2019 ASHP Midyear Clinical Meeting Roundtable/Poster Session Summary:

Emergency Medicine

Section of Clinical Specialists and Scientists
Section Advisory Group on Emergency Medicine

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This is a compilation of the Posters presented at the Emergency Medicine Roundtable/Poster Session at the ASHP Midyear Clinical Meeting 2019 in Las Vegas, Nevada. Inclusion in this document does not imply endorsement by ASHP, the ASHP Section Advisory Group on Emergency Medicine, or it's members.

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A Comparison of Mortality with the Use of Succinylcholine or Rocuronium During Intubation in Traumatic Brain Injury Patients in the Emergency Department

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FROEDTERT & THE MEDICAL COLLEGE OF WISCONSIN | FROEDTERT HOSPITAL | MILWAUKEE, WI

Froedtert & Medical College of Wisconsin

Background

Rapid sequence intubation (RSI) is a frequently utilized technique to manage compromised airways, most commonly with the use of succinylcholine or rocuronium

Succinylcholine may cause an increase in intracranial pressure (ICP) which could be detrimental in traumatic brain injury (TBI) patients

Patanwala, et al. compared in hospital mortality rates of patients with TBI who received a paralytic agent for intubation and concluded:

- No difference in mortality in the overall population
- Increase in in-hospital mortality for severe TBI patients when succinylcholine was used

At our institution, both succinylcholine and rocuronium are used during RSI, including during intubations for TBI patients

This study was developed to compare mortality rates with the use of rocuronium versus succinylcholine during RSI in patients with traumatic brain injuries at Froedtert Hospital

Outcomes

Primary Outcomes:

- In hospital mortality in TBI patients intubated with succinylcholine versus rocuronium

Secondary Outcomes:

Survival at 30 days	ICU length of stay for survivors	ICU length of stay for nonsurvivors
Mortality outcomes based on type of TBI	Mortality outcomes based on severity of TBI	Functional outcomes based on modified Rankin scale

Design & Methods

Design:

- Single-center retrospective cohort study

Intervention:

- Use of succinylcholine or rocuronium for rapid sequence intubation of traumatic brain injury patients

Study Period:

- Patient data collected from 8/31/2017 to 8/31/2019

Inclusion Criteria

- Diagnosis of TBI
- Intubated in the emergency department
- Utilization of succinylcholine or rocuronium

Exclusion Criteria

- <18 years of age
- Intubated in the field or outside hospital
- Intubated without the use of a paralytic
- Cardiac arrest prior to intubation
- Paralytic use outside of RSI
- Received more than one paralytic
- Lack of available data

Definitions

TBI – structural injury and/or physiological disruption of brain function indicated by:

- Loss of consciousness/amnesia
- Altered mental status
- Neurological deficits
- Intracranial lesions

Hypotension – systolic pressure <90 mmHg

Hypoxia – oxygen saturations < 90%

Documentation of elevated ICP:

- Clinical characteristics (e.g. nonreactive dilated pupils)
- Treatment with hyperosmolar therapy
- ICP measurement >22 mmHg

Does choice of *paralytic agent* during intubation **increase mortality** rate in *traumatic brain injury*?

Data Collection

Patient Characteristics	Injury Characteristics	ED Management
• Sex • Age • Weight • Charlson Comorbidity Index • Admitting ICD-9 or 10 code	• Alterations in consciousness • Type of TBI • Injury Severity Score • Head Abbreviated Injury Score	• Hypoxic episodes • Hypotensive episodes • Resuscitation methods • Induction and paralytic agent dose

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2. Rocuronium package insert. Teva Pharmaceuticals, Inc. Rocuronium bromide injection solution package insert. Irvine, CA; 2018.
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Future Directions

Present results to emergency medicine providers at Froedtert Hospital and pharmacists at the Pharmacy Society of Wisconsin Educational Conference

Evaluate for further publication

Develop potential exclusion criteria for specific patient populations

A Comparison of Mortality with the Use of Succinylcholine or Rocuronium During Intubation in Traumatic Brain Injury Patients in the Emergency Department
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University of Vermont MEDICAL CENTER

diltiazem for rate control in atrial fibrillation

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Background

Atrial fibrillation with rapid ventricular response (Afib RVR) is a common dysrhythmia encountered in the emergency department (ED)

Current guidelines recommend IV metoprolol or diltiazem for rate control[1]

Despite evidence supporting the efficacy & safety of weight-based (WB) IV diltiazem at a dose of 0.25 mg/kg, lower fixed-doses (FD) of 10-15 mg are commonly used.[2,3]

The objective of this study is to characterize the use of WB vs. lower FD IV diltiazem for Afib RVR, evaluate the effectiveness for heart rate control, and identify adverse events in our ED

Study Design

Retrospective chart review of adult patients that received IV diltiazem for rate control in the ED from August 1st, 2018 to August 31st, 2019

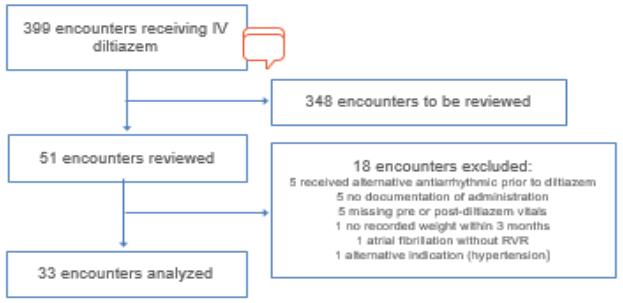
Primary Efficacy Endpoint: Rate control* at 15 minutes (min.)

Secondary Endpoints:

- Rate control* at 30 and 60 min.
- Transition to definitive rate control agent (oral or IV infusion)
- Failure to achieve rate control or progression within 60 minutes (repeat dosing, alternative agent, &/or emergent cardioversion)
- Incidence of hypotension (systolic blood pressure [SBP] <90 mmHg)
- Incidence of bradycardia (HR <60 beats per minute [BPM])

*HR<110 BPM, >20% reduction, &/or conversion to normal sinus rhythm

Preliminary Study Cohort: Inclusion & Exclusion



Approved by The UVMMC Institutional Review Board

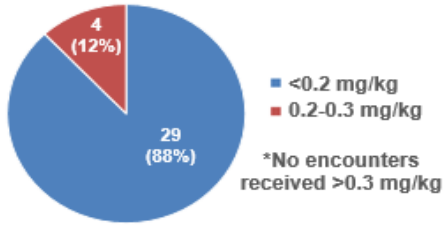
Preliminary Baseline Characteristics

Characteristics		Encounters (n=33)
Age – years (IQR)		71 (60, 79)
Male (%)		19 (58)
Weight – kg (IQR)		76.2 (70.3, 102.1)
Past medical history – No. (%)	Hypertension	20 (61)
	Diabetes	7 (21)
	CHF	11 (33)
Home medications – No. (%)	CCB	7 (21)
	β-blocker	16 (48)
	Other antiarrhythmic	3 (9)
Baseline vitals – mean (IQR)	HR (BPM)	139 (122, 149)
	SBP (mmHg)	128 (113, 142)

