Evaluation of Time to Antibiotic Administration and Initial Antibiotic Selection in an Inpatient Setting

Amy Janiak, Pharm.D., Mary Pung, Pharm.D. and Marisa Mendez, Pharm.D.
Community Medical Centers, Fresno CA

INTRODUCTION

Numerous studies have demonstrated therapeutic benefits by implementing pathways which reduce the time to initial antibiotic administration within the Emergency Department. An obvious decrease in morbidity, mortality, and length of hospital stay has been observed when antibiotics are administered promptly\(^1\). Therefore, it is essential to evaluate our institution’s time to initial antibiotic administration and the appropriateness of the initial regimen selected in order to determine where improvements in patient care can be made.

OBJECTIVES

- The primary objective of this study is to evaluate the process of time to first dose antibiotic administration in an inpatient setting.
- The appropriateness of initial antibiotic selection in reference to microbiology reports will also be evaluated.
- The assessment of these two objectives will allow the development and implementation of a clinical pathway into our hospital guidelines in order to improve the quality of patient care.

METHODOLOGY

**Design:** Prospective, observational chart review

**Patients:** All patients with a new indication warranting the initiation of antibiotic administration within the Emergency Department. An obvious decrease in morbidity, mortality, and length of hospital stay has been observed when antibiotics are administered promptly\(^1\). Therefore, it is essential to evaluate our institution’s time to initial antibiotic administration and the appropriateness of the initial regimen selected in order to determine where improvements in patient care can be made.

**Data Collection:** The numerous steps in the process of antibiotic administration were documented using the medical record, inpatient pharmacy computer system and documentation forms. The following times were evaluated:

- Time of physician order
- Clerk faxes order to pharmacy
- Nurse transcription
- Pharmacy order entry
- Pharmacy medication preparation
- Pharmacist medication verification
- Medication delivery
- Medication administration by nurse
- Medication removed from Pyxis® by nurse

Reasons for delay in antibiotic administration were recorded (i.e. pharmacy interventions, inappropriate defaults to standard administration times).

Microbiology reports were assessed to evaluate the appropriateness of initial antibiotic selection.

RESULTS

- **Average Time (Hours:Minutes) to Antibiotic Administration at UMC Hospital**
  - Order to Fax: 1:33
  - Order to Transcription: 2:37
  - Order to Floor Delivery: 5:25
  - Order to Administration: 6:05

**Initial Antibiotic Selection Susceptibility**

- **Resistant:** 13%
- **Susceptible:** 87%

**Average & Median Time (Hours:Minutes) to Antibiotic Administration**

<table>
<thead>
<tr>
<th>Floor</th>
<th>Order to Fax</th>
<th>Order to Transcription</th>
<th>Order to Pyxis</th>
<th>Fax to Enter</th>
<th>Enter to Program</th>
<th>Prepare to Verify</th>
<th>Verify to Deliver</th>
<th>Fax to Deliver</th>
<th>Deliver to Admin</th>
<th>Pyxis to Admin</th>
<th>Order to Admin</th>
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<td>0:00</td>
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<td>0:00</td>
<td>0:30</td>
<td>0:12</td>
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</tr>
<tr>
<td>Med/Surg</td>
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<td>2:12</td>
<td>0:13</td>
<td>0:13</td>
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<td>ICU</td>
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<td>2:27</td>
<td>4:04</td>
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<td>0:06</td>
<td>0:04</td>
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<td>1:13</td>
<td>2:27</td>
<td>4:04</td>
</tr>
<tr>
<td>Burn</td>
<td>1:24</td>
<td>2:52</td>
<td>0:56</td>
<td>0:84</td>
<td>0:14</td>
<td>0:06</td>
<td>0:05</td>
<td>1:46</td>
<td>1:24</td>
<td>2:52</td>
<td>0:56</td>
</tr>
<tr>
<td>Burn</td>
<td>0:51</td>
<td>1:14</td>
<td>0:56</td>
<td>0:24</td>
<td>0:13</td>
<td>0:06</td>
<td>0:04</td>
<td>1:13</td>
<td>0:51</td>
<td>1:14</td>
<td>0:56</td>
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<tr>
<td>UMC Hospital</td>
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<td>0:56</td>
<td>0:24</td>
<td>0:13</td>
<td>0:06</td>
<td>0:04</td>
<td>1:13</td>
<td>0:51</td>
<td>2:27</td>
<td>0:56</td>
</tr>
</tbody>
</table>

**Conclusions**

The average overall time to initial antibiotic administration within the hospital setting is approximately 6 hours. Although all aspects of time to antibiotic administration require improvement, the rate limiting step of the overall process appears to be the time of medication delivery to actual patient administration. Interestingly, the rate limiting step within the pharmacy process is the time a new antibiotic order is received (via fax) to the time of order entry. There are several factors that could contribute to these delays. Further investigation is necessary to identify the specific factors involved. This information will facilitate the development and implementation of a hospital pathway aimed at reducing the time to initial antibiotic administration among patients. Furthermore, initial antibiotic selection appears to be appropriate. However, with 13% of organisms being resistant to the initial antibiotic selected, additional education in UMC hospital resistance patterns and antibiotic streamlining is warranted.

REFERENCES


DISCLOSURE

The authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities.
PHYSICAL AND CHEMICAL COMPATIBILITY OF KETAMINE WITH ATROPINE

Guneet Gandhi, Pharm.D., Philippe A. Mentler, Pharm.D, and Bryan R Kuhn, Pharm.D.
Community Medical Centers – Fresno, CA

BACKGROUND

Ketamine is an anesthetic and analgesic agent commonly used for procedural sedation in children in the emergency department. One adverse reaction of ketamine is an increase in bronchial secretions which may compromise the patient’s airway. Pre-medication with an anticholinergic agent is often recommended to decrease this adverse reaction. Unless the patient has intravenous access established, the patient will require two individual intramuscular injections of ketamine and atropine, which is not only painful, but inconvenient in an emergency setting. Typically, atropine and ketamine are mixed together and administered to the patient as one intramuscular (IM) injection, though no data supports the compatibility of this admixture.

ABSTRACT

Objective: The primary objective of this study is to evaluate the physical and chemical compatibility of ketamine and atropine.

Methods: The test solutions were analyzed for physical and chemical incompatibility at 10, 20, 30, and 60 minutes. Observations for physical incompatibility included changes in clarity, precipitation, gas formation, layering, pH change, and turbidity (measured electronically). Chemical compatibility was evaluated by using high pressure liquid chromatography analytical techniques.

METHODOLOGY

• Ketamine 100 mg/mL and atropine 0.4 mg/mL were obtained for analysis
• Each test was conducted at intervals of 10, 20, 30, and 60 minutes
• Measures for physical compatibility are as follows:
  - Clarity – solution should be clear and colorless
  - Precipitation – no precipitation should occur
  - Gas formation – no odor change should be observed
  - Layering – solutions should mix together without any separation
  - Turbidity – turbidity should be <0.5 NTU (nephelometric turbidity unit)
• pH was measured using EMD ColorpHast pH Strips
• Tests for physical compatibility (clarity, precipitation, gas formation, and layering) were done visually, unaided by any instruments, against a black and white background
• Turbidity was measured electronically using a Hach Model 2100N Laboratory Turbidimeter with a range between 0-1000 NTU
• Controls for ketamine and atropine were established using 10 ml of each solution
• Each control was observed for any physical variations, including turbidity at designated intervals
• A test solution was prepared based on common pediatric dosing of 4 mg/kg of ketamine and 0.02 mg/kg of atropine
• 4.5 ml of ketamine and 5.5 ml of atropine were admixed together to form the test solution
• The test solution was observed for any physical variations at 10, 20, 30, and 60 minutes
• Turbidity of the test solution was measured at the same intervals of 10, 20, 30, and 60 minutes
• Each test was done in triplicate to ensure accuracy

CONCLUSION

• After conducting several analyses on ketamine and atropine, our data show no evidence of physical incompatibility. Therefore, it is our opinion that these two chemicals display physical compatibility when mixed in the same syringe.
• An analysis of chemical compatibility will further lend support to our data that ketamine and atropine demonstrate no physical incompatibility when mixed together.
• To test for chemical compatibility we will use high performance liquid chromatography with quadruple mass spectrometry. The results for this portion of the test are pending.

DISCLOSURE

The authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities.

REFERENCES

• Verbal communication with Dr. Patrick N. Catania, editor of King’s Guide to Parenteral Admixtures.
Evaluation of Erythropoietin Use in Critically Ill Patients at University Medical Center: A Retrospective Chart Analysis
Panit Pollavith, Pharm.D., Erin Moline, Pharm.D., Mary Pung, Pharm.D., BCPS
Community Medical Centers – Fresno, California

ABSTRACT

Objective: To assess the appropriateness of recombinant human erythropoietin (rHuEPO) use in burn, surgery, and trauma Intensive Care Unit (ICU) patients at the University Medical Center (UMC), Fresno.

