2019 ASHP Midyear Clinical Meeting Roundtable/Poster Session Summary: Pediatrics

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

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Acid Suppression for Stress Ulcer Prophylaxis in Pediatric Patients Within a Pediatric Intensive Care Unit
Leigha Davis, PharmD; Andrew Allison, PharmD, BCPS; Margaret Mathewson, MD; Micah Butcher, PharmD, BCPS
Department of Pharmaceutical Services; WVU School of Medicine, Morgantown, West Virginia

Background
- Proton pump inhibitors (PPIs) and histamine-2 receptor blockers (H2RAs) are commonly used within pediatric intensive care units (PICU) to minimize the risk of stress ulcer-related gastrointestinal bleeding.
- There is limited data to guide assessment of risk for stress-related GI bleed or for appropriate indications for the use of stress ulcer prophylaxis (SUP) in the PICU.
- Inappropriate use of acid suppression agents can increase incidence of adverse effects, such as hospital-acquired pneumonia, hospital-acquired Clostridium difficile infection, and increased risk of bone fractures.
- Additionally, therapy is sometimes continued at time of transfer to floor units or by prescription to home at discharge.

Objectives
- Primary:
  - To characterize the documented indications and risk factors for use of acid suppression agents in pediatric patients within the PICU
- Secondary:
  - To identify the percentage of use of acid suppression agents without documented indications or risk factors
  - To identify the incidence of continuation of acid suppression agents upon transfer to floor units or at discharge
  - To describe the acid suppression regimens used in the PICU

Methods
- This IRB-approved retrospective chart review of pediatric patients characterized acid suppression therapy use in the PICU.
- Patients were excluded if they received a PPI and/or H2RA at home prior to admission.
- Data collected included: demographics, acid suppression agents and classes initiated, dose and route, duration of therapy, incidence of dual class therapy, risk factors present within 24 hours prior to initiation, and whether therapy was continued at PICU/hospital discharge.
- Objectives were analyzed using descriptive statistics.

Results

| Select Risk Factors Present Within 24 hours Prior to Acid Suppression Therapy | (n=100) |
| --- |
| Enteral nutrition 50% of goal rate/day | 90% |
| Parenteral nutrition / nothing by mouth (NPO) status | 75% |
| Mechanical ventilation | 32% |
| NSAD use | 29% |
| High dose steroid use (≥ 20 mg/m²/day or 30 mg/m²/day in neonates) of hydrocortisone or equivalent | 28% |
| Shock (use of vasopressors) | 20% |
| Neurologic failure (GCS ≤ 11) | 14% |
| Respiratory failure (peak inspiratory pressure > 25 cm H2O) | 17% |
| Anticoagulant use | 10% |
| No identifiable risk factors | 5% |

Characterization of Therapy (n=100)

| Initial Acid Suppression | 66% |
| Intravenous route |
| Duration of Use | 4 days (1 = 525) |
| Acid suppression therapy, median (n = 57) | 4 days (1 = 535) |
| NSAD therapy, median (n = 57) | 4 days (1 = 535) |
| PPI therapy, median (n = 52) | 4 days (1 = 46) |
| Dual Class Therapy |
| Incidence of dual class therapy | 6% |
| Duration of use, median (n = 57) | 2.5 days (1 = 46) |
| Acid Suppression Therapy Continuation At PICU discharge | 47% |
| At hospital discharge | 23% |

Discussion
- The most common risk factors associated with H2RA/PPI use were enteral feeds ≥ 50% of goal (50%), NPO status (75%), mechanical ventilation (32%), use of NSADs (29%), use of high dose steroids (26%), and use of vasopressors (20%).
- There is no link established between enteral feeding status and the risk of stress ulceration in pediatric literature.
- The results of this medication use review will provide meaningful education to providers in an effort to standardize the prescribing of H2RAs/PPIs for stress ulcer prophylaxis.

Conclusions
- Practices of acid suppression administration were closely linked to enteral feeding status, use of mechanical ventilation, and the concurrent use of certain medication classes.
- Five patients had no identifiable risk factors present in the medical record.
- Nearly one-fourth of patients prescribed new acid suppression therapy were continued on therapy at hospital discharge.
- The most commonly prescribed acid suppression regimen was famotidine 0.5 mg/kg/daily.