IQR= interquartile range, CHF= chronic heart failure, CCB= diltiazem or verapamil, HR=heart rate, BPM= beats per minute; SBP=systolic blood pressure

Diltiazem Prescribing Practices

Initial Weight-Based IV Dose



Median initial dose (IQR):
10 mg (10, 15)

*No encounters received >0.3 mg/kg

Transition to Definitive Rate Control

	<0.2 mg/kg (n=29)	0.2-0.3 mg/kg (n=4)
Transitioned to oral – No. (%)	5 (17)	2 (50)
Transitioned to infusion– No. (%)	7 (24)	1 (25)

Adverse Effects

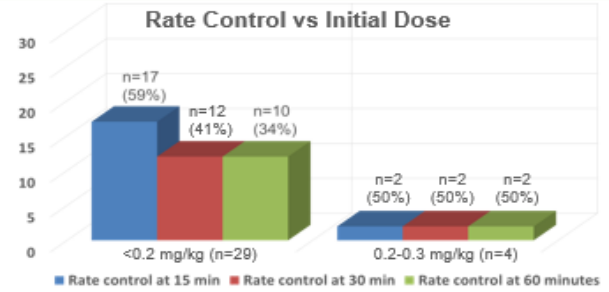
Two (6%) experienced hypotension after initial dose

- 1 after <0.2 mg/kg and 1 after 0.2-0.3 mg/kg doses

No encounters in any group experienced bradycardia

Preliminary Efficacy Endpoints

Rate Control vs Initial Dose



Failure or Progression Within 60 Minutes

		<0.2 mg/kg (n=29)	0.2-0.3 mg/kg (n=4)
Any failure or progression – No. (%)		20 (69)	3 (75)
Individual endpoints – No. (%)	Repeat IV doses	11 (38)	1 (25)
	Alternative antiarrhythmic	3 (10)	0 (0)
	Electrical cardioversion	4 (14)	1 (25)

Events are not mutually exclusive

Limitations

The retrospective study design in a single center may not allow for generalizability of study results to other healthcare institutions

Lack of documentation or missing data within electronic health record.

Interpretation of dose-response confounded by repeat dosing (IV, oral), alternative antiarrhythmic, and electrical cardioversion

Variation in computerized interpretation of HR v.s. electrocardiogram rate

Interpretation and Future Directions

Preliminary results of this study found that lower doses were associated with sufficient rate control in the majority of encounters. Few encounters received an initial diltiazem dose of 0.2-0.3 mg/kg. Failure was common and adverse effects associated with diltiazem were rare

Final data collection and analysis is to be completed in early 2020. Results to be disseminated internally and utilized for review of institutional guidelines and electronic medication orders

Selected References

[1] January, et al. 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation. Circulation. 2014;130:e199-267
[2] Dougherty, et al. Acute conversion of paroxysmal supraventricular tachycardia with intravenous diltiazem. Am J Cardiol. 1992;70:567-62
[3] Ross et al. Comparison of weight-based dose vs. standard dose diltiazem in patients with atrial fibrillation presenting to the emergency department. J Emerg Med. 2016;51(4):440-46

Characterization of institutional practices, efficacy, and safety of weight-based vs. fixed-dose diltiazem for rate control in atrial fibrillation
Eli Philips, PharmD, Kyle DeWitt, PharmD, BCPS; Blake Porter, PharmD, BCPS

Effect of methocarbamol on opioid consumption in patients with traumatic rib fractures

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Background

- Rib fractures have a substantial impact on injury-related morbidity in the United States and account for 4 – 12 % of trauma admissions.[1,2]
- Providing early pain relief for management of rib fractures is essential to help prevent complications.
- Traditional pain control heavily relies on opioid analgesics.
- Use of non-opioid adjuncts as part of a multimodal pain management may have an opioid sparing effect in acute pain management following rib fractures.[1]
- Methocarbamol may provide pain relief and help relax muscles in the chest, decreasing pain and preventing complications.
- Few studies have been published regarding use of methocarbamol and its effects on pain management in traumatic injuries.
- Currently there is a gap in the literature regarding whether methocarbamol has benefits in reducing opioid consumption for management of rib fractures.

Objective

- To assess whether the addition of methocarbamol to the rib fracture protocol reduces the amount of opioids consumed during the first 48 hours of hospital stay.

Hypothesis

The addition of methocarbamol to rib fracture pain management will reduce the amount of opioid consumption.

Study Outcomes

Primary	Secondary
• Evaluate opioid consumption in morphine equivalents (ME) in patients with rib fractures who received methocarbamol compared to those who did not receive methocarbamol	• Evaluate factors associated with ME use in rib fracture patients including methocarbamol dose, route, and frequency • Evaluate the effect of methocarbamol on hospital and ICU LOS for patients with rib fractures

Methods

- Study Design: Single center, retrospective chart review
- Inclusion Criteria: age ≥ 18 years, rib fracture(s) due to a traumatic injury
- Exclusion Criteria: Rib fractures secondary to cardiac arrest, patients receiving buprenorphine-containing products or methadone for addiction management, transferred from an outside facility, hospital LOS ≤ 48 hours, pregnant, incarcerated, surgery within 48 hours

Data Analysis

- Data will be analyzed using SSPS statistical software
- Primary outcome will be analyzed with Mann-Whitney U or independent t-test
- Other outcomes will be analyzed with descriptive statistics and linear regression

Data To Be Collected

Patient Demographic Data	Patient Specific Data	Rib Fracture Data	Medication Use	Concomitant Therapy Received	Complications
• Age • Gender • Ethnicity • Admission weight and height	• History of renal dysfunction or COPD • Serum creatinine • Opioid use prior to admission • Anaphylactic opioid/codeine allergy • Hospital and ICU LOS	• Type of trauma • Number of rib fractures • Unilateral or bilateral fractures	• Rib fracture PowerPlan use • Methocarbamol treatment regimen • Discharged with methocarbamol • Discharged with opioids	• Nonsteroidal anti-inflammatory agents • Acetaminophen • Gabapentin • Cyclobenzaprine • Topical Lidocaine • Opiate use in morphine equivalents	• Pneumonia • Pneumothorax • Atelectasis • Mechanical ventilation • Mortality

Definitions

ICU: intensive care unit
LOS: length of stay
COPD: chronic obstructive pulmonary disease

References

1. Fabricant L, et al. *Am J Surg*. 2013;205(5):511-516.
2. Sharma OP, et al. *American Surg*. 2008;74:310-4.

Disclosures: The authors of this study have nothing to disclose concerning possible financial or personal relationships with

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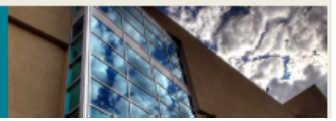

Effect of methocarbamol on opioid consumption in patients with traumatic rib fractures
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Evaluation of a take-home naloxone kit program for opioid overdose patients discharged from the emergency department

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Background

- Opioids are psychoactive substances that are derived from the opium poppy or developed as synthetic analogues. When ingested, these agents have the ability to cause respiratory depression and death.[1]
- The Centers for Disease Control and Prevention reported that Emergency Department (ED) visits for suspected opioid overdoses (OD) increased by 30% in the United States between July 2016 and September 2017.[2]
- In 2017 alone, approximately 68% of all drug overdose deaths were attributed to opioids.[3]
- The opioid epidemic continues to rise substantially, leading healthcare professionals to seek innovative and life-saving methods to aid in combatting the current crisis.
- Naloxone is a relatively inexpensive and effective medication that works by displacing opioids from the mu receptors.[4]
- Timely administration of naloxone during an opioid overdose has the ability to completely reverse the effects of opioids and reduce associated mortality.[1]

Purpose

- To evaluate the effectiveness of a take-home naloxone kit program implemented for opioid overdose patients discharged from the ED.
- To assess provider uptake of the program and opioid prescribing patterns in the ED.