Methodology: A retrospective chart review was performed at UMC, Fresno, CA. A total of 120 charts from October 1, 2003 to October 31, 2004 were reviewed. Baseline and daily monitoring of hemoglobin, hematocrit, vital signs, and the use of adjunct medications were recorded. In addition, the diagnosis, purpose of erythropoietin or blood transfusions, ICU length of stay, the amount and duration of erythropoietin or blood transfusions received, and any adverse reactions to the products received were recorded. The appropriateness of erythropoietin use will be evaluated by comparing the collected data to the established studies1,2. The analyzed results will be used to develop and implement an erythropoietin protocol for this facility.

REFERENCES


BACKGROUND

Anemia is a clinical problem that is commonly seen in patients in the ICU. It is a deficiency in the oxygen-carrying component of the blood. Blood transfusions are the mainstay of treating acute anemia in these patients. However, in the early 1980’s concerns regarding adverse effects of blood transfusions arose, which led to a change in perception that transfusions are relatively risk-free. In a number of studies, therapy with rHuEPO has demonstrated a significant increase in hematocrit by stimulating the bone marrow to release immature erythrocytes2. Essentially, the correction of anemia through the use of erythropoietin reduces the amount of blood transfusions needed in these patients, showing that erythropoietin should be considered as an alternative to blood transfusions3.

METHODOLOGY

• Retrospective chart review was performed at UMC-Fresno.
• A total of 120 charts from October 1, 2003 to October 31, 2004 were reviewed.
• Prior to commencement, the study was submitted to the UMC Institutional Review Board for approval. Patients in the burn, surgery, or trauma ICU were identified using the hospital electronic medical record system.
• The following data was collected: characteristics (age and gender); allergies; past medical history; past surgical history; concomitant medications received while in the hospital; lab values (baseline and relevant complete blood counts, BUN, Scr, iron studies, anticoagulation parameters (APTT, PT, INR)); vital signs before and up to 8 hours after transfusions or erythropoietin administration; diagnosis; purpose of erythropoietin or blood transfusions; ICU length of stay; amount and duration of erythropoietin or blood transfusions received; and any adverse reactions to the products received.

Inclusion criteria:
• Age: 18 years and older
• Admission to ICU—trauma, surgical, or burn service
• ICU length of stay greater than 3 days

Exclusion criteria:
• Age: younger than 18 years
• Pregnancy or lactation
• Seizure disorder or seizure within 6 months prior to ICU admission
• Uncontrolled hypertension (SBP>200 or DBP>110 mmHg)
• Concurrent use of androgens, cytotoxic or immunosuppressive drugs
• Renal failure on maintenance dialysis
• Cancer
• Refractory, aplastic, hemolytic anemia
• Hgb > 12 mg/dL
• Acute bleed
• ICU length of stay less than 3 days

RESULTS

Patient characteristics:
- Gender:
  - Male: 61 (66%)
  - Female: 31 (34%)
- Age (years):
  - Range: 18 to 73
  - Mean: 55
- Hemoglobin levels:
  - > 9 mg/dL: 7-9 mg/dL: < 7 mg/dL:
- On ICU admission:
  - Hemoglobin levels: 65 (71%): 25 (27%): 2 (2%)
  - At the start of rHuEPO:
    - 11 (25%): 18 (41%): 15 (34%)
  - Upon ICU discharge:
    - 37 (40%): 46 (50%): 9 (10%)
- rHuEPO administration:
  - No. of patients received rHuEPO: 44
  - No. of patients received rHuEPO, 20,000 units 3 times a week:
    - 10 (23%)
  - No. of patients received rHuEPO, 40,000 units once a week:
    - 34 (77%)
  - No. of rHuEPO orders continued upon transferring patients from ICU to floors:
    - 33 (75%)
  - No. of patients received concurrent ferrous sulfate supplement with elemental iron of ≥ 150 mg/day:
    - 30 (68%)
  - No. of patients received concurrent folic acid 1mg per day:
    - 18 (41%)
  - No. of patients received concurrent vitamin B12:
    - 16 (36%)

Blood transfusions:
- Total No. of patients received blood transfusion: 32
- No. of patients received rHuEPO:
  - 25
- No. of patients received NO rHuEPO:
  - 7
- Total No. units of PRBC transfused: 150
- Units transfused in patients received rHuEPO:
  - 98
- Units transfused in patients received NO rHuEPO:
  - 52
- Mean No. of PRBC:
  - Patients received rHuEPO: 4
  - Patients received NO rHuEPO: 8

CONCLUSION

• Anemia is a common complication in critically ill patients.
• rHuEPO criteria at UMC are not defined.
• Anemia/rHuEPO guidelines need to be developed and implemented.
• A cost-effectiveness analysis of rHuEPO use is needed.
• Additional studies regarding patients most likely to benefit from erythropoietin, the most effective dosing regimen, and use of adjunctive therapies are needed.
Mild hyperkalemia is an excess concentration of potassium (K⁺) ions in the extracellular fluid compartment, and is associated with a K⁺ level of >5.5 mEq/L, but <6.5 mEq/L, asymptomatic, and no electrocardiogram changes. Sodium polystyrene sulfonate (SPS), a cation-exchange resin, is widely used in mild hyperkalemia. It binds excess K⁺ in exchange for sodium in the intestinal lumen. Currently, to date, there are limited studies that have evaluated the effect of SPS on serum K⁺ reduction. SPS contains 4 mEq of sodium (Na⁺) per gram, which would theoretically exchange for 4 mEq of K⁺, as demonstrated by in vitro data. However, based on in vivo data, the one-to-one exchange is not the case. It has been reported that SPS has an in vivo exchange capacity of approximately 1 mEq of K⁺ for every one gram of SPS. There have also been reports that SPS can decrease serum K⁺ of 0.7 mEq/L for every 15 grams of SPS administered. Whether or not these reports are true remain questionable.

**INTRODUCTION**

The present study will be conducted in 3 phases:

- **Phase I**: Pre-intervention retrospective chart review of patients who received SPS from January 2005 to September 2005
- **Phase II**: Develop SPS guideline for management of mild hyperkalemia based on results and from current literature, and provide inservice to internal medicine teams, along with distribution of index card sized guidelines for reinforcement
- **Phase III**: Post-intervention retrospective chart review from February 2005 to April 2005 to assess if SPS was administered appropriately in accordance with the developed guidelines

**METHODOLOGY**

Data Collection

- Patients will be identified using an electronic medical record system
- Patient demographics, and risk factors for hyperkalemia will be evaluated

Patient Selection

- **Inclusion criteria**: documented SPS administration for hyperkalemia, K⁺ ≤6.5 mEq/L, and managed by internal medicine teams
- **Exclusion criteria**: hemodialysis, administration of SPS retention enema, SPS given two or three hours apart, other treatments of hyperkalemia, and furosemide administered specifically for hyperkalemia

**STATISTICS**

Paired t-test to analyze:

- Changes of serum K⁺ level before and after SPS administration
- Determine amount of K⁺ reduction was seen with SPS 15 grams vs. 30 grams

**RESULTS**

**Patient Demographics (N = 53)**

<table>
<thead>
<tr>
<th>Age (years), Mean</th>
<th>60±15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males, No.</td>
<td>35 (66%)</td>
</tr>
<tr>
<td>Serum creatinine (mg/dL), Mean</td>
<td>1.6±0.9</td>
</tr>
<tr>
<td>Pre-SPS K⁺ (mEq/L), Mean</td>
<td>5.34±0.57</td>
</tr>
<tr>
<td>Post-SPS K⁺ (mEq/L), Mean</td>
<td>4.41±0.69</td>
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**Results**

<table>
<thead>
<tr>
<th>15 grams</th>
<th>30 grams</th>
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</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>16</td>
</tr>
<tr>
<td>30 grams</td>
<td>29</td>
</tr>
<tr>
<td>45 grams</td>
<td>1</td>
</tr>
<tr>
<td>80 grams</td>
<td>5</td>
</tr>
<tr>
<td>120 grams</td>
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<table>
<thead>
<tr>
<th>SPS 15 gm</th>
<th>SPS 30 gm</th>
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<tbody>
<tr>
<td>Change in K⁺ (mEq/L)</td>
<td>-0.8688</td>
</tr>
<tr>
<td>P-value</td>
<td>0.831</td>
</tr>
</tbody>
</table>

**REFERENCES**


Disclosure: No disclosures concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.
Stress ulcer prophylaxis has been shown to significantly reduce the incidence of clinically significant gastrointestinal tract bleeds in high risk patients. Based on epidemiology studies, the ASHP therapeutic guidelines recommend stress ulcer prophylaxis for all patients who have the following risk factors: 1. Respiratory failure 2. Coagulopathy 3. Presence of multiple, less clearly identified risk factors.