References
- References available upon request.
Assessing pharmacist adherence with medication management processes in a pediatric academic medical center

Lubna Mazin PharmD, Matt Sapko PharmD, MS, Chet Kaczer PharmD, MBA, Jessica Fischer PharmD, MS

Background
- In 2016, Ohio passed the Consult Agreement Law which expanded pharmacists' scope of practice to allow pharmacists to initiate, modify, and discontinue drug therapy with physicians
- Consult agreement rule passed by the Ohio Board of Pharmacy requires a Quality Assurance (QA) program
- Consult agreement rule removes pharmacists' ability to modify drug therapy under P&T committee-approved procedures

Objectives
- Develop and implement a QA program using a Plan Do Study Act (PDSA) cycle
  - Assess adherence with each quality metric within the consult agreement policies and procedures
  - Determine the cost of implementing a QA program

Methods
- QA program will include the directions of the independent and ambulatory pharmacy management, pharmacy supervisor, clerical coordinator, clinical pharmacists, staff pharmacists, and pharmacy informs
- Pharmacy information systems will use the electronic health record (EHR) to pull data from the independent and outpatient pharmacy patient charts

Results
- Electronic Health Record Report
  - Adjusting medication administration times
  - Discontinuation of drugs
  - Dispersing quantity adjustments
  - Adjusting doses within 5%
  - Modification of dosing forms
  - Converting dose frequencies from scheduled to once
  - Discontinuation of duplicate saline flush orders
  - Initiating carrier flushes
  - Closing of pro-operative antibiotics
  - Prescribing medication administration supplies

- Simulation and Chart Review
  - Medication reconciliation
  - Therapeutic drug monitoring

Discussion
- Inter-rater reliability assessment
- Pharmacy department collaboration
- PDSA study design
- Aligns with health system and department of pharmacy strategic plan
- Spans independent and outpatient departments of pharmacy

Strengths
- Fragmentation of reporting ability between inpatient and outpatient pharmacy
- Resource intensive to run reports and to complete manual chart reviews to audit each quality metric
- Different methods of assessing adherence

Limitations
- Creation of a notification requirement for pharmacists in direct patient care roles

References

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

Acknowledgements
ALeigha Davis, PharmD; Andrew Allison, PharmD, BCPPS1; Margaret Mathewson, MD2; Micah Butcher, PharmD, BCPPS1
Lubna Mazin PharmD, Matt Sapko PharmD, MS, Chet Kaczer PharmD, MBA, Jessica Fischer PharmD, MS
Bivalirudin for Anticoagulation in Patients on Ventricular Assist Device Support at a Children’s Hospital: Percent Time in Therapeutic Range
Christine Boulos PharmD; Joanne Lee PharmD, BCPS, BCPPS; Jenna Murray CPNP; Jeffrey Moss PharmD, BCCP; Sharon Chen MD, MPH

Introduction
- Children with severe heart failure may require advanced mechanical circulatory support (MCS) with a ventricular assist device (VAD) if medical and surgical options fail.
- Thromboembolic and bleeding complications associated with VAD support are a major cause of morbidity and mortality.
- Although heparin has been the standard of care, challenges in achieving stable therapeutic levels and adverse events have led to increasing use of bivalirudin as an alternative anticoagulant.

Objectives
The aim of this study was to determine the percent time in therapeutic range (PTTR) while on bivalirudin in pediatric VAD patients at a single center cardiac program.

Methods
- This was a retrospective chart review of pediatric VAD patients admitted to Lucile Packard Children's Hospital Stanford between January 2014 and November 2019.
- Inclusion criteria: pediatric VAD support, bivalirudin as the primary agent for VAD anticoagulation.
- Exclusion criteria: prior anticoagulation use, heparin as the primary agent for VAD anticoagulation, bivalirudin used for pump thrombosis.
- The primary endpoint was PTTR while on a continuous bivalirudin infusion. Therapeutic range was defined as a patient-specific activated partial thromboplastin time (aPTT) range that varied over time as determined by a clinical team with expertise in MCS.
- Additional points included time to first aPTT range and average bivalirudin dose at aPTT target range of 70 to 90 seconds.

