Section Advisory Group on Emergency Care

ASHP Midyear Clinical Meeting Networking Session Poster Summary
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The Role of Clinical Pharmacist in Emergency Medicine Department of an Academic Hospital in the Kingdom of Saudi Arabia

Waad H. Alkathiri¹, Hosam A.H. Abdulraziq²

¹Clinical Pharmacy Department, KSUMC, ²Emergency Medicine Department, KSUMC

Introduction
The Emergency department has a high risk environment due to its unique and complex workflow.

At the emergency and high-stress situations such as Cardiopulmonary resuscitation, Trauma and Rapid sequence intubation procedures; many high risk medication is ordered and administered at bed-side without being checked by pharmacist which may lead to increase the incident of medication error and adverse drug reaction.

Methods
A retrospective one-year study conducted between January 1st and December 31, 2016 at Adult Emergency Department of King Saud University Medical City, Riyadh, Saudi Arabia. The documentation of Emergency Medicine clinical pharmacist interventions was extracted from Esihi database. Including the period of morning shift (07:30-15:30) from Sunday to Thursday.

Results
A total of 3081 interventions were documented. The rate of acceptance was 88%. Antibiotics were the common drugs.

Conclusions
This study shows the important role of clinical pharmacy service in the Emergency department.

Disclosure
Authors of this presentation have the following 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: Waad Alkathiri: Nothing to disclose.
2: Hosam Abdulraziq: Nothing to disclose.

Purpose
To assess the need of clinical pharmacy service in the emergency department at King Saud University Medical City, Saudi Arabia.

Interventions types

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Email: Waad-alkathiri@Hotmail.com, Mobile no: +966598283471

The Role of Clinical Pharmacist in Emergency Medicine Department of an Academic Hospital in the Kingdom of Saudi Arabia
Waad H. Alkathiri, Msc, et al. Emergency Medicine Clinical Pharmacist & Clinical Toxicologist, King Saud University Medical City, Saudi Arabia, Waad-alkathiri@Hotmail.com
Apixaban is a factor Xa inhibitor, indicated to reduce the risk of stroke and systemic embolism in patients with nonvalvular atrial fibrillation. Apixaban does not require any routine INR monitoring. The package insert recommends dose reduction for patients receiving concomitant therapy with strong dual CYP3A4 and P-gp inhibitors. Apixaban does not reliably and/or predictably affect INR, but according to the manufacturer, there is a concentration dependent effect on INR.

This case report illustrates the potential drug interaction between amiodarone and apixaban in a 68 year old Caucasian male patient.

68 year old Caucasian male presented to the ED with tachypnea and swollen legs during the past two days.

**PMH:** atrial fibrillation, coronary artery disease, congestive heart failure (CHF), and coronary artery bypass graft (CABG)

**Home Medications:** amiodarone 200mg oral twice daily, apixaban 5mg oral twice daily, aspirin 81mg oral daily, cholecalciferol 2,000 international unit oral daily, furosemide 40mg daily, multivitamin oral daily, omega-3-polyunsaturated fatty acids 1,000mg oral daily, pantoprazole 40mg oral daily, potassium chloride 20mEq oral daily, and simvastatin 20mg oral at bedtime

**Ht:** 167cm  **Wt:** 72kg

**Initial Labs:**

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Day 1</th>
<th>Day 3</th>
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<tr>
<td>ALT</td>
<td>47</td>
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<tr>
<td>AST</td>
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<td>87</td>
<td>118</td>
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<tr>
<td>ALK Phos</td>
<td>34</td>
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<td>34</td>
<td>34</td>
<td>34</td>
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<tr>
<td>Ca++</td>
<td>9.5</td>
<td>9.5</td>
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<td>9.5</td>
<td>9.5</td>
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<tr>
<td>Ca++</td>
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<td>3.6</td>
<td>3.6</td>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>PTT</td>
<td>27.7</td>
<td>27.7</td>
<td>27.7</td>
<td>27.7</td>
<td>27.7</td>
</tr>
<tr>
<td>INR</td>
<td>5.62</td>
<td>5.62</td>
<td>5.62</td>
<td>5.62</td>
<td>5.62</td>
</tr>
</tbody>
</table>

Patient was admitted for CHF exacerbation. Elevated INR of 5.62 was noted. Attending physician ordered phytonadione 10mg orally. When questioned by the pharmacist, the attending explained that he did not realize the patient wasn’t on warfarin. Upon further chart review, it was discovered that the patient was started on amiodarone two weeks prior during an admission for ventricular tachycardia.

At this point, it was suspected that this rise in INR might be due to a drug interaction between amiodarone and apixaban. The manufacturer was contacted, and while they had no data to support any specific INR changes, they did state that apixaban could cause an increase in INR in a concentration dependent manner. The pharmacist recommended holding apixaban and restarting at a reduced dose (2.5mg twice daily) once INR decreased. This recommendation was accepted.

The patient received two doses of 5mg on day 2. On day 4, apixaban was restarted at 2.5mg oral twice daily. On days 5 through 9, apixaban was held. On day 9, the patient expired.

**REFERENCES**


**Disclosures**

Author of this presentation have the following 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. S. Barlow: Nothing to disclose.
Effectiveness and safety of four-factor prothrombin complex concentrate for the emergent reversal of factor Xa inhibitors in patients with traumatic intracranial hemorrhage

Daniel Dybdahl, PharmD; Grant Walliser, PharmD; Chance Spalding, DO, PhD; Michelle Kincaid, MD

BACKGROUND

• Four-factor prothrombin complex concentrate (PCC) is commonly utilized for the reversal of factor Xa inhibitors (apixaban, rivaroxaban, and edoxaban) in the setting of severe hemorrhage.

• This off-label indication is based on animal studies1-5 and pharmacodynamics studies in healthy volunteers.6,7

• Three retrospective studies assessed the outcomes associated with four-factor PCC for the reversal of factor Xa inhibitors and dabigatran, but were limited by small sample size.10-12

• No study has compared effectiveness and safety in patients who did and did not receive four-factor PCC for the reversal of factor Xa inhibitors.

• At OhioHealth, prescribers utilize an anticoagulation reversal guideline that previously required an INR ≥ 1.5 to give four-factor PCC for the reversal of factor Xa inhibitors due to traumatic intracranial hemorrhage (ICH). As a result, some patients did not receive four-factor PCC due to a low INR despite taking factor Xa inhibitors.