Methods

- An IRB-approved retrospective cohort study was conducted to compare pre- and post-implementation effects of a take-home naloxone kit program.
- The pre-implementation period included patients from June 2018 through November 2018, and the post-implementation period included patients from January 2019 through June 2019.
- All patients 18 years and older who presented to the ED at a single institution for an opioid overdose in the defined study periods were included.
- Patients were determined to have an opioid overdose if they stated the overdose was due to an opioid or if a urine toxicology screen was positive for an opioid in the ED.
- A total of 145 patients were included.

Outcomes

- Outcomes of interest, comparing the pre- and post-implementation periods, included the number of opioid overdoses, the percentage of opioid overdose deaths, ED length of stay (LOS), hospital admission rates, and the percentage of patients who re-presented to the ED for an opioid overdose within 90 days of the inclusion event.
- The percentage of opioid overdose patients who received a take-home naloxone kit in the post-implementation period was evaluated.
- The percentage of new opioid prescriptions for all patients discharged from the ED was also examined.

Patient Demographics

	Pre-Implementation (n=86)	Post-Implementation (n=59)
Female, n (%)	29 (33.7)	20 (33.9)
Age in years*	32 (27.0-39.0)	32 (28.0-38.5)
Weight in kg*	81.2 (68.0-90.7)	81.6 (72.4-91.4)
Race, n (%)		
White	64 (74.4)	45 (76.3)
Black	17 (19.8)	7 (11.9)
Other	5 (5.8)	7 (11.9)
OD opioid, n (%)		
Heroin	57 (66.3)	36 (61.0)
Oxycodone	6 (6.9)	5 (8.5)
Fentanyl	3 (3.5)	5 (8.5)
Other	7 (8.1)	6 (10.2)
Unknown	13 (15.1)	7 (11.9)
Naloxone in mg*		
Amount PTA	2 (0.0-4.0)	2 (0.0-4.0)
Amount in ED	0 (0.0-1.9)	0 (0.0-0.4)
Total received	4 (2.0-6.0)	4 (2.0-4.0)
Opioid on PTA med list, n (%)	7 (8.1)	9 (15.3)

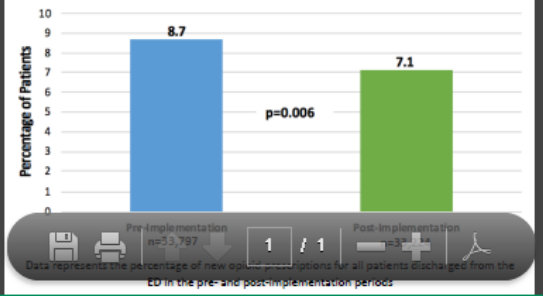
*median (IQR)
PTA- Prior to admission
No significant between group differences in regards to patient demographics existed

Results

	Pre-Implementation (n=86)	Post-Implementation (n=59)
Opioid OD deaths, n (%)	0 (0.0)	0 (0.0)
ED LOS in minutes, median (IQR)	172 (116.3-246.9)	159 (111.0-207.0)
Hospital admission rate, n (%)	16 (18.6)	5 (8.5)
Re-presentation within 90 days, n (%)	4 (4.7)	7 (11.9)
Take-home kit received, n (%)	---	26 (44.1)

No significant between group differences existed

Discharge Opioid Prescriptions from the Emergency Department



Results Continued

- Only 51 patients in the post-implementation period were eligible for a take-home naloxone kit; 26 (51%) received a kit and 25 (49%) did not.
- However, after removing patients who eloped prior to receiving a kit, who went to jail/rehab from the ED, or who declined a take-home kit, only 11 (21.6%) patients did not receive a kit when eligible.

Limitations

- Included information from our institution only, which likely underestimated the overall 90 day ED re-presentation rate and the presence of opioids on PTA medication lists.
- Utilized two different time periods which may limit comparability between groups.
- Retrospective chart review which relied on accurate chart information.
- Discharge opioid prescriptions do not provide insight on actual opioid consumption.

Conclusions

- Implementation of our take-home naloxone kit program has been well accepted by providers in the ED at our institution.
- Patients in the post-implementation period tended to have a lower rate of hospital admissions and a shorter ED LOS, showing that providing a take-home kit did not negatively impact the patient's ED LOS.
- A significant reduction in discharge opioid prescriptions from the ED has been observed since implementation of the program.

Future Steps

- Results of this MUE will be presented to the ED staff at our institution to continue raising awareness and providing education about the opioid epidemic and our take-home naloxone kit program.
- We will also look at expanding our take-home naloxone kit program to other EDs across our health system.
- We will continue to trend data on our take-home naloxone kit program along with opioid prescribing rates in the ED to assess the potential impact.

References

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3. Drug Overdose Deaths | Drug Overdose | CDC Injury Center. Opioid Overdose, Centers for Disease Control and Prevention. June 2019.
4. Doyon S, Aks SE, Schaeffer S. Expanding access to naloxone in the United States. J Med Toxicol. 2014;10(4):431–434.

Contact & Disclosure

- Samantha Spetz, PharmD – Samantha.spetz@promedica.org
- Authors of this presentation do not have any financial or personal conflicts of interest.

Evaluation of a take-home naloxone kit program for opioid overdose patients discharged from the emergency department
Samantha Spetz, PharmD, William Kirsch, PharmD, BCPS; Kristen Thomas, PharmD, BCPS

Evaluation of Coagulation factor Xa [(recombinant) Andexxa®] in Patients Requiring Reversal of Apixaban or Rivaroxaban

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Background

- Coagulation factor Xa (recombinant) was added to formulary and DUHS Guideline for Appropriate Use in Intracranial Hemorrhage (ICH) was created in July 2018

DUH Formulary Status

- Restricted, pursuant to Neurology ICU or Stroke Attending provider approval for use in patients with ICH meeting the following criteria:
  - Patient with known use of rivaroxaban or apixaban
  - Expected high quality survival from ICH (e.g., GCS score ≥7, ICH volume <60 mL)
  - No major thrombotic event within 2 weeks
- All other indications require Hematology approval

Figure 1. Dosing information.

Table 1. Dose Strength and Timing of Last DOAC Dose.