Results
Table 1. Characteristics of pediatric VAD patients on bivalirudin for anticoagulation

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age (months)</th>
<th>Weight (kg)</th>
<th>Underlying diagnosis</th>
<th>VAD type</th>
<th>Bivalirudin dose</th>
<th>Initial INR</th>
<th>Max INR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>19</td>
<td>CHD</td>
<td>TH</td>
<td>0.05</td>
<td>0.25</td>
<td>1.94</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>19</td>
<td>CHD</td>
<td>TH</td>
<td>0.05</td>
<td>0.25</td>
<td>1.74</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>7</td>
<td>CHD</td>
<td>TH</td>
<td>0.05</td>
<td>0.25</td>
<td>1.39</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>18</td>
<td>CHD</td>
<td>TH</td>
<td>0.05</td>
<td>0.25</td>
<td>1.74</td>
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<tr>
<td>5</td>
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<td>4</td>
<td>CHD</td>
<td>TH</td>
<td>0.05</td>
<td>0.25</td>
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<td>6</td>
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<td>4</td>
<td>CHD</td>
<td>TH</td>
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<td>0.25</td>
<td>1.74</td>
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<tr>
<td>7</td>
<td>7</td>
<td>11</td>
<td>CHD</td>
<td>TH</td>
<td>0.05</td>
<td>0.25</td>
<td>1.74</td>
</tr>
</tbody>
</table>

Table 2. Bivalirudin PTTR and average dose to achieve aPTT range of 70 to 90 seconds

<table>
<thead>
<tr>
<th>Patient</th>
<th>Days in VAD</th>
<th>PTTR</th>
<th>NPTT</th>
<th>Time to first aPTT range</th>
<th>Average dose of bivalirudin (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>37</td>
<td>87.4</td>
<td>64.7</td>
<td>15.6</td>
<td>0.73 (0.23)</td>
</tr>
<tr>
<td>2</td>
<td>27</td>
<td>91.6</td>
<td>70.7</td>
<td>14.0</td>
<td>0.73 (0.23)</td>
</tr>
<tr>
<td>3</td>
<td>17</td>
<td>98</td>
<td>78.0</td>
<td>17.3</td>
<td>0.73 (0.23)</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>94.2</td>
<td>70.0</td>
<td>15.0</td>
<td>0.73 (0.23)</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>94.4</td>
<td>70.0</td>
<td>15.0</td>
<td>0.73 (0.23)</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>94.4</td>
<td>70.0</td>
<td>15.0</td>
<td>0.73 (0.23)</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>94.4</td>
<td>70.0</td>
<td>15.0</td>
<td>0.73 (0.23)</td>
</tr>
</tbody>
</table>

Conclusions
- Bivalirudin achieves target anticoagulation goals for a majority of therapy duration and can be utilized for pediatric VAD anticoagulation.
- More studies evaluating clinical outcomes are needed to determine the safety and efficacy of bivalirudin for VAD anticoagulation.
- A future comparison of bivalirudin to heparin would be valuable in assessing various anticoagulation strategies in this population.

References
All of the authors have no conflicts of interest to disclose. This study was supported in part by the National Heart, Lung, and Blood Institute of the National Institutes of Health under grant number 2K24HL122809.
Evaluating the use of heparin derivatives in overweight and obese pediatric patients: a review
Michael P. Garner, PharmD Candidate; Chimnonso P. Onuoha, PharmD Candidate; Norman E. Fenn III, PharmD, BCPPS
University of Texas at Tyler - Fisch College of Pharmacy

BACKGROUND
- According to the CDC, one in five minors in the United States are described as obese.1
- Obese children are at higher risk of a hypercoagulable event, such as venous thrombosis, compared to healthy weight children.2
- Concerns exist with the narrow therapeutic window of anticoagulants in general, and especially with children.3
- The use of low molecular weight heparins (LMWH) in anticoagulation prophylaxis in overweight and obese children has been sparsely studied.

OBJECTIVES
- Evaluate and describe current available literature on the use of heparin derivatives in overweight and obese pediatric patients.
- Assess efficacy and safety parameters of heparin derivatives in overweight and obese pediatric patients.

METHODS
- A comprehensive literature search of PubMed, SCOPUS, Cumulative Index of Nursing and Allied Health Academic Library, and Google Scholar was conducted.
- Search terms used were “factors on low molecular weight heparin” OR “enoxaparin” OR “dalteparin” OR “fondaparinux” OR “fraxiparin” OR “pediatric” OR “child OR children” AND “obese OR obésité OR overweight.”
- No limits of timeline restrictions were imposed.
- Studies were included if they contained pediatric patients who were overweight or obese and received either enoxaparin, dalteparin, fondaparinux, or fondaparinux.

RESULTS
- Enoxaparin was the most studied heparin derivative in obese pediatric patients.
- Evidence for dalteparin and fondaparinux were limited.
- No patients using enoxaparin in this population were retrieved.
- Enoxaparin dose reductions of 25% to 37% occurred from baseline within the treatment studies.
- Enoxaparin dose increases of enoxaparin from baseline ranged from 8% to 27%.
- Monitoring of anti-factor xa measurements was inconsistent, performed or reported by investigators.
- Major adverse bleeding events were reported in the literature along with minor bleeding event.
- These thrombocytopenia events and two new thrombosis formations were described.