The current ASHP guideline recommends histamine-2 receptor blockers (H-2 blockers) as the agent of choice for stress ulcer prophylaxis. Although proton pump inhibitors (PPIs) have become popular agents for stress ulcer prevention, there have been no studies that have evaluated the use of H-2 blockers compared to PPIs in low risk patient populations.

### BACKGROUND

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### METHODOLOGY

The study will be conducted in three (3) phases:

- **Phase 1**: A pre-intervention retrospective chart review in patients receiving H-2 blockers or PPI over a one month period will be reviewed with respect to the ASHP Guidelines to identify areas of inappropriate usage.
- **Phase 2**: Targeted educational programs will be used to educate house-staff on appropriate usage of stress ulcer prophylaxis medications.
- **Phase 3**: A post-intervention chart review of patients receiving prophylaxis will be evaluated to assess the efficacy of the targeted education.

### Patient Selection

- All patients hospitalized at UMC who received either a H-2 blocker or a PPI for stress ulcer prophylaxis in June 2005 and March 2006.

### Outcome measures

- **Primary endpoint**: proportion of patients initiated on therapy for stress ulcer prophylaxis with appropriate risk factors for stress ulcer induced GI bleeds, before and after the targeted education.
- **Secondary endpoints**: 1) the proportion of patients initiated on therapy for stress ulcer prophylaxis with H-2 blocker rather than PPIs, and 2) pharmacy cost of stress ulcer therapy, before and after the targeted education.

### Data Collection

Patients will be identified using the Lastword® electronic medical record system. Patient demographics, past medical history, and risk factors will be evaluated.

### RESULTS

#### Phase I: Patient Demographics

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>No. of Patients</th>
<th>H-2 Blockers</th>
<th>PPIs</th>
<th>H-2 Blockers vs. PPIs</th>
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</thead>
<tbody>
<tr>
<td>Age &lt; 60</td>
<td>14</td>
<td>9 (64%)</td>
<td>5 (36%)</td>
<td>0.02*</td>
</tr>
<tr>
<td>Age ≥ 60</td>
<td>36</td>
<td>25 (69%)</td>
<td>11 (31%)</td>
<td>0.0004*</td>
</tr>
<tr>
<td>Sex (M/F)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>28</td>
<td>19 (68%)</td>
<td>9 (32%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Female</td>
<td>22</td>
<td>15 (68%)</td>
<td>7 (32%)</td>
<td>0.01</td>
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</tbody>
</table>

#### Phase I: Presence of risk factors at initiation of therapy

#### Phase I: Agent Selection for Prophylaxis

#### References


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

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**Stress ulcer prophylaxis is largely over-utilized in low risk patient populations at the University Medical Center.**

- Approximately 61% of all admitted patients were initiated on stress ulcer prophylaxis without an indication.
- 60% of these patients were admitted to the medicine service.
- Proton pump inhibitors are being prescribed in lieu of the guideline-recommended histamine-2 blockers.
- In patients whom stress ulcer prophylaxis was indicated, approximately 41% of the patients were prescribed a proton pump inhibitor.
- As a result of the Phase 1 study, educational programs will be emphasized in the target areas mentioned above.

**Phase 2 and 3 data is pending.**
Assessment of total parenteral nutrition utilization and the development of a guideline for use in malnutrition

Julius Chang, Pharm.D., Timothy Lopez, Pharm.D., and Alice H. Robbins, Pharm.D., BCPS
University Medical Center, Fresno, CA

INTRODUCTION

Total parenteral nutrition (TPN) therapy is necessary for patients whose gastrointestinal (GI) tract is nonfunctional or inaccessible. However, continuous use of TPN therapy has been associated with infectious, mechanical and metabolic complications, which can increase adverse events and overall hospital costs. Therefore, the initiation of TPN therapy should be reserved for those patients who have a true indication for its use. The American Society of Parenteral and Enteral Nutrition (A.S.P.E.N.) published updated guidelines for parenteral therapy use in 2002. The primary purpose of this study is to review these guidelines along with current literature to develop a concise list of appropriate indications for TPN therapy. The secondary purpose is to assess outcomes of TPN therapy by evaluating changes in albumin and/or prealbumin serum levels during TPN therapy. These analyses will be conducted at Community Regional Medical Center (CRMC), a private community hospital, and University Medical Center (UMC), an academic teaching facility, in Fresno, California.

OBJECTIVES

• Develop a guideline of appropriate TPN indications
• Assess appropriateness of TPN therapy
• Evaluate albumin and prealbumin levels for outcomes
• Educate medical staff regarding the new guideline
• Reassess appropriate use of TPN after education

RESULTS

• A retrospective analysis of TPN therapy between 9/05 and 8/06
• A prospective analysis will be performed in 2/07

Inclusion criteria: Patients on TPN therapy
Exclusion criteria: Patients <18 yrs, receiving peripheral parenteral nutrition (PPN) therapy, or on concomitant enteral nutrition (EN)

General TPN Indication Considerations
TPN should be reserved for patients whose:
• GI tract is non-functional, severely diminished or inaccessible
• EN trial failed or when the risk of EN related complications is unacceptably high
• Disease state and the expected time of inadequate nutrition warrant TPN initiation
• Expected therapy is > 4 days

*See accompanying handout for a complete list of appropriate TPN indications

Statistics
Statistical comparisons of the nominal and ordinal data were performed with Pearson’s chi-square test and the independent t-test, respectively

• A total of 207 subjects received TPN therapy and 178 subjects met inclusion criteria

<table>
<thead>
<tr>
<th></th>
<th>UMC n=38</th>
<th>CRMC n=140</th>
<th>Total n=178</th>
<th>p value</th>
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<tbody>
<tr>
<td>Female</td>
<td>12 (32%)</td>
<td>78 (56%)</td>
<td>90 (51%)</td>
<td>0.008</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>48.8 ± 16.3</td>
<td>58.5 ± 19.7</td>
<td>56.4 ± 19.4</td>
<td>0.006</td>
</tr>
<tr>
<td>Appropriate Indication</td>
<td>33 (87%)</td>
<td>108 (77%)</td>
<td>141 (79%)</td>
<td>0.19</td>
</tr>
<tr>
<td>Baseline AB</td>
<td>2.8 ± 0.36</td>
<td>3.1 ± 0.58</td>
<td>3.0 ± 0.57</td>
<td></td>
</tr>
<tr>
<td>Baseline PAB</td>
<td>7.0 ± 4.9</td>
<td>6.4 ± 6.7</td>
<td>6.2 ± 6.4</td>
<td></td>
</tr>
<tr>
<td>AB shift (95% CI)</td>
<td>0.18 (-0.14 to 0.49)</td>
<td>-0.15 (-0.23 to -0.07)</td>
<td>-0.13 (-0.2 to -0.05)</td>
<td>0.002</td>
</tr>
<tr>
<td>PAB shift (95% CI)</td>
<td>3.5 (6.3 to 7.6)</td>
<td>2.9 (3.6 to 8.2)</td>
<td>5.6 (3.5 to 7.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Baseline AB/ PAB ordered</td>
<td>19 (50%)</td>
<td>130 (93%)</td>
<td>141 (78%)</td>
<td></td>
</tr>
<tr>
<td>Days on TPN</td>
<td>10.9 ± 11.8</td>
<td>9.43 ± 6.9</td>
<td>9.74 ± 9.6</td>
<td>0.41</td>
</tr>
</tbody>
</table>

The authors have nothing to disclose.

REFERENCES


The authors have nothing to disclose.
Study of Myers Briggs Type Indicator Personality Profiling in Specialty Clinical Pharmacists
Jeffrey Chiu, Pharm.D., Philippe A. Mentler, Pharm.D., Michelle Chang, Pharm.D.
University Medical Center, Fresno, CA

INTRODUCTION

Personality type may have an important role in career choices. Using the Myers-Briggs Type Indicator (MBTI) instrument researchers have found correlations between medical specialties and personality type. In 1991, Saline found 2 personality types, ESFJ and ISFJ, prevailing in dental hygiene students differed from a random sample of the general population. In 2005, Boyd R. et al. concluded that emergency department (ED) senior medical staff were inclined to be introverted 48.5%, intuitive 58.8%, thinking 58.8%, and judging 77.9% suggesting a difference in personality type from the general population. Stilwell et al. compared MBTI results of medical students from 1950 to medical students in 2000 and concluded that the MBTI type distribution remained consistent. These results indicate that the MBTI is a reliable and reproducible tool for assessing personality type within the medical field. Although studies have evaluated pharmacist personality types, few have evaluated whether a correlation exists between a pharmacist’s personality type and their choice in specialty pharmacy.

METHODOLOGY

Subjects
Pharmacists associated with ASHP accredited residency programs in the United States.

Inclusion criteria:
• Licensed pharmacists practicing within a hospital, retail, or industry setting.
• Pharmacists with ≥1 year of practice in their specialty practice setting.
• Full-time pharmacists with ≥40 hour work weeks.