Medication	Last Dose of Medication	Timing of Medication Last Dose before Andexxa® Initiation		
		<8 hours	≥8 and <18 hours	≥18 hours
Rivaroxaban	≤10 mg	Low Dose	Low Dose	Send Rivaroxaban Assay If >0.04 mcg/mL, use Low Dose
	>10 mg	High Dose		
Apixaban	≤5 mg	Low Dose		Send Apixaban Assay If >40 ng/mL, use Low Dose
	>5 mg	High Dose		

Table 2. Coagulation factor Xa (recombinant) dosing information.

Dose of FXa Inhibitor	Initial IV Bolus	Follow-on IV Infusion
Low Dose	400 mg at target rate of 30 mg/min	4 mg/min for up to 120 mins
High Dose	800 mg at target rate of 30 mg/min	8 mg/min for up to 120 mins

DukeHealth

Methods

Study Design

- Retrospective, observational study of patients at Duke University Hospital who received coagulation factor Xa (recombinant) between July 1st, 2018 and September 30th, 2019

Inclusion Criteria

- Received at least one dose of coagulation factor Xa (recombinant) for reversal of apixaban or rivaroxaban

Primary Objective

- To determine the appropriateness of coagulation factor Xa [(recombinant) Andexxa®] based on current institutional restrictions and guidelines

Secondary Objectives

- To determine the patient location of disposition at discharge
- To determine the rate of thrombotic event(s) within 30-days
- To determine the length of hospitalization and length of ICU stay

Results

Table 3. Patient characteristics.

Characteristic		n = 39
Age, mean		71.77
Male, n (%)		21 (53.8)
Race, n (%)	Caucasian/White	31 (79.5)
	African American	7 (17.9)
	Unknown	1 (2.6)
Weight (kg), mean (Range)		83.52 (44.7 – 127)
DOAC, n (%)	Apixaban	32* (82.1)
	Rivaroxaban	7 (17.9)
DOAC Indication, n (%)	Atrial Fibrillation	27 (69.2)
	DVT/PE	12 (30.8)
Coagulation Factor Xa (Recombinant) Dose	Low Dose	37†‡
	High Dose	3

*: One patient was suspected to be taking apixaban, but was later found to be only on clopidogrel
†: One patient received both coagulation factor Xa (recombinant) and four-factor prothrombin complex concentrate
‡: One patient received low-dose coagulation factor Xa (recombinant) on two separate admissions

Table 4. DOAC characteristics.

DOAC Characteristics		n = 40
Apixaban Dosing	10 mg twice daily	1
	5 mg twice daily	25*
	2.5 mg twice daily	7†
Rivaroxaban Dosing	20 mg daily	6
	15 mg daily	1
Timing of Last Dose of DOAC before Andexxa	<8 hours	7
	≥8 and <18 hours	14
	≥18 hours	9
	Unknown	10
Apixaban Assay (ng/mL), mean (Range)		149 (<40 to 824)
Rivaroxaban Assay (mcg/mL), mean (Range)		0.163 (0.06 to 0.27)

*: One patient was suspected to be taking apixaban, but was later found to be only on clopidogrel
†: One patient received Andexxa on two separate encounters

Figure 2. Indications for reversal of apixaban or rivaroxaban.

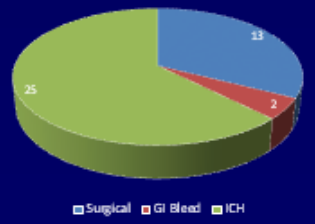
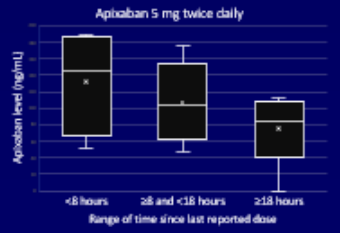


Figure 3. Apixaban levels compared to time of last reported dose administered (n=14).



Results

Table 5. Length of stay.

Length of Stay	n = 40
Total Hospital LOS (Days), median (Range)	8 (0 to 113)
Total ICU LOS (Days), median (Range)	3 (0 to 26)

Table 6. Patient disposition at discharge.

Disposition	n = 40
Death	7
Home	13
Skilled Nursing Facility	15
Hospice	4
Other	1

Figure 4. Range of GCS scores of patients diagnosed with ICH prior to administration of coagulation factor Xa (recombinant).

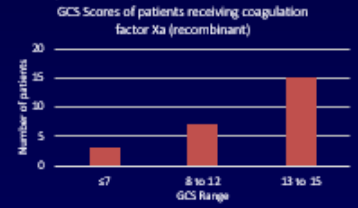


Table 7. Adverse Effects.

Andexxa Dose	Adverse Effect
Low-dose	Patient received 1 hour of coagulation factor Xa (recombinant) infusion and had 15 second run of ventricular tachycardia with chest pain
High-dose	Patient developed STEMI post-coagulation factor Xa (recombinant) infusion

Discussion and Conclusions

- All but one patient had approval from either Neurology ICU, Stroke Attending or Hematology prior to dose administration. The one dose was approved by hematology post-administration
- The majority of patients receiving coagulation factor Xa (recombinant) for intracerebral hemorrhage had a GCS of 13-15 prior to administration, thus indicating higher chance of survival
- All but one patient was taking either taking apixaban or rivaroxaban
- One patient received both coagulation factor Xa (recombinant) and four-factor prothrombin complex concentrate
- Two notable adverse effects occurred with administration of coagulation factor Xa (recombinant)

References

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Correspondence to: mark.vestal@duke.edu; jennifer.mando@duke.edu

The authors have no financial or personal relationships to disclose with commercial entities that may have direct or indirect interest in the subject matter of this presentation.

Evaluation of Coagulation factor Xa [(recombinant) Andexxa®] in Patients Requiring Reversal of Apixaban or Rivaroxaban
Mark L. Vestal, PharmD; Mark Friedland, MD; Adam Root, PharmD; Kimberly Hodulik, PharmD, CACP, CPP; Jennifer Mando-Vandrick, PharmD, BCPS; Thomas L. Ortel, MD, PhD; Ian J. Welsby, MBBS, FRCA

Evaluation of the Appropriate Utilization of the CIWA-Ar Protocol in the General Hospital Setting

Rakhshan Naseeb, PharmD, Lindy Sidelsky PharmD, BCCCP, Erin Quinn, PharmD, BCPS, Edith Liang, PharmD, BCCCP

AMITA Health Saints Mary and Elizabeth Medical Center, Chicago, IL

BACKGROUND

The cessation or reduction of alcohol from chronically elevated levels results in decreased inhibitory tone through the gamma-aminobutyric acid (GABA) receptors and an increase in the excitatory tone through glutamate binding to the N-methyl-D-aspart (NMDA) receptors. Withdrawal symptoms may present within six hours of the last use of alcohol. Clinical studies suggest benzodiazepines (BZDs) have efficacy in reducing symptoms and in decreasing risk of seizures. The Clinical Institute Withdrawal Assessment for Alcohol-Revised (CIWA-Ar) protocol is a validated scale used to assess and quantify a patient's severity of alcohol withdrawal syndrome and guide clinical treatment using symptom-triggered BZD therapy. Studies have found that symptom-triggered BZD dosing resulted in reduced BZD usage and shorter length of stay in inpatient addiction centers and emergency department units. A symptom-triggered regimen may also reduce the risk of overmedication and adverse events since dosing is based on withdrawal symptoms.