DISCUSSION
- The observed decrease seen from the enoxaparin treatment studies suggests that obese pediatric patients may be receiving supersuppressant dosing initially.
- Enoxaparin doses of enoxaparin were unchanged in two of three studies regardless of monitoring due to study protocol.
- Minor bleeding events were the most commonly reported safety parameter, with only one incidence of a major bleed reported in the literature.
- The observed loss of monitoring is concerning due to the narrow therapeutic window of these agents, potentially placing patients at greater risk for safety concerns.

CONCLUSIONS
- Enoxaparin is the most frequently used anticoagulant in the obese pediatric literature.
- Monitoring should be performed using anti-factor xa measurements, although consistency does exist with the use of these measurements.
- Larger, long-term randomized, controlled trials are needed to determine optimal treatment strategies on the heparin derivatives for better clinical outcomes in the overweight or obese pediatric population.

REFERENCES
For the full list of references, abstract, and more information use this URL code.
Evaluation of Atypical Antipsychotics for Treatment of Delirium in the Pediatric Intensive Care Unit (PICU)

**Background**

- Delirium may occur in up to 30% of critically ill pediatric patients. It is associated with increased hospital mortality, prolonged hospital stay, and increased risk of ventilator dependency. Several atypical antipsychotic agents have been used in adult populations experiencing delirium, but data on their effectiveness in pediatric populations is limited. This study aimed to evaluate the efficacy of atypical antipsychotics for treatment of delirium in the PICU.

**Objectives**

- To assess the effect of antipsychotics on CAMI scores in pediatric patients with hyperactive delirium.

**Methods**

- **Study Design**: Retrospective chart review conducted in the BCH PICU.

**Results**

- **Table 1: Demographic and Treatment Characteristics**

<table>
<thead>
<tr>
<th>Age in years, median (IQR)</th>
<th>7.0 (0.75-13.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight in kg, median (IQR)</td>
<td>25.0 (17.9-38)</td>
</tr>
<tr>
<td>CAMI Before Antipsychotic Use</td>
<td>5 (4-8)</td>
</tr>
<tr>
<td>CAMI After Antipsychotic Use</td>
<td>4 (2-6)</td>
</tr>
<tr>
<td>CAMI Dose (mg/kg)</td>
<td>0.1 (0.05-0.15)</td>
</tr>
</tbody>
</table>

- **Table 2: Effect of Antipsychotics on CAMI Dose**

<table>
<thead>
<tr>
<th>Patient</th>
<th>CAMI Dose Before Antipsychotic Use</th>
<th>CAMI Dose After Antipsychotic Use</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5 (4-8)</td>
<td>4 (2-6)</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>8 (6-10)</td>
<td>6 (4-8)</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>7 (5-9)</td>
<td>5 (3-7)</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>8 (6-10)</td>
<td>6 (4-8)</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>9 (7-11)</td>
<td>7 (5-9)</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>7 (5-9)</td>
<td>5 (3-7)</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>6 (4-8)</td>
<td>4 (2-6)</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>8 (6-10)</td>
<td>6 (4-8)</td>
<td>2</td>
</tr>
</tbody>
</table>

- **Conclusion**

- 44% of patients had > 15% improvement in CAMI scores following initiation of antipsychotics (Table 3).
- Antipsychotics may be effective in reducing hyperactive delirium in pediatric patients, but further research is needed to determine optimal dosing and duration of treatment.

**References**

Evaluation of Atypical Antipsychotics for Treatment of Delirium in the Pediatric Intensive Care Unit (PICU)
Stephanie M. Yasechko, PharmD Candidate 2020, Kimberly Novak, PharmD, BCPS, BCPPS, FPPA
Nationwide Children’s Hospital Department of Pharmacy
Columbus, Ohio

Background
- Adult and pediatric cystic fibrosis (CF) patients at Nationwide Children’s Hospital have been shown to develop serious infections with multi-drug resistant organisms (MDROs) in both the pediatric and adult ICUs. Infections with MDROs have been associated with increased morbidity, mortality, and healthcare costs.
- The use of atypical antipsychotics for the treatment of delirium in CF patients may reduce complications associated with MDROs.

Objective
- This study aimed to evaluate the incidence of MDRO colonization in CF patients on CFTR modulator therapy.
- The study focused on patients receiving atypical antipsychotics for delirium.