Exclusion criteria:
• Pharmacy interns, residents, and non-licensed pharmacists.
• Pharmacist with multiple specialty areas of practice.
• Pharmacy practice specialties unique and limited to single facilities.

Data Collection
• Phase I: IRB approval & grant proposal submission – Complete
• Phase II: Enrollment – Pending
• Phase III: Data collection – Pending
• Phase IV: Personality classification – Pending
• Phase V: Final data analysis - Pending

CONCLUSION

Myers Briggs Type Indicator
Consists of 93 forced-choice questions (i.e., only two options available). The test will be scored to identify which dichotomy the participant prefers. Participants will be classified into one of 16 personality classes.

<table>
<thead>
<tr>
<th>Dichotomies</th>
<th>Extraversion</th>
<th>Introversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensing</td>
<td>Thinking</td>
<td>Feeling</td>
</tr>
<tr>
<td>Judging</td>
<td>Perceiving</td>
<td></td>
</tr>
</tbody>
</table>

Fig 1. A dichotomy is a division of two mutually exclusive groups, or in this case, type preferences.

- Extraverts/Introverts: describes attitudes, and how persons orient and receives energy
- Sensing/Intuition: perceiving functions
- Thinking/Feeling: decision-making functions
- Judging/Perceiving: orientation functions

Personality Classes

<table>
<thead>
<tr>
<th>Personality Class</th>
<th>ISTJ</th>
<th>ISFP</th>
<th>INFJ</th>
<th>INTJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISTP</td>
<td>ESFP</td>
<td>ENFP</td>
<td>ENTP</td>
<td></td>
</tr>
</tbody>
</table>

Fig 2. Organization of the sixteen classes.

This information may provide direction for future participants towards their field of pharmacy study and lead to aid in specialty decision making.

- MBTI test could be given to pharmacy students and residents to guide them in their decisions on clinical rotations and specialty residency choices.

- Results could help the MBTI identify career paths in the field that would enhance career fulfillment, thereby increasing the retention of professionals in the field.

- Results of this study is pending.

OBJECTIVE

To determine if a correlation exists between a pharmacist’s personality type, identified by the MTBI, and their chosen pharmacy specialty.

REFERENCES

7. Lowenthal WA. Myers-Briggs Type Inventory preference of pharmacy students and practitioners. Eval & Health Prof. 1994 Mar;17(1):22-42.

Disclosure: No disclosures concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.
Treatment outcomes of resistant *Acinetobacter baumannii* with tigecycline and colistimethate

Mark Danek, Pharm.D. and Marisa N. Mendez, Pharm.D.

*University Medical Center, Fresno, California*

**BACKGROUND**

The development of multidrug resistant (MDR) strains of *Acinetobacter* spp. has led to the evaluation of older, less commonly utilized antibiotics as therapeutic alternatives. The safety and efficacy of colistimethate for the treatment of MDR *Acinetobacter* spp. has been studied in the intensive care unit. This evaluation suggested that treatment of sepsis caused by *Acinetobacter* spp. with colistimethate was safe and equally as effective as other antimicrobial agents. Tigecycline, a glycyclcline, has demonstrated activity versus *A. baumannii*. Currently, there is little data regarding the use of tigecycline, alone or in combination with colistimethate, for the treatment of resistant *A. baumannii* infections.

**OBJECTIVE**

The objective of this study is to evaluate the efficacy of tigecycline and colistimethate therapy in resistant cases of *Acinetobacter* spp. infections.

**METHODOLOGY**

- **Retrospective review**
  - 09/01/05 – 02/28/07
- **Inclusion Criteria**
  - Microbiologically confirmed MDR *Acinetobacter baumannii*
  - Received colistimethate or tigecycline therapy alone or in combination for at least 7 days
- **Exclusion Criteria**
  - Pregnant women
  - Known hypersensitivity to colistimethate or tigecycline
- **Data to be collected**
  - Patient demographics
  - Antimicrobial usage and duration
  - Microbiological cultures and sensitivities
  - White blood cell count, sputum production, ventilator status, and imaging studies
- **Outcome Measures**
  - Microbiologic cure
    - Resolution of infection as per repeat negative microbiologic culture accompanied by normalization of leukocyte count, temperature, and clinical improvement.
  - Clinical cure
    - Resolution of infection without repeat negative microbiologic culture confirmed by normalization of leukocyte count, temperature, and clinical improvement.
  - Treatment failure
    - Inability to achieve microbiologic or clinical cure following antimicrobial therapy or patient expiration during the treatment period.

**RESULTS**

**Patient Demographics**

<table>
<thead>
<tr>
<th>Male (%)</th>
<th>n = 7 (58%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (%)</td>
<td>n = 9 (42%)</td>
</tr>
<tr>
<td>Average Age</td>
<td>58.7 yrs</td>
</tr>
<tr>
<td>Avg Length of Therapy (days)</td>
<td>11.3</td>
</tr>
<tr>
<td>+ Colistimethate</td>
<td>10.8</td>
</tr>
<tr>
<td>+ Tigecycline</td>
<td>11.1</td>
</tr>
</tbody>
</table>

**Site of Infection**

- Urine: 15%
- Wound: 12%
- Bacter: 16%
- Sputum: 58%

**Treatment Groups**

- Colistimethate
- Tigecycline
- Combination

**Success vs Failure**

<table>
<thead>
<tr>
<th>Microbiologic Cure</th>
<th>Clinical Cure</th>
<th>Treatment Failure</th>
<th>Treatment Failure &amp; Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colistimethate</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Tigecycline</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Combination</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**REFERENCE**


**DISCLOSURE**

The authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities.
Implementation of a point of care pharmacy service in a cardiovascular progressive care unit: defining clinical roles and determining the best pharmacy practice model

Gillian H. Pineda, Pharm.D., Alice Robbins, Pharm.D., BCPS, and Curtis Takemoto, Pharm.D., FCSHP

Community Regional Medical Center – Fresno, California

BACKGROUND

Traditionally, hospital pharmacists spent most of their time tending to the needs of the patients and doctors from a centralized pharmacy location.

Today, more pharmacists are working at the point-of-care (POC), in collaboration with other healthcare professionals, to positively influence patient outcomes.

OBJECTIVES

This four-week pilot program is designed to place the pharmacist at the POC in order to:

- Foster collaboration, and improve the satisfaction of healthcare professionals with pharmacy services.
- Evaluate the cost-savings and cost-avoidance from the POC services to justify additional POC pharmacist positions.
- Define the role of the POC pharmacist.
- Determine the best pharmacy practice model for Community Regional Medical Center (CRMC).

METHODOLOGY

A four-week pilot program that will be conducted from October 1, 2007 through October 26, 2007, Monday through Friday, 0800 through 1600.

The POC pharmacist will be working in the cardiovascular progressive care unit (CPCU), which consists of 60-beds.

A pre-and-post trial nursing satisfaction survey will be administered to the CPCU nurses. The survey will evaluate the accessibility of the pharmacist, medication turn-around times, medication administration records (MARs) accuracy, and overall satisfaction with pharmacy services.

Clinical interventions made by the POC pharmacist will be documented using Quantifi®, a clinical documentation and reporting tool that can provide key financial data, such as potential cost-savings and cost-avoidance, to demonstrate pharmacy value to the CRMC administration. Clinical interventions will include, but is not limited to TPN evaluation, therapeutic drug recommendations, and PK monitoring.

The POC pharmacist will compile a weekly report documenting their clinical activities, as well as any challenges they encounter, to serve as a guide in formally defining the POC pharmacist’s role.

The study proposal was reviewed by the CRMC Institutional Review Board (IRB), where it was determined to be exempt from IRB oversight.

Statistical Analysis: A traditional five-point Likert scale will be utilized in the pre-and-post trial Nursing Satisfaction Surveys. Wilcoxon rank sum will be used to test for a difference between the median values.

RESULTS

Preliminary Results

Nursing Satisfaction Survey

- Pre-trial n=33; Post-trial n=43
- Likert Scale: 1=Dissatisfied, 5=Extremely Satisfied
- Paired Pre-and-Post Trial Questions
  - Q1: Pharmacist interaction
  - Q2: Provision of drug information
  - Q3: Turn-around times
  - Q4: Missing medications
  - Q5: Accuracy of the MARs
  - Q6: Overall satisfaction with the pharmacy services

Additional Post-trial Questions

- 92.9% of the post-trial responders report an increase in pharmacy services utilization as a result of the POC pharmacy program.
- 100% of the post-trial responders were satisfied with the POC pharmacist.

CONCLUSIONS

The POC pharmacy practice program significantly increased the level of satisfaction of the medical staff with pharmacy services, which may translate to an improvement in patient care.

Based on the preliminary results, it seems advantageous to transition CRMC towards a POC pharmacy practice model.