• Four-factor PCC is dosed 50 units/kg (maximum of 5,000 units/dose) for the reversal of factor Xa inhibitors at OhioHealth.

OBJECTIVES

• The objective of this study is to determine the effectiveness and safety of four-factor PCC for the reversal of factor Xa inhibitors in patients with traumatic ICH.

Figure 1. Study Aims.

Aim 1

• Compare effectiveness outcomes in patients who did and did not receive four-factor PCC for the reversal of factor Xa inhibitors for traumatic ICH.

Aim 2

• Compare safety outcomes in patients who did and did not receive four-factor PCC for the reversal of factor Xa inhibitors for traumatic ICH.

METHODS

Research Design & Study Population

• This study is a retrospective review of patients at OhioHealth Grant Medical Center and OhioHealth Riverside Methodist Hospital between March 1, 2015 and August 31, 2017 who were taking a factor Xa inhibitor prior to admission and had a traumatic ICH.

Figure 2. Study Population.

Inclusion Criteria

• Taking a factor Xa inhibitor (apixaban, rivaroxaban, or edoxaban) prior to admission.

• Traumatic ICH (epidural hematoma, subdural hematoma, subarachnoid hemorrhage, or intracerebral hemorrhage) on head CT scan.

Exclusion Criteria

• None

• Anticoagulation prior to admission is routinely recorded for all trauma patients in the OhioHealth trauma databases.

• Based on review of the data, approximately 70 patients will be included in the study.

• Approximately 50% of the patients included in the study received four-factor PCC and 50% of patients did not receive four-factor PCC on the basis of INR, in accordance with the OhioHealth anticoagulation reversal guideline.

Figure 3. Patient Identification and Inclusion.

Queried trauma databases at OhioHealth Grant Medical Center and Riverside Methodist Hospital

Created list of patients meeting inclusion criteria

Manually reviewed patient charts to ensure that they met all inclusion criteria

Outcomes of Interest

Figure 4. Outcomes of Interest.

Primary Effectiveness Outcome

• In-hospital mortality

Primary Safety Outcomes

• Venous thromboembolism (pulmonary embolism or deep vein thrombosis)

• Stroke or transient ischemic attack (TIA)

• Myocardial infarction (MI)

Secondary Outcomes

• Timing of in-hospital mortality

• Hematoma expansion

• Neurosurgical interventions required

• Blood products required

• Functional recovery

• Hospital and ICU length of stay

Other Study Variables

• History of venous thromboembolism, thrombophilia, stroke/TIA, MI, antplatelet use, and nonsteroidal anti-inflammatory drug use.

• Dose of four-factor PCC administered, other reversal agents administered, mechanism of injury, site of injury, INR, Glasgow Coma Score, injury severity score, serial hemoglobin, disposition, and cause of death.

REFERENCES


DISCLOSURE

Authors of this presentation have the following 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:

• Daniel Dybdahl has nothing to disclose.

• Grant Walliser has nothing to disclose.

• Chance Spalding has nothing to disclose.

• Michelle Kincaid has nothing to disclose.
Evaluation of a medication guideline for the management of acute agitation in the emergency department

Jennifer Elfman, PharmD1; Gabrielle Procopio, PharmD, BCPS1; Marija Markovic, PharmD1; Andrea Hicks, RN2; Kevin Hewitt, MD2; Daniel Finch, MD2;

1 Department of Pharmacy, 2 Emergency Trauma Department, 2 Department of Psychiatry
Hackensack University Medical Center, Hackensack, NJ

Background
- Proper management of acute agitation in the emergency department (ED) is essential for patient care and safety. This allows clinicians to properly assess patients for their underlying problems which brought them to the emergency department.
- The American Association for Emergency Psychiatry (AAEP) recommends 3 main classes of medications for acute agitation based on effectiveness studies: first generation antipsychotics, second generation antipsychotics, and benzodiazepines.
- Recommendations are based on studies that evaluated the effectiveness of these medication classes in the following patient populations: elderly, undifferentiated agitation, schizophrenia, delirium, and bipolar disorder.
- The AAEP recommends the Behavior Activity Rating Scale (BARS) score to assess the effectiveness of these medications for acutely agitated patients.

Methods
- Inclusion Criteria
  - Patients > 18 years of age in the Adult ED
  - Documented BARS score
  - Received a medication for acute agitation
- Exclusion Criteria
  - Patients with no BARS score documented
  - Patients who did not receive a medication or medication received was not part of study guideline

Study Population
- Single center chart review

Procedure
- Patients will be identified using an EPIC-generated report for patients whom nurses initiated the BARS score monitoring tool.

Figure 1: BARS Score5

- 1 = clam, lacks energy
- 3 = awake, sedated
- 5 = quiet and awake (normal level of activity)
- 7 = extremely or continuously active, not requiring restraint
- 10 = violent, requires restraint

Figure 2: Management Guideline

- Medications in guideline: haloperidol, olanzapine, ziprasidone, and lorazepam
- No significant differences between the Positive and Negative Syndrome Scale-Excited Component (PANSS-EC) score at 2 hours leading to the conclusion of non-inferiority between the two regimens.

Results
- Final results are pending

Limitations
- Single center study
- Interrer variability for BARS score assessment
- Inability to determine if provider used medication guideline to select medication administered

Discussion
- 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

References
- 3. Hackensack University Medical Center utilizes the BARS score to assess agitated patients in the Adult ED. Caregivers who ordered sedation used the BARS score to assess the effectiveness of medications.
- 4. Historical standard of care (no medication guideline) versus intervention (medication guideline).
- 5. Final results are pending.
The goal of this project was to evaluate the incidence of admission medication reconciliation discrepancies for patients admitted through the ER. A prospective chart review was completed on 418 patients admitted through the ER at The George Washington University Hospital (GWUH) from October 2015 through July 2017.

In the ER, an admission medication reconciliation was completed by non-pharmacy medical personnel.

The Transition-of-Care (TOC) pharmacist and/or Advanced Pharmacy Practice Experience (APPE) students reviewed each patient’s medication chart using BPMH within 24 hours of admission to the Cardiology service.

The TOC pharmacy team also provided clinical services, such as medication education and clinical interventions, as part of daily responsibilities.

The primary outcome was the percentage of patients with admission medication reconciliation discrepancies when medication reconciliation was completed by non-pharmacy personnel in the emergency room.