PURPOSE

The purpose of this retrospective study is to evaluate the appropriate utilization of CIWA-Ar protocol in hospitalized patients at AMITA Health Saints Mary and Elizabeth Medical Center (AHSMEMC) as determined by documented CIWA-score assessments and BZD doses.

OBJECTIVES

To identify the proper implementation of CIWA-Ar protocol.

To evaluate whether the proper implementation of CIWA-Ar protocol decreases:

- Total daily dose of BZD
- Need for adjunctive medication
- Incidence of withdrawal seizures
- Amount of rapid response calls
- Amount of intubations

METHODS

Study Design:

- This is a retrospective chart review for patients admitted to AHSMEMC between July 2017 to June 2019
- Data will be collected from 100 patients through electronic medical record by one data abstracter
- This study is exempt from IRB approval

Primary endpoint:

- The percentage of patients complaint with the general inpatient alcohol withdrawal protocol at AHSMEMC

Secondary endpoints:

- Time to initiation of the CIWA-Ar protocol upon admission
- Intensive care unit transfers
- Additional BZD doses outside the protocol
- Adjunctive medication use of haloperidol, clonidine or metoprolol
- Incidence of rapid response team activation
- Incidence of intubations
- Incidence of seizures
- Duration of BZD therapy on the protocol
- Total daily dose of BZDs in lorazepam equivalents

Inclusion Criteria:

- 18 years of age or older
- ICD-10 diagnosis code of alcohol withdrawal upon admission

Exclusion Criteria:

- Pregnant
- Incarcerated
- Prior history of epilepsy

DATA COLLECTION

- Unit of admission where CIWA-Ar was ordered
- Time to CIWA-Ar protocol implementation
- Total daily dose of BZDs in lorazepam equivalents
- Scheduled and as-needed doses in addition to protocol
- Use of adjunctive medications such as:
  - Haloperidol, metoprolol, clonidine
- CIWA score assessments
- ICU transfers

CIWA-Ar PROTOCOL FOR INPATIENT ALCOHOL WITHDRAWAL

CIWA-Ar Score	Lorazepam Dose
0-4	Use lorazepam 1mg IV/PO as needed for anxiety
5-7	0.5 mg IV/PO one dose; Reassess in 4 hours
8-10	1 mg IV/PO one dose; Reassess in 4 hours
11-14	2 mg IV/PO one dose; Reassess in 2 hours
15-25	3 mg IV/PO one dose; Reassess in 1 hour
>25	4 mg IV/PO one dose; Notify physician and reassess in 15 minutes

ANTICIPATED OUTCOMES

Past studies have shown that the implementation of CIWA-AR protocol led to decreased amount of BZDs ordered, use of adjunctive medications and hospital length of stay. We predict our study will show similar results with proper implementation. We also anticipate that there will be a discrepancy between the CIWA-Ar protocol and actual medication administration.

NEXT STEPS

Further results and conclusions of this study will be presented at the 2020 Illinois Pharmacy Residency Conference.

DISCLOSURES

The authors of this presentation have nothing to disclose concerning financial or personal relationships with commercial entities that can have an interest in the subject matter of this presentation.

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Evaluation of the Appropriate Utilization of the CIWA-Ar Protocol in the General Hospital Setting
Rakhshan Naseeb, PharmD, Lindy Sidelsky PharmD, BCCCP, Erin Quinn, PharmD, BCPS, Edith Liang, PharmD, BCCCP

Incidence of Anticoagulation Medication Prescribing Errors in Patients Discharged from the Emergency Department

Morgan Cantley, PharmD Candidate[1], Haili Gregory, PharmD[1,2], Gregory Hall, MD[2], Andrew Matuskowitz, MD[2], Kyle Weant, PharmD[1,2]

1. Department of Pharmacy, Medical University of South Carolina, Charleston, SC
2. Department of Emergency Medicine, Medical University of South Carolina, Charleston, SC

Background

- Adverse drug reactions are the 5th leading cause of death in the United States
- Potential causes of Emergency Department (ED) Medication Errors include:
  - Fast-paced environment, reliance on verbal orders, unfamiliar patients, and a wide range of disease state acuity
- Anticoagulants have important physiological roles and appropriate dosing is crucial for preventing life-threatening emergencies while mitigating associated toxicities, such as increased bleeding risk.

Outcomes

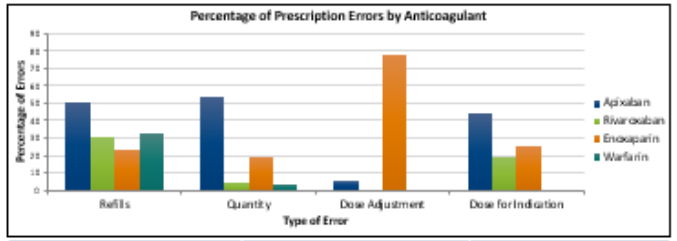
Primary Outcome	Identify the number of errors in anticoagulation prescriptions written for patient discharged from the Medical University of South Carolina (MUSC) ED
Secondary Outcome	Categorize errors based on inappropriateness of refills, quantity, patient-specific dose adjustment, dose per indication, 30-day readmission due to prior error, and prescriber status

Methods

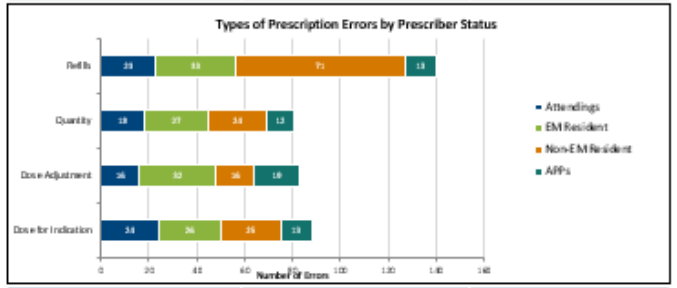
- Retrospective chart review of 797 anticoagulation prescriptions written upon discharge at MUSC ED from January 1, 2015 through August 1, 2018.

Inclusion Criteria	Exclusion Criteria
Patients who were seen at Main Hospital ED or Ashley River Tower ED and were discharged on anticoagulant medication	• Prisoners • < 18 years old