FUTURE DIRECTION

- Complete data collection and analysis.
- Evaluate data from Quantifi®, and translate clinical interventions into dollar amounts.
- Quantitatively determine the impact of the program on medication turn-around times.
- Establish the roles and responsibilities of the POC pharmacist.
- Present findings to the CRMC Board of Directors to garner support for the program.
- Implement point-of-care pharmacy services one floor at a time.
- Re-evaluate and determine if a POC pharmacy practice model is the best choice for CRMC.

REFERENCE

- The authors have nothing to disclose.
Reimbursement for Inpatient Pharmacy Cognitive Services
Leonard Valdez, Jr., Pharm.D. and Danny Vera, Pharm.D.
Community Regional Medical Center- Fresno, California

BACKGROUND
- Inpatient pharmacists at Community Regional Medical Center (CRMC) in Fresno, California have provided valuable cognitive services for years continue to participate in these non-distributive functions without any reimbursement for these services.
- Inpatient pharmacy cognitive services requested by physicians include but are not limited to:
  - pharmacokinetic monitoring of amino-glycosides and vancomycin
  - initiating parenteral nutrition regimens
  - evaluating drug therapies
  - providing therapeutic recommendations

OBJECTIVE
- Develop and implement an effective mechanism of reimbursement for pharmacy cognitive services provided by inpatient pharmacists at Community Regional Medical Center

METHODOLOGY
- Institutional Review Board (IRB) at CRMC determined research project exempt from IRB oversight based on federal guidelines at 45CRF46.101 (b) (2).
- Prospective Administrative Study

Phase I:
- Evaluate current practices of reimbursement in the United States
- Identify the current cognitive services provided at CRMC that can potentially be reimbursed
- Identify key players in the review and approval process of the reimbursement protocol:
  - pharmacists, pharmacy and hospital administration, finance, billing, information systems and legal services, and other relevant administrative committees

Phase II:
- Pharmacists support:
  - inform of goals and objectives of project; encourage cooperation and process consistency
  - standardize progress note writing (Subjective Objective Assessment Plan format required for reimbursement) for pharmacy consults to become part of medical record
  - training sessions on appropriate use of consult coding, billing and reimbursement process
- Begin data collection for a period of 6 months to track:
  - type of physician requested pharmacy consults
  - time spent per consult
  - level of complexity
  - physician acceptance of pharmacy recommendations
- Design charge codes associated with Current Procedure Terminology (CPT) codes, approved by the billing/coding department; inpatient pharmacy consultation fees will be determined by charge levels associated with acuity of illness and complexity of pharmacist decision making (AMA CPT Codes for 2007)

Phase III:
- Project proposal and analysis will include:
  - potential reimbursement
  - potential pharmacy and hospital cost savings due to pharmacy cognitive services

FUTURE DIRECTION
- Reimbursement proposal to be presented to key players for review and approval
- Once approved, inform physicians via P&T newsletter in an effort to gain support and acceptance of project
- Develop continual training sessions for pharmacists to maintain consistency of progress note writing, coding and billing procedures
- Implementation of reimbursement mechanism

REFERENCES
Michalets EL and Williams E. Reimbursement for pharmacists' cognitive services in the Inpatient setting. Am J Health-Syst Pharm. 2001;58:164-6
Dole EJ and Murawski MM. Reimbursement for clinical services provided by pharmacists: What are we doing wrong? Am J Health-Syst Pharm. 2007;64(1):104-106

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

- Secondary hypoxic brain injury from intracranial hypertension has contributed to the high mortality of patients with traumatic brain injury (TBI).
- Hyperosmotherapy has been used to improve cerebral oxygenation by decreasing intracranial pressure (ICP).
- Traditionally mannitol is recommended for control of raised ICP following TBI but it’s use includes risk of kidney failure after multiple uses and possible systemic hypotension.
- Bolus administration of hypertonic saline (HTS) has been proven safe and effective in several randomized, clinical trials in lowering ICP.
- However, there are limited clinical studies directly comparing hypertonic saline versus mannitol in ICP management and evaluating the use of osmotherapy to lower intracranial pressure in non-TBI patients.

OBJECTIVE

- Compare the efficacy of 20% mannitol versus 7.5% hypertonic saline in lowering intracranial pressure in patients with traumatic or non-traumatic brain injury.

METHODOLOGY

Study Design

Retrospective, chart review

Study Population

Inclusion criteria:
- Age ≥18 years old at time of therapy
- Documented computed tomographic (CT) scan of head showing abnormality or lesion (e.g. subarachnoid hemorrhage, subdural hematoma)
- Diagnosed with traumatic or non-traumatic brain injury resulting in intracranial hypertension (ICP ≥20mmHg for >5 min)
- Patients requiring ICP monitoring due to Glasgow Coma Scale (GCS) ≤8 or requiring post-operative ICP monitoring
- Received order for treatment with either 7.5% hypertonic saline or 20% mannitol using the Community Regional Medical Center (CRMC) Intracranial Hypertension/Head Injury – Adult Supplemental order set (OS-39)

Intervention

- 7.5% hypertonic saline: 2ml/kg IV bolus over 20minutes x 1 then q4h prn ICP ≥20mmHg
- 20% mannitol: 1gm/kg IV q4h pm ICP≥20mmHg

Methods

- Potential subjects will be identified from the intensive care unit (ICU) admissions by pharmacists receiving orders for 7.5% HTS or 20% mannitol.
- Patients will be further screened for inclusion or exclusion based on electronic dictation, medical records, radiology and pharmacy reports.
- The following data will be gathered:
  - Baseline characteristics: demographics, vitals, basic metabolic panel, GCS score, concurrent medications, serum sodium and osmolarity
  - Measures of efficacy: hemodynamic measures (ICP, cerebral perfusion pressure, mean arterial pressure, central venous pressure) pre- and post-osmotherapy treatment and total number of doses
  - Measured adverse events (basic metabolic panel, fluid balance, GCS score, serum sodium and osmolarity)

CONCLUSION

- Document use of 7.5% hypertonic saline as an effective alternative to mannitol for patients requiring reductions in intracranial pressure.
- Increase the published literature available describing the use on hypertonic saline and mannitol for intracranial pressure management in patients with non-traumatic brain injury.

REFERENCES


DISCLOSURE

Authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.
Outcomes of a Hospital-Wide Diabetic Ketoacidosis Order Set Implementation

Sofia Jimenez, PharmD, Michelle Chang, PharmD, and Amy Bower, MS, PharmD, BCPS
Community Regional Medical Center – Fresno, California

BACKGROUND

- Diabetic ketoacidosis (DKA) is a serious complication of diabetes and warrants prompt and effective treatment.
- There is currently no comprehensive, hospital-wide protocol available at Community Regional Medical Center (CRMC) for the initial management of DKA.
- Implementation of a standardized treatment guideline for DKA is expected to positively impact various clinical outcomes.

OBJECTIVES

- The primary objective of this study is to evaluate the effects of a newly developed comprehensive diabetic ketoacidosis order set on the time to anion gap closure.
- Secondary objectives of this study are to evaluate the effects of the order set on time to resolution of DKA, effects on various clinical outcomes such as hospital length of stay and frequency of hypoglycemia.

METHODOLOGY

- A retrospective chart analysis
- Includes patients ≥ 18 years admitted to the ICU or medical-surgical floors with a diagnosis of DKA from September 1, 2008 to March 31, 2009.
- In-services will be scheduled and informational flyers and newsletters will be distributed during the initial implementation / pilot phase from November 2008 through December 2008.
- Data will be collected and analyzed from the pre-implementation period, September 2008 to November 2008 and from the post-implementation period December 2008 to March 2009.

RESULTS

Preliminary Results

- Pre-implementation data: September – November 2008
- September 2008

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>N = 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes Mellitus Type 1</td>
<td>8</td>
</tr>
<tr>
<td>Diabetes Mellitus Type 2</td>
<td>8</td>
</tr>
<tr>
<td>Male</td>
<td>7</td>
</tr>
<tr>
<td>Precipitating Factors</td>
<td></td>
</tr>
<tr>
<td>Medication noncompliance</td>
<td>10</td>
</tr>
<tr>
<td>Medications</td>
<td>1</td>
</tr>
<tr>
<td>Infection</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
</tr>
</tbody>
</table>

2005 DKA order set utilization 0

Primary Endpoint

- Time to anion gap closure: 14.5 (Mean) 2.5 - 46.5 (Range)
- Time to blood glucose normalization: 10.6 (Mean) 2.5 - 16
- Hospital length of stay: 91.5 (Mean) 41 - 269

Secondary Endpoints

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Within 24 hrs</th>
<th>After 24 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypokalemia</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>Hyperkalemia</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Hypophosphatemia</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Anion gap recurrence</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

This study proposal was submitted to and approved by the Institutional Review Board (IRB). All data will be recorded without patient specific identifiers and maintained in a confidential manner to protect patient privacy.

CONCLUSION

- Based on the preliminary results, the implementation of a comprehensive DKA order set could benefit time to closure of anion gap and through a standardized set of therapy, improve patient care.

