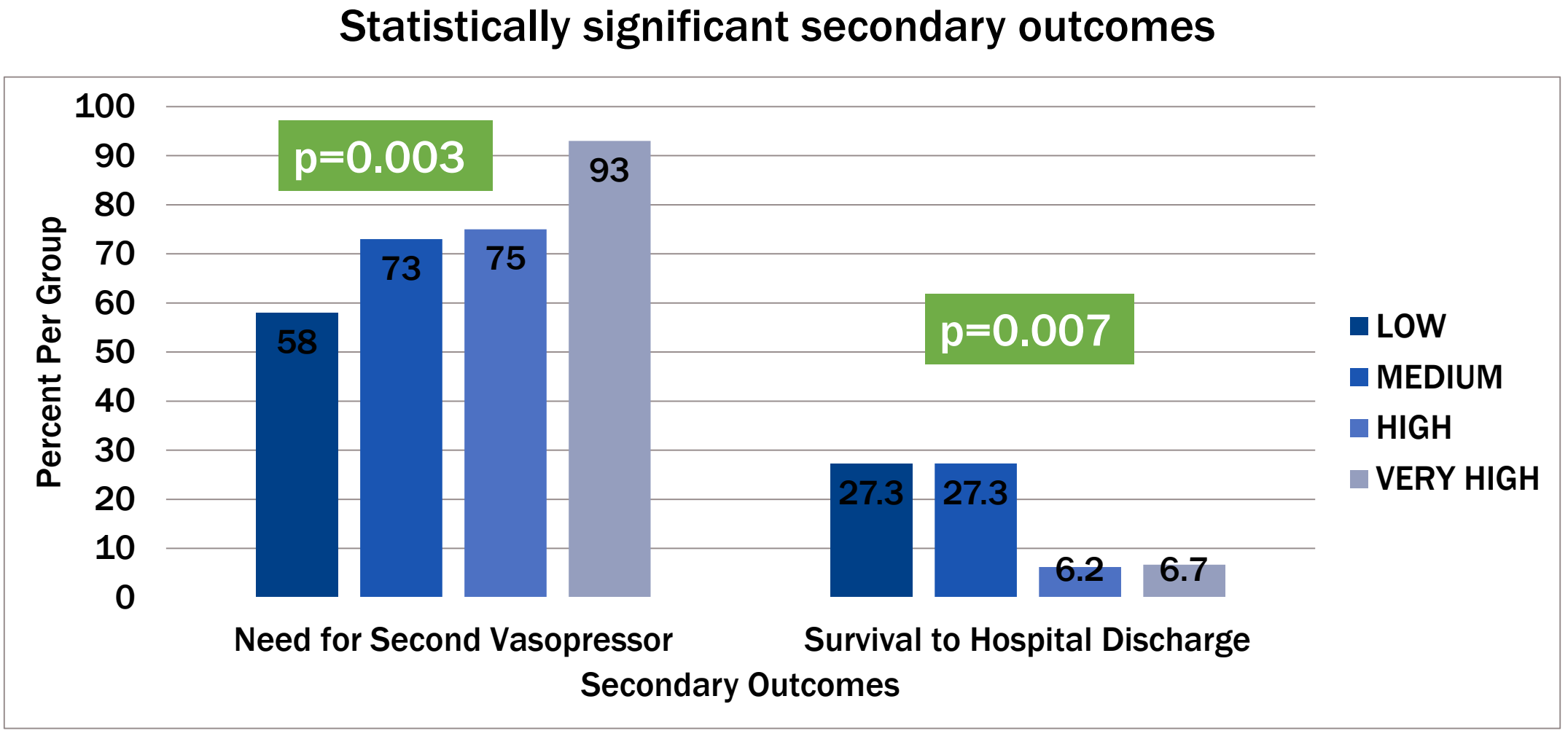
Results



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Discussion

- **No difference** in the primary outcome

- Patients receiving high initial doses
  - More likely to require a second vasopressor
  - Less likely to survive to hospital discharge
  - No increased risk of malignant hypertension or arrhythmia

- Limitations
  - Single-center, retrospective study with small number of patients
  - Inconsistent charting of initial ROSC date/time by EMS

Conclusions

- Patients receiving higher initial doses of vasopressors ***appeared*** to be significantly more ill and were **less likely to survive** despite similar rates of cardiac re-arrest

- Larger studies need to be run to determine optimal initial dosing strategies in this patient population

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- Chetna Patel, PharmD
- Danielle Mabrey, PharmD, BCCCP

QUESTIONS

Thank you for attending!

- No CE credit is offered for this activity.
- Please send any remaining questions to sections@ashp.org
- Register for the **Emergency Medicine Research: A Review of Resident Research Session #2 on July 17th at** https://register.gotowebinar.com/register/3866535308632605710

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