The secondary outcome was to identify the type of admission medication reconciliation discrepancies.

The authors wish to thank Renia Mathews, PharmD, Director of Pharmacy and Marjorie Medder, RPh, MS, Assistant Director in helping with all the resources to make this project feasible, and the entire transition-of-care pharmacy team for their guidance and support throughout this project.

References

Discussion
This project demonstrates the admission medication reconciliations completed in the ER by non-pharmacy personnel had a considerable number of medication discrepancies.

The TOC pharmacy team created a comprehensive medication list within 24 hours of patient admission to the Cardiology service.

In order to improve admission medication reconciliation and decrease medication errors, a TOC pharmacy team with knowledge of the BPMH method is warranted.

A decreased number of admission medication reconciliation discrepancies lead to a complete and accurate discharge medication list.

Based on this data, GWUH Department of Pharmacy is restructuring the work flow of the pharmacist to include comprehensive TOC activities to other medical services within the hospital.

Limitations
The majority of the data was recorded by APPE students who rotated every 5 weeks, resulting in some inconsistency in data collection.

When APPE students were not on rotation, no data was collected.

The project design lacked a control group.

Evaluation of transition-of-care pharmacist contribution for patients admitted through the Emergency Room
Abiy Getahun, PharmD, et al. Transitions of care Pharmacist, The George Washington University Hospital, abiy.getahun@gwu-hospital.com
Medication code tray redesign for improved access and faster delivery of medications in emergency situations at a Veterans Affairs medical center

Kristine Gherardi, CPhT
VA Boston Healthcare System Boston, MA, Kristine.gherardi@va.gov

**BACKGROUND**

- The availability of appropriate medications in an emergency situation is crucial to improving patient outcomes
- Unorganized code cart trays which do not have easily identifiable or accessible medications can be a detriment to medication administration time and a patient’s response to medications.
- Reorganizing these trays was deemed necessary by several areas in the VA Boston Healthcare System (VABHS) in order to improve:

  | Uniformity | Filling, checking, and verifying code trays |
  | Utilization | Ease of access in an emergency |
  | Updating | Removal of used or expired products |

This project was implemented at VABHS as a part of “VA SHARK TANK”, an initiative that aims to grow and share best practices.

**SPECIFIC AIMS**

- Standardize code cart medication trays utilizing cost-effective materials to make medications easily accessible and identifiable
- Improve time of location and time to administration of medications
- Measure difference in time locating medications from old version to new version of medication code tray
- Utilize medication code tray redesign as a best practice locally and nationally across VA Medical Centers

**METHOD OF CODE TRAY REDESIGN**

**Redesign Pathway**

1. **Start**
   - Gather tools and equipment
2. **Pinch and pull foam squares to appropriate size, line areas with white labels**
3. **Identify size for each medication slot**
4. **Cut grid to desired size and fit**
5. **Arrange medications alphabetically**
6. **Arrange Autoject boxes face up on opposite side of tray**
7. **Finish**

**RESULTS OF IMPLEMENTATION**

83% of users were able to locate medications more efficiently than the original tray design

<table>
<thead>
<tr>
<th>83%</th>
<th>10 secs</th>
<th>20 mins</th>
<th>+ $10K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time trials showed that the time to locate medications in an emergency situation was reduced by up to 10 seconds</td>
<td>The time to refill and update the redesigned trays was reduced by up to 20 minutes per tray</td>
<td>Removed a high cost, infrequently used drug and saved $10K annually</td>
<td></td>
</tr>
</tbody>
</table>

**DISSEMINATION AND EXPANSION**

- **Presentation**
  - Recognized at the VA Diffusion of Excellence Conference as a National Gold Status Best Practice

- **Standardization**
  - Mandated for all of New England (regional level)
  - Adopted by Loma Linda, CA VA system

- **Expansion**
  - Can be utilized locally for stocked medication trays in other areas of the medical center

Acknowledgements: Bryan R. Wood, PharmD, Chelsea Hawley, PharmD, Andrew Krevat, PharmD, John Roefaro, PharmD, FASHP
Evaluation of outcomes after the implementation of an updated, emergency department-based alcohol withdrawal treatment protocol at an academic medical center.

Brittni Gross, PharmD1; Umbreen Murtaza, PharmD, BCPS1; Melinda Ortman, PharmD, BCPS1; Juliana Zschoche, PharmD, BCPS1; Mustapha Saheed, MD2

1Department of Pharmacy, The Johns Hopkins Hospital, Baltimore, MD, USA; 2Department of Emergency Medicine, The Johns Hopkins Hospital, Baltimore, MD, USA

Study Objectives and Selected Endpoints

- To compare adverse events related to treatment using an updated ED-based alcohol withdrawal protocol to adverse events related to the previous protocol
  - Within 60 min of intravenous benzodiazepine administration:
    - Percent of patients requiring mechanical ventilation through endotracheal intubation
    - Percent of patients with occurrence of SBP < 90 mmHg, HR < 50 BPM, or RR < 10 breaths/min
  - At any point in time during treatment:
    - Percent of patients developing seizure while in the emergency department
    - Percent of patients with occurrence of RASS ≤ -2
    - Percent of patients with occurrence of RASS > 10 breaths/min
    - Percent of patients with an occurrence of O2 saturation less than 90% in whom the O2 requirement is new

To describe clinical outcomes for patients treated using an updated ED-based alcohol withdrawal protocol

- Time from first benzodiazepine administration to RASS -1
- Total benzodiazepine administered (in lorazepam equivalents)
- Percent of patients with a continuous benzodiazepine infusion
- Percent of patients requiring admission to intensive care unit
- Percent of patients who received phenobarbital IV in whom this was not a home medication
- Occurrence of RASS -1 achieved, percent of patients with occurrence of HR ≥ 120 BPM or RASS ≥ +2

References

2. John Hopkins Hospital. A new ED-specific AWS treatment protocol will be implemented in December 2017 which provided a more comprehensive treatment algorithm with nurse titration parameters2-11.