FUTURE DIRECTION

- Complete data collection and analysis.
- Evaluate and determine if a comprehensive DKA order set is improving clinical outcomes of patients at CRMC.

REFERENCES


All 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.
Retrospective review of warfarin therapy monitoring pre- and post-implementation of the Joint Commission National Patient Safety Goal 03.05.01

Krista R. Preckel, Pharm.D., Tim Lopez, Pharm.D., and Jennifer Trytten, Pharm.D., BCPS
Community Regional Medical Center – Fresno, CA & Clovis Community Medical Center – Clovis, CA

BACKGROUND

The Joint Commission National Patient Safety Goal 03.05.01 (NPSG.03.05.01) implementation requires that warfarin be appropriately ordered, dispensed, administered and monitored in the inpatient hospital setting by January 1, 2009.

Previously, CRMC and CCMC did not have an established warfarin policy that defined appropriate warfarin prescribing guidelines, including the requirement for consistent INR monitoring.

An inpatient pharmacy anti-coagulation consulting service will be available starting January 1, 2009.

A warfarin order set will also be put in place that requires several elements including the indication for warfarin therapy, initial dose, and the schedule for INR and CBC lab draws to monitor therapy.

OBJECTIVE

Compare the effectiveness, monitoring practices, and safety of warfarin use pre- and post-implementation of NPSG.03.05.01.

Study Design

Retrospective, chart review

Pre-implementation: January 1, 2008 - March 31, 2008
Post-implementation: January 1, 2009 - March 31, 2009

Inclusion Criteria

Age ≥ 18 years old at time of warfarin therapy
Received warfarin therapy during hospital stay for ≥ 3 days
Warfarin naïve patients, or patients on warfarin as outpatient, but who present with a break in therapy for a minimum of four days, or baseline INR < 1.3 when first hospitalized

Exclusion Criteria

Patients with a pre-existing coagulopathy as defined by INR > 1.5 or platelets < 50,000
Patients on concomitant argatroban for HIT
Patients admitted to hospital with active bleeding who were on warfarin as outpatient
Patients with acquired bleeding disorders: DIC, ITP, TTP, drug-induced thrombocytopenia, or vitamin K deficiency

Outcome Measures

Presence of INRs > 4 during hospitalization
Documentation of a baseline INR (taken no more than 24 hours before warfarin initiation)
Bleeding events requiring Vitamin K, FFP, blood transfusion, or surgical intervention while on warfarin during hospitalization

Statistical Analysis

Nominal data will be analyzed using the chi square test, and continuous data will be analyzed using the student’s t-test.

RESULTS

Baseline Characteristics of the Patients (N=51)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>32 (63)</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>68</td>
</tr>
<tr>
<td>Age range</td>
<td>29-91</td>
</tr>
</tbody>
</table>

Outcome Measures

Baseline INR (taken (77%) INRs > 4 (12%) bleeds (15%) Nominal data will be analyzed using the chi square test, and continuous data will be analyzed using the student’s t-test.

CONCLUSIONS

Based on the results of previous studies, implementation of a pharmacy-based warfarin monitoring process in the inpatient setting may result in improved rates of therapeutic INR levels, as well as improved safety as demonstrated by fewer bleeding events.

FUTURE DIRECTION

Pharmacy warfarin consultation service, and warfarin order set will be in place by January 1, 2009.

Complete data collection and analysis.

Evaluate the effectiveness of the post-implementation of NPSG.03.05.01 based on the outcome measures.

REFERENCES


The authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities.
Safety and efficacy of therapeutic hypothermia after out of hospital cardiac arrest
Noelle de Leon, PharmD, Daniel Yousef, PharmD, BCPS and Amy Bower, MS, PharmD, BCPS
Community Regional Medical Center – Fresno, California

BACKGROUND

Therapeutic hypothermia is a procedure performed on patients who experience a return of spontaneous circulation (ROSC) after cardiac arrest outside the hospital setting in an effort to improve neurological outcomes and decrease mortality. Two landmark trials have established the efficacy of therapeutic hypothermia on neurological outcomes six months after cardiac arrest and survival to hospital discharge. 

Currently, there is a protocol implemented for the use of this procedure at Community Regional Medical Center (CRMC).

OBJECTIVES

The primary objective of this study is to assess safety by examining the effects of this procedure on serum potassium levels. Secondary objectives of this study evaluate the efficacy of this procedure by examining clinical outcomes such as:

- Improvement in neurological outcome following cardiac arrest
- Length of stay in hospital
- Mortality of patients within 90 days of cardiac arrest

RESULTS

A retrospective chart analysis

Includes patients ≥ 18 years old who experienced a ROSC after primary cardiac arrest and have since sustained persistent coma.

The following patients will be excluded:

- Pregnant
- Responsive to verbal commands after ROSC
- Systolic blood pressure less than 90 mmHg and not responsive to fluids or inotropes
- Known pre-existing coagulopathy or bleeding
- More than six hours from ROSC
- Cardiac arrest due to trauma or overdose

The outcomes of patients who underwent therapeutic hypothermia are compared with the outcomes of those who did not undergo the procedure.

Data to be collected are as follows:

- Demographic characteristics, rhythm on admission, past medical history, and baseline serum potassium level and Glasgow Coma Scale score upon admission
- Potassium levels drawn at baseline, eight hours after cooling is initiated, and at the end of re-warming
- Glasgow Coma Scale from baseline to time of hospital discharge, length of stay in hospital, and 90-day mortality of cardiac arrest patients

Statistical analyses:

- Primary outcome will be analyzed using a student’s t-test
- Secondary outcome will be analyzed using Fisher’s exact test or student’s t-test, as appropriate for the type of data

Preliminary Data

Baseline Characteristics

<table>
<thead>
<tr>
<th>Rhythm on Admission</th>
<th>Treatment</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventricular Fibrillation</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Pulsless Ventricular Tachycardia</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Pulsless Electrical Activity</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Asystole</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Past Medical History

| Diabetes | 2 | 3 |
| Coronary Artery Disease | 1 | 1 |
| Congestive Heart Failure | 1 | 3 |
| Hypertension | 1 | 5 |
| None | 1 | 1 |

Deviations of Potassium Levels

Baseline 8 Hours 48 Hours

\[
\begin{array}{c|c|c}
\text{Time} & \text{Baseline} & \text{8 Hours} & \text{48 Hours} \\
\hline
\text{Control} & 5.5 & 5.4 & 5.3 \\
\text{Treatment} & 5.4 & 5.2 & 5.1 \\
\end{array}
\]

Secondary Outcomes

<table>
<thead>
<tr>
<th>Outcome Measures</th>
<th>Treatment</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glasgow Coma Scale at Baseline (average)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Glasgow Coma Scale at Discharge or Death (average)</td>
<td>5.4</td>
<td>6.4</td>
</tr>
<tr>
<td>Length of Stay in Hospital (average days)</td>
<td>11.8</td>
<td>13.3</td>
</tr>
<tr>
<td>90-Day Mortality</td>
<td>80%</td>
<td>71%</td>
</tr>
</tbody>
</table>

CONCLUSION

Based on preliminary data, therapeutic hypothermia does not produce significant changes in serum potassium levels and may be used safely in patients who have experienced out of hospital cardiac arrest.

FUTURE DIRECTION

- Complete data collection and analysis
- Assess and determine whether therapeutic hypothermia is safely improving clinical outcomes at CRMC

REFERENCES


3. Physician Order Set 797: Therapeutic Hypothermia for out of Hospital Cardiac Arrest. Community Regional Medical Center

All 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.
Evaluation of a standardized intensive care unit (ICU) delirium assessment and management tool
Terrie Liu, PharmD, Daniel Yousef, PharmD, BCPS and Amy Bower, MS, PharmD, BCPS
Community Regional Medical Center – Fresno, California

BACKGROUND
Delirium is a frequent and under recognized problem among ICU patients
Increases in duration of mechanical ventilation, hospital lengths of stay, mortality rates and hospital costs have all been associated with ICU delirium
The Society of Critical Care Medicine (SCCM) recommends routine delirium monitoring and supports use of the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU)
CAM-ICU will soon be implemented at Community Regional Medical Center (CRMC) to assist with routine identification of this complication

OBJECTIVES
Primary objective of this study is to assess the importance of delirium evaluation to ICU nurses
Secondary objectives of this study are to determine:
Incidence of delirium
ICU length of stay for delirious versus non-delirious patients
Types of medications used to treat ICU delirium
All 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.

METHODOLOGY
Phase I: Pre-implementation
Identify current ICU nursing practices and perceptions of ICU delirium by administering a nursing survey (adapted from Devlin et al.)