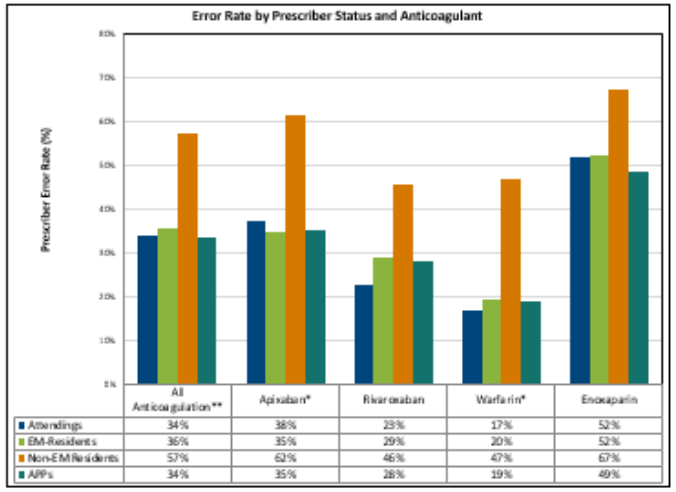
RESULTS



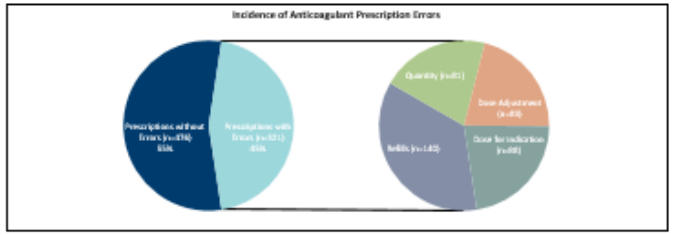
Anticoagulant	Total Number of Prescriptions	Errors in Prescriptions
Apixaban	266 (33.3%)	33.3%
Rivaroxaban	163 (20.5%)	20.5%
Enoxaparin	210 (26.3%)	26.3%
Warfarin	149 (18.7%)	18.7%



Prescriber Status	Total Number of Prescriptions	Errors in Prescriptions
Attending Physician	195 (24.5%)	81 (20.7%)
EM-Resident (EM)	269 (33.8%)	118 (30.1%)
Non-EM Resident (Non-EM)	199 (25.0%)	136 (34.7%)
Advanced Practice Provider (APP)	134 (16.8%)	57 (14.5%)



	All Anticoagulation**	Apixaban*	Rivaroxaban	Warfarin*	Enoxaparin
Attendings	34%	38%	23%	17%	52%
EM-Residents	36%	35%	29%	20%	52%
Non-EM Residents	57%	62%	46%	47%	67%
APPs	34%	35%	28%	19%	49%



- **Non-EM Residents were more likely to make an error in prescribing any type of anticoagulation when compared to all members of all other prescribing status ($P<0.001$)
- *Non-EM Residents were more likely to make an error in prescribing apixaban or warfarin when compared to all members of all other prescribing status ($P<0.05$)
- Of all the errors identified, only 2 prescriptions (0.6%) led to patient readmission within 30 days.

SUMMARY

- Of those evaluated, 392 errors were identified within 321 prescriptions.
- Non-EM Residents were more likely to make errors than any other prescriber.
- Refills made up a large majority of errors, and improving the continuity of care with can reduce the likelihood of this error.

FUTURE DIRECTIONS

- Prescribing restrictions via preauthorization may be useful in assuring appropriate anticoagulation dosing and prescription accuracy in the future.
- Future studies should investigate the effect that a second-check system managed by an Emergency Medicine Pharmacist has on improving the appropriateness of anticoagulation prescribing habits upon patient discharge.
- Future studies may analyze the time of day that most prescription errors occurred and justify the need for an around-the-clock emergency medicine pharmacist.

The authors have no conflicts to disclose.

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Incidence of Anticoagulation Medication Prescribing Errors in Patients Discharged from the Emergency Department
Morgan Cantley, PharmD Candidate; Haili Gregory, PharmD; Gregory Hall, MD; Andrew Matuskowitz, MD; Kyle Weant, PharmD

Ketamine for Severe Depression or Suicidal Ideation in the Emergency Department: A Randomized, Double-Blind, Placebo-Controlled Trial

Background

- There is no current standard of care for patients presenting to the ED with severe depression, and traditional medications for depression have a delayed time to therapeutic effect
- Multiple trials using a subanesthetic dose of ketamine for treatment-resistant depression have demonstrated ketamine to significantly improve depressive symptoms within 4 hours, with the effects persisting for up to two weeks after a single dose
- Ketamine's ability to produce a rapid antidepressant effect makes it an appealing option for use in the emergency department to treat patients with severe depression or suicidal ideation, although it has not been studied in this population.
- Depression is not effectively managed by emergent treatment alone. The utility of ketamine for emergent treatment of depression relies on it impacting the patient's disposition after leaving the ED

Objective

- Examine the effect of a low-dose ketamine infusion on (1) rapid reduction of depressive symptoms in the emergency department, (2) rate of follow-up with outpatient psychiatry after the ED visit, and (3) rate of return to the ED within 30 days

Study Design

- **Interventions:** ketamine 0.5 mg/kg or 50 mL 0.9% saline, infused over 40 minutes
- **Inclusion:** adults with suicidal ideation or a chief complaint of severe depression
- **Exclusion:** acute mania or psychosis, acute intoxication, pregnancy or lactation, prior enrollment in study, medical contraindication to ketamine, discharging from ED without a ride, provider judgement, patient does not consent

Psychiatric Assessment

- Brief Psychiatric Rating Scale (BPRS) at baseline and 4 hours
- Completed by on-call psychiatry resident or on-call psychiatry nurse

Safety Assessment

- **Hemodynamic monitoring:** continuous telemetry with BP, HR, and SPO2 documented hourly for 4 hours
- **Intoxication:** Visual Analog Scale for Intoxication (VAS-High) self-assessed by patient at baseline, 2 hrs, and 4 hrs

Post-Discharge Follow-Up

- ED Records from all Des Moines area hospital for visits within 30 days of discharge
- Contact patient to ask about outpatient psychiatry visit (will confirm visits with provider)

Results Pending

- Approved by IRB 11/14/19
- Target enrollment 25-100 patients per treatment group, enrolling through April 2020

Discussion

- Ketamine is a low-cost, well-tolerated medication commonly used in the emergency department for sedation, pain, and agitation
- If ketamine can effectively reduce ED return visits or increase rates of outpatient follow-up, it may be beneficial to routinely use in the emergency department for acute treatment of depression or suicidal ideation
- Future research on the use of ketamine for depression in pediatric populations is warranted

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Can a single IV dose of ketamine for severe depression or suicidal ideation affect healthcare utilization after discharge?

- Outpatient psychiatric follow-up visits within 30 days
- ED visits within 30 days

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Nothing to Disclose
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MERCY ONE

Ketamine for Severe Depression or Suicidal Ideation in the Emergency Department: A Randomized, Double-Blind, Placebo-Controlled Trial
Kathryn Bress, PharmD; Jessica Nesheim, PharmD, BCPS; Adnan Iqbal, MD

Time to Reversal: The Association Between Four-Factor Prothrombin Complex and Outcomes in Intracranial Hemorrhages with Warfarin

Corey Cicci, PharmD; Ashley Weiss, PharmD; Cathyyen Dang, PharmD, BCPS; Jessica Feih, PharmD, BCCCP; Matthew Stanton, PharmD, BCPS, DABAT; Benjamin Jung, PharmD, MS, MPA; Ryan Feldman, PharmD, BCPS, DABAT

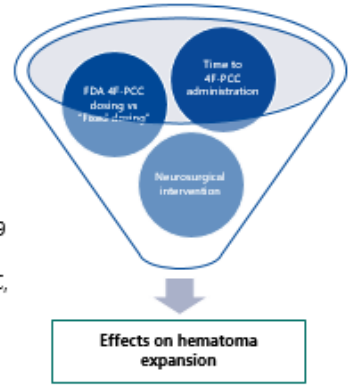
FROEDTERT & THE MEDICAL COLLEGE OF WISCONSIN | FROEDTERT HOSPITAL | MILWAUKEE, WI

Background

- Intracranial hemorrhage (ICH) is associated with high morbidity and mortality[1]
  - Incidence of ICH has been reported at 24.6 per 100,000 person-years with a median case mortality of 40.4% at one month.[2]
  - Hematoma expansion for patients not on anticoagulants occurs in up to 40% of patients within the first 6 hours after symptom onset.[3]
  - Coagulopathy is an independent risk factor for both mortality and hematoma expansion.
  - For patients taking warfarin, the annual rate of ICH is between 0.3% and 0.6%, and in these patients the rate of hematoma expansion has been shown in prospective studies to be as high as 54%.[4]
- Neurocritical Care Society Guidelines for ICH[5]
  - Recommendations include prompt reversal of warfarin in ICH using intravenous vitamin K and prothrombin complex concentrate.
  - However, no specific time goals exist for achieving this therapeutic intervention.