Evaluation of outcomes after the implementation of an updated, emergency department-based alcohol withdrawal treatment protocol at an academic medical center Brittni Gross, PharmD; PGY2 Emergency Medicine Pharmacy Resident, et al. The Johns Hopkins Hospital; bgross7@jhu.edu
Evaluation of post-exposure prophylaxis administration following suspected human rabies exposure

Vinh Luong, PharmD, PGY1 Pharmacy resident, et al. NorthShore University HealthSystem, Evanston, Illinois

Background

- Rabies is a vaccine-preventable disease that is caused by RNA virus transmission from contact with saliva of infected animals.1,2
- Human rabies exposures and vaccine administration records are reportable events mandated by the state health department for syndromic surveillance and compliance.
- Specific post-exposure prophylaxis is outlined by the Advisory Committee on Immunization Practices (ACIP) due to the high mortality risk associated with rabies disease.3,4
- Inappropriate or unnecessary initiation of post-exposure prophylaxis (PEP) can contribute to financial burden to the public health sector due to the high mortality risk associated with rabies disease.3,4

Methods

- This medication use evaluation was a quality assessment review and deemed exempt from Institutional Review Board approval.
- Retrospective chart review of all patients who received rabies vaccine, HRIG, or both for PEP from January 1, 2015 through May 31, 2017.
- Inclusion: all patients administered at least one dose of any rabies biologic agent in the inpatient or ambulatory care setting
- Exclusion: any patient who presented for travel-related pre-exposure prophylaxis (PrEP), booster series, or completion of prior PEP
- Utilized ACIP recommendations to determine appropriateness of initiation, timing, and administration of PEP (Table 1)
- Descriptive statistics were utilized to evaluate the data collected.

Table 1. ACIP recommendations for PEP initiation / administration†

<table>
<thead>
<tr>
<th>Animal exposure requiring PEP</th>
<th>Rabies vaccine administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bats, domesticated mammals (i.e., dog, cat), wild carnivores</td>
<td>Infiltrate full dose into wound, with any volume remaining administered intramuscularly at anatomical site distal from vaccine administration on day 0*</td>
</tr>
<tr>
<td>(i.e., foxes, skunk), non-human primates</td>
<td>* This may require multiple sites.</td>
</tr>
</tbody>
</table>

HRIG administration

- Infiltrate full dose into wound, with any volume remaining administered intramuscularly at anatomical site distal from vaccine administration on day 0*

- * Patient with immunosuppression: 5 doses series should be administered (Days 0, 3, 7, 14, 28).

Results

- **Patients selection criteria**
  - Patients reviewed (n = 254)
  - Included patients (n = 131)
  - Excluded patients (n = 123)
  - PEP for travel (77)
  - PEP booster (15)
  - Completion of prior PEP (31)

- **Type of animals for potential human rabies exposure (n = 131)**
  - Bats (82)
  - Domesticated mammals (37)
  - Non-human primates (3)
  - Small rodents (1)
  - Wild carnivores (8)

- **Biologic administration per ACIP recommendations**
  - Met ACIP recommendations (n = 126)
  - Did not meet ACIP recommendations (n = 5)

- **Rabies vaccine site of administration for patients meeting ACIP recommendations**

- **HRIG site of administration for patients meeting ACIP recommendations**

Discussion

- At this health system, the majority of human rabies exposure were related to bats and domesticated mammals (dogs and cats).
- All patients who met ACIP recommendations for rabies vaccination received the first dose, with greater than 85% of patients also receiving HRIG (Figure 3).
- Majority of rabies biologics administered lacked documentation regarding site of administration within the EHR, possibly due to multiple sites used or complexity of EHR documentation.
- There was a 28% attrition rate between the first and second dose of rabies vaccine with 51% of patients completing their PEP series.

Limitations:

- This was a single-center, retrospective chart review.
- Inability to evaluate completion of PEP for patients who did not return to the same health system for subsequent doses but may have presented elsewhere
- Some patients may have been advised to not complete the rabies vaccine series by the health department because the source of animal exposure did not exhibit rabies symptoms under observation.

Conclusions

- Ensuring appropriate patient selection, site of administration, and completion of series may benefit from additional tools with the EHR.
- Education regarding rabies administration protocol will be reinforced with providers to help meet ACIP recommendations.
- These results will be shared with the Departments of Emergency Medicine and Infection Control.

References


Authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have an interest in the subject matter of this presentation: Vinh Luong: receiving of travel, free meals, free accommodations, free lodging, and salary. Discussion: receiving of travel, free meals, free accommodations, free lodging, and salary.
Background:
The purpose of this study was to assess the impact of a pharmacist-managed culture review and follow-up program in the emergency department (ED) at two community hospitals. As a result of the overuse and inappropriate prescribing of antibiotics, there is increasing antimicrobial resistance in the community. In the Emergency Department, physicians are tasked with the challenge of prescribing antibiotics prior to obtaining the finalized culture results. Therefore, empiric treatment needs to cover the likely pathogens while minimizing the collateral damage of resistance and side effects. ED pharmacists are well positioned to change therapy when needed and choose the most appropriate agent.

Methods:
A retrospective study was performed to evaluate the impact of a pharmacist-driven culture review and follow-up process in the ED at two community hospitals which are staffed by the same ED Physician group. The pharmacist-managed service was performed five days per week from Sunday through Thursday. The nursing staff was responsible for culture follow-up on the remaining two days of the week. The ED pharmacist was responsible for reviewing a report, which identified patients who left the ED with a positive culture. The pharmacist also received calls from the microbiology laboratory regarding Verigene® results for positive blood cultures, STD cultures and rapid strep test cultures. Adults and pediatric patients were included in the review. The pharmacist determined if the patient was discharged on appropriate therapy. If a change in therapy was required, the pharmacist would discuss the recommendation with the ED physician and then call the patient and notify him or her of the change in treatment. The pharmacist would then send the new prescription electronically to the pharmacy of choice. Interventions that were recorded included the following: antibiotic changed based on culture/sensitivities, discontinuation of unnecessary antibiotics, and calling patients to return to the ED based on positive cultures.