Phase II: Post-implementation
Evaluate the effects of CAM-ICU on nursing practices and perceptions of ICU delirium
The same survey will be administered to ICU nurses after CAM-ICU implementation
A retrospective chart review of adult ICU patients age ≥ 18 years will be completed after CAM-ICU implementation
Patients with the following conditions will be excluded:
Pre-existing dementia
History of psychiatric disorders
Language barriers or deafness
Severe neurological disorders such as stroke or meningitis
Collected data will include delirium incidence, ICU length of stays, and medications used to treat ICU delirium
Statistical analyses:
Survey responses will be analyzed using Student’s t-test, Fisher’s exact test and Mann-Whitney test, when appropriate
P value < 0.05 will be considered significant

RESULTS
Preliminary Results
Pre-implementation survey
10/07/09 - 10/16/09
N = 34
Conditions that nurses rank as the most important to routinely evaluate for in ICU patients:
Frequency by which nurses evaluate for delirium compared to sedation:

CONCLUSIONS
Currently, the majority of ICU nurses do not perceive delirium as an important condition that requires routine evaluation
ICU nursing practices and perceptions towards ICU delirium may benefit from CAM-ICU implementation
Nursing education and inservices: Dec. 2009
CAM-ICU implementation: Jan. 2010
Post-implementation data: Feb. – Mar. 2010

REFERENCES
Retrospective cost-savings analysis of monitoring palivizumab (Synagis®) prophylaxis usage in a neonatal intensive care unit (NICU) during respiratory syncytial virus (RSV) season

Linda Ly, Pharm.D. and Harlan Husted, Pharm.D.
Community Regional Medical Center – Fresno, California

BACKGROUND

- RSV is a leading cause of lower respiratory illness that results in significant morbidity or mortality in infants.¹ ² ³ ⁴
- Palivizumab is a monoclonal antibody used in the prevention of severe RSV infections in high-risk populations meeting American Academy of Pediatrics (AAP) eligibility criteria.¹ ³ ⁵
- Palivizumab is expensive and cost of administration or waste can be significant.²
- Implementation of palivizumab order set based on AAP guidelines will restrict administration to high risk patients and reduce cost.

OBJECTIVES

- To examine the following:
  o Appropriate administration of palivizumab, defined as administration to patients that meet eligibility criteria based on AAP guideline recommendations.
  o Total cost of palivizumab administration for 2007-2008 compared to 2008-2009 when order set implemented.
- To perform a cost-analysis to determine the potential cost savings of monitoring palivizumab usage in a neonatal intensive care unit during RSV season.

METHODOLOGY

- A retrospective chart analysis.
- Determine official start and end date for RSV seasons 2007-2008 and 2008-2009.
- Establish which patients received palivizumab during RSV season using information technology generated drug utilization evaluation (DUE) report sorted on the criteria of palivizumab and NICU and special care nursery (SCN) dating back to October 2007.
- Access electronic records of patients that received palivizumab on DUE report to determine date and quantity of doses administered through duration of RSV season.
- Review dictated notes on dates palivizumab was received to determine patient risk factors for RSV and eligibility for palivizumab based on AAP guidelines.
- Evaluate total cost, number of doses and quantity of palivizumab vials dispensed and appropriately administered for both RSV seasons.
- Perform an analysis of the total cost for palivizumab administration in 2007-2008 compared to 2008-2009.

PRELIMINARY RESULTS

<table>
<thead>
<tr>
<th></th>
<th>2007-2008</th>
<th>%</th>
<th>2008-2009</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>2</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order set used</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>37.5</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>20</td>
<td>10</td>
<td>62.5</td>
</tr>
<tr>
<td>Patient meets AAP criteria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>100</td>
<td>14</td>
<td>87.5</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>12.5</td>
</tr>
<tr>
<td>Patient meets ≥ 2 AAP risk factor criteria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 29 wks GA &amp; &lt; 12 mo</td>
<td>1</td>
<td>50</td>
<td>5</td>
<td>31.25</td>
</tr>
<tr>
<td>29-32 wks GA &amp; &lt; 6 mo</td>
<td>1</td>
<td>50</td>
<td>6</td>
<td>37.5</td>
</tr>
<tr>
<td>Chronic lung disease</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>≤ 2 yrs w/CLD or O2 w/in 6 mo</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>≤ 2 yrs w/coronary disease</td>
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<td></td>
</tr>
<tr>
<td>Severe immune deficiency</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Patient meets ≥ 2 AAP risk factor criteria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School aged siblings</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>18.7</td>
</tr>
<tr>
<td>Exposure to air pollutants</td>
<td></td>
<td>0</td>
<td>0</td>
<td>18.7</td>
</tr>
<tr>
<td>Congenital abnormalities</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Immune deficiency</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Neuromuscular disease</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Twin/multiple births</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>18.7</td>
</tr>
<tr>
<td>Total actual cost</td>
<td>$1,697</td>
<td></td>
<td>$13,576</td>
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</tr>
<tr>
<td>Total potential cost savings</td>
<td>0</td>
<td></td>
<td>$1,697</td>
<td></td>
</tr>
</tbody>
</table>

CONCLUSION

Based on the preliminary results, most patients meet AAP eligibility criteria and are administered palivizumab appropriately.

Most patients > 32 weeks tend to have school aged siblings, exposure to air pollutants and twin/multiple births as risk factors for AAP eligibility.

FUTURE DIRECTION

- Complete data collection and analysis.
- Evaluate and determine if palivizumab order set minimizes administration only to patients meeting AAP guideline eligibility criteria and reduce cost.

REFERENCES


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GA = gestational age
Development and implementation of a pharmacy technician check technician program in an inpatient pharmacy

Tsung-Chi Lien, MS, PharmD, Timothy Lopez, PharmD, Keith Walsh, PharmD, and Kellie Allen, CPhT
Community Regional Medical Center – Fresno, California

BACKGROUND

- According to the California Code of Regulations 1793.7 and 1793.8, a pharmacy technician is authorized to check the filling of floor, ward stock and unit dose distribution done by other pharmacy technicians in a hospital pharmacy defined by the California Business and Profession Code section 4029(a) which maintains a clinical pharmacy service program in acute care hospitals.¹
- By relieving pharmacists from checking unit dose cassettes (UDC) allows pharmacists to spend more time on evaluating the appropriateness of medication therapies and provide more clinical services.
- The Pharmacy Technician-Check-Technician (PTCT) Program is a cost-saving program.

OBJECTIVES

- Develop, implement, and validate policies and procedures of the PTCT Program including training, certification, and quality assurance measures.
- Pharmacy technicians completed the training and certification program can accurately check UDC filled by other pharmacy technicians.

Study Design

- Double-blind, randomized cohort study
- A minimum of 99.80% accuracy rate for pharmacist and pharmacy technician verifier was pre-determined.² ²

Phase I (August 2010 – November 2010)

- Determine the baseline accuracy rate of pharmacist verifiers checking UDC.
- Collect the accuracy rate of pharmacy technicians filling UDC.
- Develop policies and procedures including training program and competency exam of the CRMC PTCT program.

Phase II (To be determined)

- Obtain the approval of CRMC PTCT policies and procedures.
- Identify and train qualifying pharmacy technicians.
- Collect and evaluate the accuracy rate of pharmacy technicians filling UDC.
- Collect and evaluate the accuracy rate of non-pharmacist verifiers checking UDC.

Phase III (Next fiscal year)

- Perform longitudinal and periodic quality assurance audit to maintain the validity of the CRMC PTCT program.

Statistical Analysis

- Nominal data will be analyzed using the chi-square test.
- To detect 0.2% difference in accuracy rate checking UDC, 13,499 doses per cohort should be audited to achieve 80% power and 5% level of significance using the chi-square test.

METHODOLOGY

- The average number of medications for patients in acute care hospitals is 7.4, at range of 5 to 14.³
- A total of 361 beds are utilizing UDC to distribute daily scheduled medications, and the average occupancy rate of CRMC for the past 20 months was 78%.
- It is estimated that 62,511 doses were filled during the 30-day period from Aug 2010 to Sep 2010.
- A total of 14,701 doses were audited during the Phase I study period.

Phase I - Filling Errors

- The accuracy rate of pharmacist verifiers checking UDC was slightly lower than the pre-defined minimum accuracy rate of 99.80%.
- The accuracy rate of pharmacy technicians filling UDC is 99.61%.
- Wrong quantity, drug, strength, and patient cassette are the most frequent errors occurred during the process of filling UDC respectively.
- Wrong patient cassette, quantity, drug, strength, and dosage form are the most frequent errors occurred when pharmacist verifiers checking UDC respectively.

Phase I - Checking Errors

- Complete the Phase II study.
- Expand the PTCT program for non-pharmacist verifiers to check PYXIS® floor stocks.
- Seek improvements to decrease the most common errors occurred during the process of filling and checking UDC.

FUTURE DIRECTION

- The accuracy rate of pharmacist verifiers checking UDC was slightly lower than the pre-defined minimum accuracy rate of 99.80%.
- The accuracy rate of pharmacy technicians filling UDC is 99.61%.
- Wrong quantity, drug, strength, and patient cassette are the most frequent errors occurred during the process of filling UDC respectively.
- Wrong patient cassette, quantity, drug, strength, and dosage form are the most frequent errors occurred when pharmacist verifiers checking UDC respectively.