Methods

- **Design**
  - Retrospective, single-center study
- **Inclusion Criteria**
  - At least 18 years of age
  - Diagnosis of ICH
  - On home warfarin with a current INR >1
  - Received 4F-PCC for anticoagulation reversal
  - Presented to the Froedtert Hospital Emergency Department from January 1, 2014 through June 1, 2019
- **Exclusion Criteria**
  - Pregnant, incarcerated, incomplete medical record, received heparin therapy within 24 hours of 4F-PCC, left ventricular assist device, liver disease with Child-Pugh Class C, did not receive vitamin K within 24 hours of admission
- **Statistical Analyses**
  - T-test, chi-square (χ^2) test, ANOVA, and logistic regression; significance defined as $p<0.05$ (2-tailed)



Is there an **optimal time window** for anticoagulation reversal using 4F-PCC for ICH patients on *warfarin*?

Preliminary Results

Primary Outcome

- Composite of the following:
  - **Incidence of hematoma expansion** via 6-hour computed tomography (CT) based on time-to-treatment category (0-30 min, 31-60 min, 61-90 min, 91-120 min, >120 min)
  - **Death due to neurologic injury** prior to repeat CT

Secondary Outcomes

- Mortality, INR change within 6 hours after 4F-PCC, incidence of neurosurgical interventions, functional status change at discharge, hematoma expansion size, hematoma expansion at any time during hospitalization

Objective

- To evaluate the clinical outcomes associated with time to administration of four-factor prothrombin concentrate (4F-PCC) in patients with intracranial hemorrhage on warfarin

References

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Future Directions

- This study will characterize clinical outcomes based on time to anticoagulation reversal.
- If there are clear benefits to earlier reversal, it may lead to an increased hospital focus on achieving "time to reversal" for ICH.

Time to Reversal: The Association Between Four-Factor Prothrombin Complex and Outcomes in Intracranial Hemorrhages with Warfarin
Corey Cicci, PharmD; Ashley Weiss, PharmD; Cathyyen Dang, PharmD, BCPS; Jessica Feih, PharmD, BCCCP; Matthew Stanton, PharmD, BCPS, DABAT; Benjamin Jung, PharmD, MS, MPA; Ryan Feldman, PharmD, BCPS, DABAT

Trends in administration of opioids and alternatives to opioids in an emergency department over a two-year period

Denver Health Medical Center, Denver, CO
Kali Turrin, PharmD; Eric Gilliam, PharmD, BCPS; Kevin Kaucher, PharmD, BCCCP

Background

- Pain management is one of the most common reasons for emergency department (ED) visits, with up to 60% of super-users having a chief complaint related to acute or chronic pain.[1]
- Rates of drug overdose deaths increased 140% from 2000 to 2014, with deaths resulting from opioid overdose increasing from 3 to 9 deaths per 100,000 persons.[2]
- In 2017 the Colorado Hospital Association (CHA) launched a 6-month pilot program within ten hospitals across Colorado. This program utilized the Colorado Chapter of the American College of Emergency Physicians (ACEP) Opioid Prescribing & Treatment Guidelines, which led to a reduction in opioid administrations by 36% and increased usage of alternatives to opioids (ALTO) by 31%.[3]
- Denver Health was not selected as a pilot site, however, its data on opioid and ALTO administration over time may be used to reveal trends not related to active ALTO pathways.

Objective

The purpose of this medication use evaluation is to determine baseline opioid and ALTO use prior to the implementation of Colorado ACEP guidelines at Denver Health Medical Center

Methods

Retrospective, observational analysis on administration trends of opioids within the ED and Urgent Care between June 1, 2017 and June 30, 2019

- Included all patients ≥ 18 years old
- Data was extracted using the Epic Clarity database reporting tool
  - All pain medications administered within the ED and Urgent Care were separated into opioids and ALTO groups (Table 1)

Table 1. List of Opiates and ALTO Agents

Opiates	ALTO
Codeine Fentanyl Hydrocodone Hydromorphone Meperidine Methadone Morphine Oxycodone Tramadol	Ketamine Lidocaine nasal spray Lidocaine IV Lidocaine patch Lidocaine topical Ketorolac tromethamine Haloperidol Acetaminophen Ibuprofen Dicyclomine

Methods

Statistical Analysis

- Data is evaluated via descriptive statistics (Table 2)
- Comparisons of opioids versus ALTOs are compared by administrations per 1000 patient visits (Figure 1)
- Trend-time data is compared by using absolute percent reduction by month and linear regression analysis (Figure 1 and Figure 2)

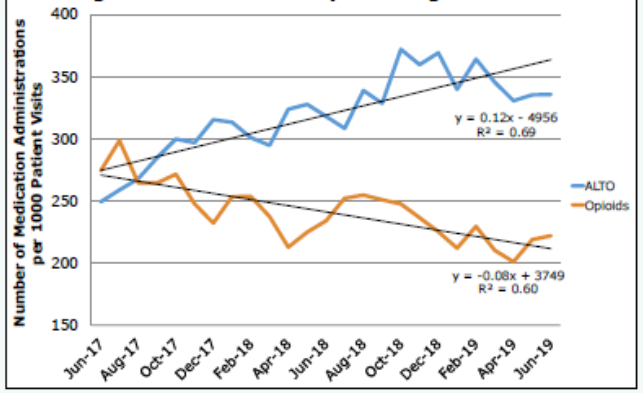
Results

A total of 50,876 unique patients were identified out of over 232,000 ED visits over the two-year period.