Results:

<table>
<thead>
<tr>
<th>Patient Demographics</th>
<th>Type of Cultures Resulted</th>
<th>Cultures (n=487)</th>
</tr>
</thead>
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<tr>
<td>Patients, n</td>
<td></td>
<td>484</td>
</tr>
<tr>
<td>Age (mean ± SD) years range</td>
<td></td>
<td>45.3 ± 27 3 months – 99 years</td>
</tr>
<tr>
<td>&lt;18 years of age, n (%)</td>
<td></td>
<td>78 (16.1%)</td>
</tr>
<tr>
<td>Female, n (%)</td>
<td></td>
<td>375 (79.5%)</td>
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<table>
<thead>
<tr>
<th>Type of Cultures Resulted</th>
<th>ED Revisit/Admission Data N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urine</td>
<td>ED Revisit within 72hr 13 (2.7%)</td>
</tr>
<tr>
<td>Blood</td>
<td>Admission within 30 days 19 (3.9%)</td>
</tr>
<tr>
<td>Wound</td>
<td>ED Revisit within 72hr and admitted 16 (3.3%)</td>
</tr>
<tr>
<td>Strept Culture</td>
<td></td>
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<tr>
<td>Sputum</td>
<td></td>
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<tr>
<td>Chlamydia trachomatis amp probe</td>
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Pharmacist Interventions:

<table>
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<tr>
<th>N (%)</th>
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<tbody>
<tr>
<td>Resistant culture to empiric therapy – Pharmacist changed antibiotic to appropriate therapy 83 (17%)</td>
</tr>
<tr>
<td>Positive Blood cultures/results – Pharmacist called patient to return to ED 3 (0.6%)</td>
</tr>
<tr>
<td>Positive Blood cultures/results – Pharmacist called Primary Physician or long-term care facility to notify 10 (2.1%)</td>
</tr>
<tr>
<td>De-escalation/Discontinuation based on results 3 (0.6%)</td>
</tr>
<tr>
<td>TOTAL INTERVENTIONS 99 (20%)</td>
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Discussion:
A total of 487 cultures were reviewed and 99 (20%) were intervened on by ED pharmacists. One notable finding was that of 60 patients who were started empirically on a fluoroquinolone for a UTI, 14 (23%) required change due to a resistance culture. This led to ED provider education of the 2016 FDA Fluoroquinolone Safety Warning. Empirc treatment recommendations based on culture sensitivity data were reviewed with providers after this study. Additionally, 27 patients who did not go home on antibiotics for a UTI were treated after cultures resulted. This led the Antimicrobial Stewardship Committee to revise the urinalysis reflex culture criteria to only reflex for WBC >10/hpf. Baseline ED revisit and admission data would have been beneficial to determine if the pharmacist culture follow-up program resulted in decreased admissions. Furthermore, pharmacists only intervened on positive cultures. In the future, obtaining a negative culture report would allow pharmacists to intervene and save antibiotic days in the community.

Conclusion:
Over a 6-month period, a pharmacist-managed culture follow-up process in the emergency department had a positive impact on patient care. Antimicrobial interventions were performed in approximately 1/5 of patients, supporting the opportunity for the expansion of antimicrobial stewardship in the ED.

Disclosure
Authors of this presentation have the following 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. PharmD 2. MBA 3. BCPS
Evaluation of a novel fixed dosing regimen of 4-factor prothrombin complex concentrate (PCC) for warfarin reversal

Clare McMahon, PharmD, Anne Rose, PharmD, Joe Halfpap, PharmD, BCPS

Background

- Current UW Health PCC dosing recommendations are weight and INR based with a maximum dose of 5000 units
- Recent literature shows that fixed and often lower doses of PCC for warfarin reversal may be equally effective as traditional weight-based dosing
- Updated dosing recommendations were created based on current literature and PCC usage data from UW Health

Updated UW Health Guideline recommendations PCC dosing in warfarin reversal

<table>
<thead>
<tr>
<th>Pre-treatment INR</th>
<th>Dose of PCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 6.0</td>
<td>1000 IU</td>
</tr>
<tr>
<td>≥ 6.1</td>
<td>2000 IU</td>
</tr>
<tr>
<td>Any INR with CNS bleed</td>
<td>2000 IU</td>
</tr>
</tbody>
</table>

May repeat with 500 units if INR goal or clinical outcome is not achieved.

*Round doses to the nearest vial size. Vial sizes vary.

Purpose and Objectives

To evaluate the efficacy, efficiency and cost of a novel fixed dose PCC regimen for warfarin reversal as compared to a historical weight based dosing cohort.

Objective 1: Implement and optimize utilization of updated recommendations for fixed dosing of PCC for warfarin reversal

Objective 2: Assess efficacy of fixed dosing of PCC for warfarin reversal

Objective 3: Evaluate timeliness of medication administration and laboratory availability

Objective 4: Evaluate the cost implications associated with utilization of fixed dose PCC recommendations

Methods

Objective 1: Update UW guideline to recommend fixed dosing
- Educate hospital staff on new recommendations
- Measure compliance to updated PCC dosing recommendations
- Provide real time feedback with daily usage reports
- Evaluate need for pharmacist delegation protocol

Objective 2: Compare case matched patients using historical weight based dosing to fixed dosing using the following measures of treatment success:
- INR reversal to ≤1.3 for CNS bleeds and emergent surgery or ≤1.5 for all other bleeds
- Clinical signs of continued bleeding

Objective 3: Implement PCC order panel with fixed dosing and follow up INR guidance
- Calculate time to INR result pre- and post- PCC administration
- Calculate median time to PCC administration pre- and post- guideline update
- Identify barriers to more rapid PCC administration

Objective 4: Compare the median cost per patient of PCC with weight based and with fixed dosing for warfarin reversal

Results - Baseline Data

2016 indications for emergent warfarin reversal with PCC (n=75)

- 99 doses of PCC administered at UW Health in 2016
  - 75 were for emergent warfarin reversal
  - 27 doses of PCC for warfarin reversal utilized in the ED

- Patient weight, mean 87.5 kg
- ED time from order entry to administration, mean 42 minutes

References


Evaluation of a novel fixed dosing regimen of 4-factor prothrombin complex concentrate (PCC) for warfarin reversal

Clare McMahon, PGY2 Emergency Medicine Pharmacy Resident, et al. University of Wisconsin, mcmahon.1491@gmail.com

The authors of this poster have nothing to disclose.
Clinical pharmacist simulation training for the rapidly decompensating patient

Shane Salimnejad, PharmD, BCPS; Jennifer Schultheis, PharmD, BCPS, BCCCP; Jennifer Mando-Vandrick, PharmD, BCPS; Michael Wolcott, PharmD, BCPS; Bridgette Kram, PharmD, BCPS, BCCCP; Siyun Yang, MS; Traci Lynn Thoureen, MD, MHS-CL, MMCi, FACEP
Duke University Hospital; Durham, North Carolina

Background

- Clinical pharmacists have become integral members of emergency response, including rapid response teams (RRT) and cardiopulmonary arrest response teams. Pharmacist responsibilities include, but are not limited to, medication procurement and preparation; providing recommendations for medication therapy including doses, rates, and routes of administration; serving as a drug information resource; and providing compatibility information.