REFERENCES


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**BACKGROUND**

- Piperacillin/tazobactam (P/T) is commonly used in the hospital setting as empiric coverage for gram-negative infections.
- Due to its short half-life and time-dependent pharmacodynamics, frequent intermittent dosing is required to maintain serum concentrations above the minimum inhibitory concentration (MIC).
- Administering P/T using an extended-infusion dosing strategy will maximize bacteriologic killing by extending the period of time above the MIC, and simplifying the dosing of P/T.
- The extended-infusion dosing strategy has been implemented in the intensive care units (ICU) and 10-west step down units (SDU) at Community Regional Medical Center (CRMC) since November 30, 2009.

**OBJECTIVES**

- To evaluate changes in the following areas before and after implementation of the extended-infusion dosing regimen:
  - The appropriateness of P/T dosing based on the patients’ renal function
  - MIC changes of select enterobacteriaceae organisms to P/T
  - Mortality rates
  - Length of stay (LOS) in the ICU and/or SDU
  - Pharmacy cost savings from drug expenditures

**METHODOLOGY**

- Retrospective chart review
- Treatment groups:
  - Intermittent dosing (11/30/08 - 11/29/09)
  - Extended-infusion dosing (11/30/09 - 11/30/10)
- Inclusion criteria:
  - All ICU and 10-west SDU patients receiving P/T
- Exclusion criteria:
  - Patients who do not grow gram-negative organisms will be excluded in the evaluation for MIC changes
- Other considerations:
  - Patients receiving intermittently dosed P/T on or after 11/30/10 is considered to be inappropriately dosed
  - Appropriateness of P/T dosing will be based on patients’ creatinine clearance (CrCL) according to Tables 1 and 2 below

**FIGURES / RESULTS**

- Data was collected for 23 patients who received P/T using the extended-infusion dosing regimen
- 87% of the doses were appropriate according to the patients’ renal function (Figure 1)
- Gram-negative cultures were collected from 57% of these patients
  - Of the 15 positive cultures collected, the most common source of infection was the respiratory tract
  - Common organisms were Pseudomonas aeruginosa, Escherichia coli, and Klebsiella species
- 87.5% of these cultures were sensitive to P/T
  - Mortality rate: 57% of the patients expired
- Sepsis was the most common cause of death, resulting in 9 of the 13 reported deaths
- The LOS in the ICU and/or SDU ranged from 1 day to 42 days
- Median LOS was 6 days

**CONCLUSION**

- Preliminary results indicate that P/T is dosed appropriately 87% of the time using the extended-infusion dosing regimen
- Resistance of select enterobacteriaceae to P/T is relatively low, occurring in 12.5% of the cultures reported
- High mortality rates were observed, with sepsis causing 69% of the fatalities

**FUTURE DIRECTION**

- Complete data collection
- Expand the implementation of the extended-infusion dosing of P/T for all inpatients at CRMC
- Provide continuing education to healthcare providers to minimize the rate of inappropriately dosed P/T

**REFERENCES**

Comparing the Cost of Treating Acute Agitation in the Emergency Department
With and Without the Use of a Standardized Order Set

Emilyn Chee, PharmD., and Gillian Pineda, PharmD., BCPS
Community Regional Medical Center – Fresno, California

BACKGROUND

- In the Emergency Department (ED), patients presenting with acute agitation require rapid tranquilization to minimize harm to themselves or others.1
- Medications’ appropriateness, efficacy, safety and cost are key components to determining the most suitable treatment regimen.
  - Haloperidol is effective and inexpensive, but may cause extrapyramidal symptoms.
  - Olanzapine is effective, but is costly and may cause hypotension and/or bradycardia.
  - Lorazepam and midazolam are effective and inexpensive, but may cause excess sedation or paradoxical excitation. They do not treat an underlying psychiatric disorder if one does exist.1,2,3
- CRMC’s optional Acute Agitation order set recommends intramuscular (IM) treatment:
  - Haloperidol and diphenhydramine
  - Olanzapine
  - Lorazepam or midazolam

METHODOLOGY

- Retrospective chart review 11/19/10-11/30/11
- Inclusion criteria: Patients > 18 years old presenting with acute agitation and treated with either IM haloperidol, IM olanzapine, IM benzodiazepine or a combination antipsychotic plus benzodiazepine
- Exclusion Criteria: Patients who received both haloperidol and olanzapine, and women who are pregnant
- Data collection:
  - Use of order set
  - Presenting features if suspected or known
  - Medications used to treat acute agitation
  - Medications used to prevent or treat adverse drug reactions (ADRs)
  - Associated ADRs, labs or vitals as related to patient presentation or ADRs
- Definition: Treatment of acute agitation is defined as 24 hours post initial drug therapy administration

This study proposal was submitted to and approved by the Institutional Review Board (IRB). All data will be recorded without patient specific identifiers and maintained in a confidential manner to protect patient privacy.

FIGURES / RESULTS

Preliminary Findings

- 105 patients screened
  - 28 patients eligible for inclusion
  - 7 patients excluded for being treated with both haloperidol and olanzapine
- Order set usage:
  - No order sets used with patients included into the study
  - Order set was used in one patient treated with both haloperidol and olanzapine (excluded)

CONCLUSION

- Based on preliminary results, there is a wide variability in medication regimens used to treat acute agitation

FUTURE DIRECTION

- Complete data collection and analysis

REFERENCES

2) Battaglia, J. Pharmacological Management of Acute Agitation. Drugs 2005; 65(9): 1207-1222

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Cost-effectiveness Analysis of Levetiracetam versus Phenytoin for Post-Traumatic Seizure Prophylaxis

Mallory Cruz, Pharm.D., Staci Anderson, Pharm.D., BCPS and Melissa Reger, Pharm.D.

COMMUNITY REGIONAL MEDICAL CENTER – FRESNO, CALIFORNIA

BACKGROUND

- 25-50% of patients with subarachnoid hemorrhage and traumatic brain injury develop overt seizures or electroencephalogram (EEG) abnormalities consistent with seizure activity.¹
- Phenytoin has been shown to reduce post-traumatic seizures up to 73% in the first week following traumatic brain injury.²
- A single-blinded, randomized controlled trial of levetiracetam versus phenytoin demonstrated similar outcomes regarding mortality and seizures; however, levetiracetam was associated with less adverse drug events and better long term outcomes.¹

OBJECTIVES

- Determine the cost-effectiveness of levetiracetam versus phenytoin for post-traumatic seizure prophylaxis.
- Evaluate the efficacy of levetiracetam versus phenytoin for early post-traumatic seizure prophylaxis.
- Evaluate the rate and nature of adverse drug events associated with each agent.

This study proposal was submitted to and approved by the institutional review board (IRB). All data recorded without patient specific identifiers and maintained in a confidential manner to protect patient privacy.

BACKGROUND

- Phenytoin has been shown to reduce post-traumatic seizures up to 73% in the first week following traumatic brain injury.²
- A single-blinded, randomized controlled trial of levetiracetam versus phenytoin demonstrated similar outcomes regarding mortality and seizures; however, levetiracetam was associated with less adverse drug events and better long term outcomes.¹

METHODOLOGY

- Study Design
  - Retrospective chart review

- Inclusion Criteria
  - Admission for traumatic brain injury between March 2011 and March 2012
  - Post-traumatic seizure prophylaxis with levetiracetam, phenytoin or fosphenytoin for a minimum of 7 days post-injury

- Exclusion Criteria
  - History of seizures or traumatic brain injury
  - Non-traumatic brain injury
  - Pregnancy
  - Incarceration
  - Less than 18 years of age

- Data collected will consist of
  - EEG results
  - Record of seizures
  - Glasgow coma scale score
  - Drug dose and phenytoin levels
  - Duration of therapy
  - Rate/type of adverse drug events
  - Type of traumatic brain injury
  - Head/neck abbreviated injury score (AIS) and injury severity score (ISS)

- Costs included in the analysis
  - Acquisition cost
  - Drug preparation and distribution cost
  - Drug administration costs
  - Drug level cost
  - Adverse event cost

FIGURES / RESULTS

- Preliminary Results
  - 275 charts reviewed
  - 21 patients met inclusion criteria

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Characteristics of Patients (N=21)</td>
<td></td>
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<tr>
<td>Male</td>
<td>13 (62)</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>47.9</td>
</tr>
<tr>
<td>Age range</td>
<td>18-88</td>
</tr>
</tbody>
</table>

CONCLUSION

- Based on previous studies, levetiracetam is at least as effective as phenytoin for post-traumatic seizure prophylaxis.¹,³
- Lack of required laboratory monitoring and severe or life threatening reactions make levetiracetam an appealing alternative to phenytoin.⁴

FUTURE DIRECTION

- Complete data collection and analysis
- Perform cost-effectiveness analysis

REFERENCES


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