Table 2. Baseline Characteristics

	n=50,876
Age, years (IQR)	38 (24)
Male, n (%)	25,681 (50.4)
Race, n (%)	
Caucasian	24,134 (47.4)
Hispanic	12,114 (23.8)
African American	7,204 (14.2)
Other/Decline to Answer	7,424 (14.6)
Primary Care Area, n (%)	
ED	36,647 (72)
Urgent Care	14,229 (28)

Figure 1. ALTO versus Opioid Usage Over Time



Results

Figure 2. Percentage Change from Baseline in Opioid Administrations Over a Two-year Period

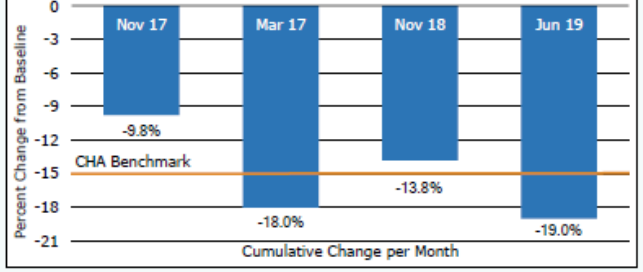


Table 3. ALTO and Opioid Statistical Data

	ALTO	Opioid
Percent Change Over Time a Two-Year Period	34.66	-19.04
Standard Deviation	32.65	23.34

Conclusion

- Correlation of ALTO and opioid administrations over time demonstrate a linear increase in ALTO agents, along with a linear decrease in opioid administrations.
- Previous studies with active ALTO intervention pathways have aimed for a similar percent reduction in opioid prescribing, with the CHA targeting a 15% reduction during the pilot period.[3] Our results show an opioid administration reduction of 19% despite no active intervention (Figure 2).
- Administration of ALTO agents increased by 34% over a two year period, which is similar to the CHA pilot program results, indicating that even without invention similar positive results were seen at our institution.
- Our data suggests that despite not having ALTO pathways at our institution, there were changes in administration over time, which is reflective of community understanding and awareness of the opioid epidemic and a shift away from using opioids when ALTO agents are available.
- Limitations include: descriptive ability to explain changes, interventions may have been made but not documented, and retrospective data was used for analysis.

References:
1. Giuliano J, Sakup A. Reducing Opioid Prescribing Rates in Emergency Medicine. Ochsner J. 2018 Spring;18(1):42-45.
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Disclosure: Nothing to disclose

Trends in administration of opioids and alternatives to opioids in an emergency department over a two-year period
Kali Turrin, PharmD; Eric Gilliam, PharmD, BCPS; Kevin Kaucher, PharmD, BCCCP

Utility of Shock Index in Predicting Post-intubation Hypotension in Pediatric Patients Receiving Ketamine

Meagan Singletary, PharmD and Lorrie LeClair, PharmD, BCPS
Department of Pharmacy, Inova Fairfax Medical Campus, Falls Church, VA

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Background

- The shock index (SI), defined as heart rate divided by systolic blood pressure, was originally validated to predict severity of illness in trauma patients within the adult population.[1] Later, it was discovered that adults with a high SI (> 0.9) are more likely to experience hypotension after intubation leading to its' use as a predictor of post-intubation hypotension in adults undergoing rapid sequence intubation (RSI).[2]
- From the utility seen in the adult population, the SI was adapted to identify severely injured pediatric patients at high risk for death between the ages of four and sixteen years old; known as shock index, pediatric age-adjusted (SIPA).[1] Recently, SIPA was additionally validated for ages 1 through 3 years expanding the ability to identify pediatric patients at high risk for mortality.[3]
- Ketamine is known to affect hemodynamics and increase risk of hypotension in adults with a high SI.[4]
- The SIPA tool has not been evaluated for prediction of post-intubation hypotension in pediatrics.

Purpose

The objective of this study is to determine if the newly validated SIPA index will be able to predict post-intubation hypotension in pediatric patients who received ketamine as an induction agent.

Methods

Study Design: Retrospective cohort study

Inclusion Criteria: Pediatric patients age 1 to 16 at Inova Fairfax Medical Campus who were intubated and received ketamine as an induction agent

Exclusion Criteria: Patients who received vasopressor therapy during or within 10 minutes after intubation, and those without documented vitals pre and post intubation

Primary Outcome: Incidence of hypotension, defined based on the patients' age as outlined by Pediatric Advanced Life Support (PALS) recommendations, between the shock groups

Secondary Outcomes: Mean change in systolic blood pressure and heart rate

Statistical Analysis:
- Fisher's exact test will be performed for primary outcome between high shock and low shock groups
- Estimated 60 patients in total were needed to achieve 80% power in detecting a 26% difference between SI groups

Preliminary Results

Figure 1. Subject Enrollment

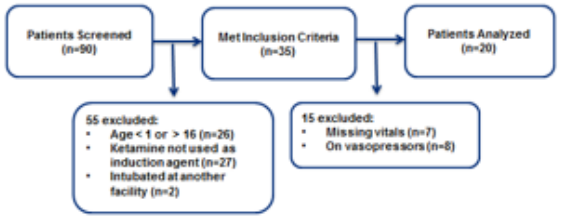


Table 1. Threshold for Elevated SIPA

Age Group	SIPA Score
1 to 3 years	1.2
4 to 6 years	1.2
7 to 12 years	1
> 12 years	0.9

Table 2. Baseline Patient Demographics*

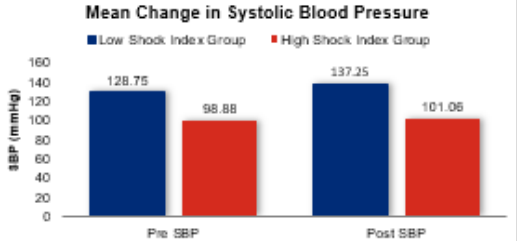
Characteristic	Population (n=20)
Age (years)	7.4 ± 5
Male	15 (75)
Weight (kg)	24.6 ± 13
SIPA score	
Low SI	0.86 ± 0.29
High SI	1.45 ± 0.32
Indication for Intubation	
Septic shock	6
Asthma	2
Pneumonia	3
Anaphylaxis	1
Croup	1
Overdose	1
ARDS	1
Guillain-Barré	1
Fluid overload	2
Seizure	2
Ketamine dose (mg/kg)	1.69 ± 0.53
Paralytic Used	
Succinylcholine	1
Rocuronium	8
Vecuronium	8
None	3

HR = heart rate
SBP = systolic blood pressure
ARDS = Acute respiratory distress syndrome
*Data reported as mean ± standard deviation or n (%) unless otherwise noted

Table 3. Primary Outcome*

Patient Group (n=20)	Incidence of Post-Intubation Hypotension
Low Shock Index Group (n=4)	0
High Shock Index Group (n=16)	4 (25)

Figure 2. Secondary Outcome*



Conclusions

- Our preliminary results show that patients who received ketamine as an induction agent with a high SI experience post-intubation hypotension more frequently than those with a low SI. Our results of 25% incidence mirrors the findings of the research performed in adults, in which 26% of patients with a high SI experienced post-intubation hypotension with ketamine.
- Majority of patients who experienced the primary outcome of post-intubation hypotension required intubation due to septic shock or metabolic crisis. In these select patient populations, they may be experiencing depletion in their catecholamine reserves allowing the negative inotropic effects of ketamine to dominate.
- Findings will guide better identification of pediatric patients at increased risk for post-intubation hypotension who are receiving ketamine as an induction agent. Utilizing the SIPA tool may minimize peri-intubation complications.

Limitations

- Single-center, retrospective study
- Some patients may have been excluded due to report limitations
- Accuracy of data dependent on proper chart documentation

Disclosures

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.

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