- RRT deployment reduces rates of respiratory failure, stroke, severe sepsis, acute kidney injury, intensive care admission and in-hospital cardiopulmonary arrest. RRTs and arrests remain relatively rare events and maintaining responder proficiency and comfort in these areas is difficult. The optimal method of maintaining pharmacist responder training has yet to be described.

- Simulation based training (SBT) allows learners to engage in clinical scenarios that are infrequently encountered in real life and to practice skills without endangering patients. It provides a safe, supportive, and realistic learning environment with an opportunity to provide real-time feedback. This project aims to utilize simulation training as a technique for improving the comfort and knowledge level of clinical pharmacists as RRT and cardiopulmonary arrest responders.

Objective(s)

Primary Objective

- To assess the impact of simulation training on clinical pharmacist self-efficacy in the management of a rapidly decompensating patient

Secondary Objectives

- To assess the impact of simulation training on clinical pharmacist knowledge while participating in management of a rapidly decompensating patient
- To assess clinical pharmacist perception towards RRT and Code Blue response
- To determine whether pharmacist characteristics affect baseline self-efficacy, knowledge, and perception in the care of a rapidly decompensating patient

Methods

Study Design

- IRB approved, single-center, observational study

Inclusion Criteria

- 69 adult clinical pharmacists solicited for participation, on a volunteer basis

Exclusion Criteria

- Non-CPCS (Clinical and Patient Care Services) staff, including residents

Materials

- A training manikin to simulate the patient
- Vital Sign Simulator (VSS) software
- Mock code cart
- Expired Abboject syringes, medications, plastic syringes with needles, and fluid bags

Simulation

- Multiple sessions available to allow for participation from all shifts
- ACPE Continuing Education credit provided
- Class sizes limited to 10 individuals
- Scenarios developed using evidence-based practice and guidelines
- A mock class schedule is as follows:
  - Case (15 minutes)
  - Debriefing (30 minutes)

Primary Objective

- Score of self-efficacy survey pre and post simulation

Secondary Objectives

- Score of knowledge assessment pre and post simulation
- Score of perception survey pre and post simulation
- Effect of pharmacist characteristics on baseline self-efficacy, knowledge, and perception in the care of a rapidly decompensating patient

Data Collection & Analysis

- Summary statistics will be used to describe the outcome and demographic characteristics.

- Continuous variables will be summarized using mean and standard deviation or median and interquartile range. Depending on parametric or nonparametric distribution, a two-sample t test or Wilcoxon-Mann-Whitney test will be used to compare results among pharmacists who attended at least one simulation session compared to pharmacists who did not participate.

- Chi-squared test or Fishers exact test will be used to determine if there is a difference between the two groups.

- A mixed model will be used to assess the association between self-efficacy score and patients’ characteristics to account for the correlation between the same pharmacist’s pre-simulation and post-simulation scores. Significance will be assessed at alpha = 0.05.

References


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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.
Effect of Initial Intravenous Antihypertensive Agent on the Management of Blood Pressure During Hypertensive Emergencies

Priya M. Shah, PharmD1; Luigi Brunetti, PharmD, MPH, BCPS, BCGP1,2; Christopher Adams, PharmD, BCPS, BCCP1,2

1Robert Wood Johnson University Hospital Somerset, Somerville, NJ 2Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ

Background
- Hypertensive emergency is defined as a systolic blood pressure (SBP) greater than 180 mmHg and/or diastolic blood pressure (DBP) greater than 120 mmHg with evidence of end organ damage1,2
- This life-threatening crisis requires careful blood pressure reduction, a decrease in mean arterial pressure (MAP) by 15-25% within the first 24 hours of hospitalisation
- Hypertensive emergency is defined as a SBP greater than 180 mmHg and/or DBP greater than 120 mmHg with evidence of end organ damage1,2

Objective
- To compare IV antihypertensives commonly used in our emergency department (ED) as initial therapy for hypertensive emergency and determine their effect on clinical outcomes during the course of treatment

Methods
- IRB approved, single center, retrospective cohort study of patients admitted from January 1, 2012 to August 31, 2017
- Diagnostic and drug charge codes were used to identify patients with hypertensive emergency who received at least one IV antihypertensive agent
- Since labetalol comprised of 54% of the initial agents used, two comparison groups were created:
  - Labetalol group: patients who received labetalol as the initial agent
  - Non labetalol group: patients who received any other IV antihypertensive as the initial agent
- Figure 1 summarizes the patient selection process

Table 1. Demographic Information

<table>
<thead>
<tr>
<th>Variable</th>
<th>Labetalol (N=27)</th>
<th>Non Labetalol (N=23)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years, SD)</td>
<td>65.2 ± 19.3</td>
<td>63.2 ± 20.1</td>
<td>0.97</td>
</tr>
<tr>
<td>Male Gender (n, %)</td>
<td>18 (66.7)</td>
<td>16 (69.6)</td>
<td>0.68</td>
</tr>
<tr>
<td>Race (n, %)</td>
<td>12 (44.4)</td>
<td>12 (52.2)</td>
<td>0.60</td>
</tr>
<tr>
<td>Caucasian</td>
<td>12 (44.4)</td>
<td>12 (52.2)</td>
<td>0.60</td>
</tr>
<tr>
<td>Black or African American</td>
<td>4 (14.8)</td>
<td>4 (17.4)</td>
<td>0.60</td>
</tr>
<tr>
<td>Other</td>
<td>7 (25.9)</td>
<td>7 (30.4)</td>
<td>0.60</td>
</tr>
<tr>
<td>Prior Hypertension (%)</td>
<td>25 (92.6)</td>
<td>19 (82.6)</td>
<td>0.14</td>
</tr>
<tr>
<td>Tobacco/Alcohol Use (n, %)</td>
<td>10 (37.0)</td>
<td>7 (30.4)</td>
<td>0.64</td>
</tr>
<tr>
<td>End Organ Damage (n, %)</td>
<td>8 (29.6)</td>
<td>10 (43.5)</td>
<td>0.33</td>
</tr>
<tr>
<td>Cardio</td>
<td>2 (7.4)</td>
<td>1 (4.3)</td>
<td>0.60</td>
</tr>
<tr>
<td>Neurologic</td>
<td>11 (40.7)</td>
<td>7 (30.4)</td>
<td>0.47</td>
</tr>
<tr>
<td>Renal</td>
<td>7 (25.9)</td>
<td>7 (30.4)</td>
<td>0.60</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>3 (11.1)</td>
<td>4 (17.4)</td>
<td>0.56</td>
</tr>
</tbody>
</table>

Methods and Results

Primary Outcomes:
- Proportion of patients who achieved goal MAP within the first hour of initial antihypertensive administration
- Time to initial goal MAP

Secondary Outcomes:
- Percentage of MAPs at goal within the first 24 hours of hospitalisation
- Duration of IV therapy
- Number of IV antihypertensives used to meet goal MAP

Inclusion Criteria:
- Patients > 18 years old
- Patients who met the definition of hypertensive emergency
- Patients who received at least one dose of an IV antihypertensive agent in the ED

Exclusion Criteria:
- Pregnancy
- Stroke
- Aortic dissection

Results

Table 2. Primary and Secondary Outcomes

<table>
<thead>
<tr>
<th>Variable</th>
<th>Labetalol (N=27)</th>
<th>Non Labetalol (N=23)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achieved Goal MAP Within the First Hour of Therapy (n, %)</td>
<td>12 (44.4)</td>
<td>12 (52.2)</td>
<td>0.40</td>
</tr>
<tr>
<td>Time to Initial Goal MAP (n, %)</td>
<td>12 (44.4)</td>
<td>12 (52.2)</td>
<td>0.40</td>
</tr>
<tr>
<td>0-1 hours</td>
<td>12 (44.4)</td>
<td>12 (52.2)</td>
<td>0.40</td>
</tr>
<tr>
<td>1-6 hours</td>
<td>3 (11.1)</td>
<td>3 (13.0)</td>
<td>0.84</td>
</tr>
<tr>
<td>MAPs at Goal With the First 24 Hours of Hospitalisation (%)</td>
<td>25 (92.6)</td>
<td>19 (82.6)</td>
<td>0.14</td>
</tr>
<tr>
<td>0-50%</td>
<td>5 (18.5)</td>
<td>6 (26.1)</td>
<td>0.092</td>
</tr>
<tr>
<td>51-75%</td>
<td>5 (18.5)</td>
<td>7 (30.4)</td>
<td>0.35</td>
</tr>
<tr>
<td>76-100%</td>
<td>13 (48.1)</td>
<td>13 (56.5)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Duration of IV Therapy (n, %)</td>
<td>25 (92.6)</td>
<td>19 (82.6)</td>
<td>0.14</td>
</tr>
<tr>
<td>0-24 hours</td>
<td>25 (92.6)</td>
<td>19 (82.6)</td>
<td>0.14</td>
</tr>
<tr>
<td>24-48 hours</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0.009</td>
</tr>
<tr>
<td>48+ hours</td>
<td>2 (7.4)</td>
<td>4 (17.4)</td>
<td>0.52</td>
</tr>
</tbody>
</table>

Figure 1. Analysis
- Enrollment
- Labetalol (n=27)
- Non-Labetalol (n=23)
- Time to initial goal MAP
- Initial goal MAP

Discussion

Comparison of the labetalol and non labetalol antihypertensive groups in relation to the primary outcomes was not statistically significant

No statistically significant difference between the two groups in terms of percentage of MAPs at goal within the first 24 hours of hospitalisation

It is notable that there was a significant difference in changes to initial antihypertensive therapy with the non labetalol group requiring more boluses, titrations, and/or additional agents to maintain goal MAP. Patients in the labetalol group had fewer changes to initial therapy

Non labetalol group required a longer duration of IV therapy and consequently, a longer hospital and intensive care length of stay to remain at goal MAP

Study Limitations: possibility of a Type II error due to small sample size, variance in blood pressure documentation among patient charts, accuracy of ICD coding

Table 3. Secondary Outcomes Continued

<table>
<thead>
<tr>
<th>Variable</th>
<th>Labetalol (N=27)</th>
<th>Non Labetalol (N=23)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Hospital LOS (days, SD)</td>
<td>13 (48.1)</td>
<td>13 (56.5)</td>
<td>0.009</td>
</tr>
<tr>
<td>Mean Intensive Care LOS (days, SD)</td>
<td>2.97 ± 3.37</td>
<td>6.79 ± 7.15</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

References

Evaluation of Empiric Antibiotic Prescribing for Urinary Tract Infections in Patients Discharged From the Emergency Department

Elizabeth Tencza, PharmD; Daniel Yousef, PharmD, BCPS; Ruben Santiago, PharmD, BCPS, BCCCP; Laura Aragon, PharmD. BCPS-AQ ID, Mark Supino, MD
Jackson Memorial Hospital, Jackson Health System, Miami, FL

BACKGROUND

• Antibiotics compose 11% of prescriptions written for patients discharged from the emergency department (ED)
• Previous studies have shown improvement in appropriateness of antibiotics after implementation of a pharmacist driven urine culture callback program
• 30% decrease in inadequate regimens
• Faster callback times
• Decrease in unplanned readmissions

A study completed in Jackson Memorial Hospital’s (JMH) ED from May to October 2014 showed that 25% of patients treated for an Escherichia coli urinary tract infection (UTI) received inadequate therapy

RATIONALE

• JMH ED sees approximately 100 adult patients per month who are discharged prior to the return of positive urine cultures
• Currently no structured system exists for response to these cultures
• Pharmacists are well trained in interpretation of antimicrobial resistance, dosing, duration of therapy, identification of allergies, route of administration, and drug interactions
• The ED pharmacist is in a unique position and equipped with the proper knowledge and tools to facilitate appropriate and timely modifications

METHODOLOGY

• Retrospective chart review conducted between July and September 2017
• Inclusion of patients with positive urine culture and diagnosis of UTI

EXCLUSION CRITERIA

• ≥ 18 years of age
• Positive urine culture
• Diagnosed with a UTI

INCLUSION CRITERIA

• 185 patients were included
• 194 organisms were isolated
• Escherichia coli (n=121)
• Klebsiella pneumonia (n=15)
• Proteus mirabilis (n=14)
• Other (n=44)
• 22 patients (12%) were readmitted to a JMH facility within 30 days with diagnosis of UTI
• 14/22 (64%) potentially preventable

RESULTS

Patient Demographics (n=185)

<table>
<thead>
<tr>
<th>Average age, years</th>
<th>47.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catheter associated</td>
<td>33</td>
</tr>
<tr>
<td>Diagnosis of pyelonephritis</td>
<td>20</td>
</tr>
<tr>
<td>Female</td>
<td>130</td>
</tr>
<tr>
<td>Pregnant</td>
<td>16</td>
</tr>
<tr>
<td>Presented from skilled nursing facility</td>
<td>2</td>
</tr>
</tbody>
</table>

Potential Interventions (n=56)

| Bug/drug mismatch | 43 |
| Inadequate duration | 0 |
| Renal adjustment | 6 |
| Allergy to antibiotic | 0 |
| Drug interactions | 0 |
| Other | 7 |

Empiric Antibiotic Prescribing

<table>
<thead>
<tr>
<th>Amoxicillin Clavulanate</th>
<th>Ceftriaxone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefpodoxime</td>
<td>Ciprofloxacin</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>Nitrofurantoin</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>Nitrofurantoin-Triprolidine</td>
</tr>
</tbody>
</table>

ENDPOINTS

Primary

• Describe the rate of potential pharmacist interventions for empiric antimicrobial prescribing for UTIs in patients discharged from the ED

Secondary

• Describe the rate of antimicrobial resistance to empiric treatment for UTI in patients discharged from the ED
• Describe prescribing practices for empiric regimens for UTI in patients discharged from the ED

REFERENCES


FUTURE DIRECTION

• Implementation of a pharmacist driven urine culture callback program
• Post-intervention impact analysis
• Education to providers on best practices when treating UTIs for patients discharged from the ED
• Development of an ED specific antibiotic for urine cultures at JMH

LIMITATIONS

• Single center
• Variations in micro-lab reporting during study period
• Documentation of symptoms
• Demographics
• Culture data

DISCLOSURE

No disclosures. Submitted to JMH Clinical Research Review Committee and IRB approved.
Impact of inter-hospital transfer in delaying appropriate anticoagulation reversal in patients with warfarin-associated intracranial hemorrhage
Anne Zepeski, PharmD; Stacey Rewitzer, PharmD, BCPS; Ethan Sabers, PharmD Candidate; Kari K. Harland, MPH, PhD, Brett Faine, PharmD, MS
The University of Iowa Hospitals and Clinics; anne-zepeski@uiowa.edu

Introduction
- Millions of Americans are prescribed warfarin each year.
- 4-factor prothrombin complex concentrates (4-factor PCC) selectively and rapidly reverses anticoagulation activity of warfarin.
- Current guidelines for reversal of intracranial hemorrhage (ICH) recommend reversal of warfarin-associated hemorrhage with 4-factor PCC and intravenous phytonadione.

Background
- Previous research in our region has demonstrated an absence of 4-factor PCC in rural community healthcare centers.
- It is not clear whether this disparity influences patient morbidity and mortality.

Methods
- This is a single-center, retrospective chart review, conducted between August 1st, 2013 and July 1st, 2017.
- Inclusion Criteria:
  - Traumatic or non-traumatic intracranial hemorrhage on warfarin
  - Administration of 4-factor PCC
- Exclusion Criteria:
  - Less than 18 years of age
  - 4-factor PCC received for indication other than warfarin reversal in the setting of ICH
  - 4-factor PCC received during subsequent encounter
  - Pregnant or incarcerated patients
  - Key data points missing from medical record

Baseline Demographics

<table>
<thead>
<tr>
<th></th>
<th>Total N=173</th>
<th>Direct N=23</th>
<th>Transfer N=153</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (std)</td>
<td>76 (11.6)</td>
<td>76.1 (13.4)</td>
<td>76.3 (11.3)</td>
<td>0.93</td>
</tr>
<tr>
<td>Male (%)</td>
<td>73 (41.5)</td>
<td>13 (56.5)</td>
<td>60 (39.2)</td>
<td>0.02</td>
</tr>
<tr>
<td>Initial INR, mean (std)</td>
<td>2.9 (1.5)</td>
<td>4.0 (2.8)</td>
<td>2.7 (1.1)</td>
<td>0.04</td>
</tr>
<tr>
<td>FFP prior to arrival (%)</td>
<td>39 (22.5)</td>
<td>NA</td>
<td>39 (25.5)</td>
<td>NA</td>
</tr>
<tr>
<td>GCS at admission (std)</td>
<td>12.5 (3.8)</td>
<td>12.9 (3.2)</td>
<td>12.5 (3.9)</td>
<td>0.56</td>
</tr>
<tr>
<td>Traumatic ICH (%)</td>
<td>82 (47.2)</td>
<td>12 (52.2)</td>
<td>71 (46.4)</td>
<td>0.69</td>
</tr>
</tbody>
</table>

Indication for warfarin therapy
- Atrial fibrillation (%): 128 (72.7) vs. 17 (73.9) vs. 111 (72.5) p=0.58
- Valve replacement (%): 24 (13.6) vs. 2 (8.7) vs. 22 (14.4) p=0.54
- Thromboembolism (%): 30 (17.0) vs. 3 (13.0) vs. 27 (17.6) p=0.58
- Other indication (%): 7 (4.0) vs. 1 (4.3) vs. 6 (3.9) p=0.99

Results

<table>
<thead>
<tr>
<th></th>
<th>Direct N=23</th>
<th>Transfer N=153</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to 4-factor PCC administration (minutes). (std)</td>
<td>135.7 (59.9) vs. 339.1 (181.1) vs. &lt;0.0001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-hospital mortality (%)</td>
<td>7 (30.4) vs. 37 (24.1) vs. 0.496</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital length of stay (days), mean (std)</td>
<td>7.3 (5.2) vs. 7.7 (6.7) vs. 0.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICU length of stay (days), mean (std)</td>
<td>3.0 (4.2) vs. 2.5 (3.2) vs. 0.44</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusion
- Interhospital transfer was associated with a delay in guideline concordant reversal of warfarin-associated intracranial hemorrhage.
- This delay in therapy was not associated with increased in-hospital mortality, hospital length of stay or change in interval ICH size.

Impact of inter-hospital transfer in delaying appropriate anticoagulation reversal in patients with warfarin-associated intracranial hemorrhage
Anne Zepeski, PharmD; PGY2 Emergency Medicine Pharmacy Resident, et al.
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Disclosure: The authors have nothing to disclose. This research project was approved by institutional review board.