Methods
- A retrospective review of patient records was conducted.
- The study included pediatric and adult patients receiving atypical antipsychotics.
- The study assessed the incidence of MDRO colonization in these patients.

Results
- A total of 91 patients were included in the study.
- Of these, 56 patients were pediatric and 35 were adult.
- The study found a significant increase in MDRO colonization in patients receiving atypical antipsychotics.

Conclusions
- Administration of atypical antipsychotics must be used cautiously in CF patients to prevent the development of MDROs.
- Further research is needed to better understand the impact of antipsychotics on MDRO colonization.

Discussion
- Limitations of the study include the retrospective nature of the data.
- Future studies should focus on prospective evaluations of antipsychotic use in CF patients.

Disclosures
- The authors declare no conflicts of interest.

Table 1: Demographic data
<table>
<thead>
<tr>
<th>Age Group</th>
<th>Pediatric Patients (N=56)</th>
<th>Adult Patients (N=35)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>10.9 ± 4.4 (2-19)</td>
<td>27 ± 7.7 (20-46)</td>
</tr>
</tbody>
</table>

Table 2: MDRO colonization
<table>
<thead>
<tr>
<th>Age Group</th>
<th>Pediatric Patients (N=56)</th>
<th>Adult Patients (N=35)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean WBC</td>
<td>12.5 ± 3.8</td>
<td>10.3 ± 3.4</td>
</tr>
</tbody>
</table>
Evaluation of romiplostim utilization in children with chemotherapy-induced thrombocytopenia at a large, academic children’s hospital

Emma L. Wysocki, PharmD, RDN, CNSC; Alexis Kuhn, PharmD, BCOP
Nationwide Children’s Hospital Department of Pharmacy

Background

- GIT can result in therapy delays, dose reductions, and significant bleeding
- Platelet transfusion is the most common treatment for GIT but has many undesirable side effects
- Romiplostim, a thrombopoietin receptor agonist effective at raising platelet counts, is FDA-approved for treatment of chronic immune thrombocytopenia in children and adults
- Romiplostim has been effective in different use for GIT treatment in adults
- Data on romiplostim use in pediatric patients with GIT is lacking

Objective

Evaluate the utilization, effectiveness, and safety of romiplostim for GIT in pediatric patients at a large, academic children’s hospital

Methods

Retrospective chart review of patients ≤ 18 years of age with GIT who received at least one dose of romiplostim at Nationwide Children's Hospital between January 1, 2014 and July 31, 2019.
- Baseline characteristics
- Platelet threshold for treatment or surgery
- Initial dose, dose changes, number of doses, and reason for discontinuation of romiplostim
- Major safety events (bleeding, thrombosis)
- Platelet counts during romiplostim therapy

Results

- Twenty-six treatment courses among 16 patients were included in this analysis
- The majority of patients (77%) achieved their platelet threshold while receiving romiplostim
- Concurrent platelet transfusion was common (81%)
- The average dose required to achieve platelet threshold was 5.3 mcg/kg
- No patients in this analysis experienced thrombosis during treatment and one patient experienced a major bleeding event

Conclusion

Romiplostim, in combination with platelet transfusion, was effective in increasing platelet counts above thresholds for the majority of patients in this analysis

Romiplostim was well tolerated with no incidence of thrombosis and only one patient with discontinuation due to side effects (paresthesia)

Romiplostim, in combination with platelet transfusion, may be considered as a treatment option in pediatric patients with refractory chemotherapy-induced thrombocytopenia

References

Disclosures

Evaluation of romiplostim utilization in children with chemotherapy-induced thrombocytopenia at a large, academic children’s hospital
Emma L. Wysocki, PharmD, RDN, CNSC; Alexis Kuhn, PharmD, BCOP
Evaluation of ursodiol use in patients with cystic fibrosis

Catherine Mechler, PharmD Candidate and Kimberly J. Novak, PharmD, BCPS, BCPPS, FPPA

Background
- Cystic fibrosis (CF) is the most common genetic disease for Caucasians.
- Patients with CF often have gastrointestinal, pancreatic, and pulmonary diseases secondary to chloride channel dysfunction.
- Ursodiol is a gallstone dissolution agent that is often prescribed for some of these complications, including:
  - Liver disease related to CF — confirmed or increased liver function tests (LFTs)
  - Gallbladder (GB) cholecystitis
  - Total parenteral nutrition (TPN)-induced cholecystitis
- There is a lack of solid evidence promoting the routine use of ursodiol, and it can increase the risk of adverse reactions.
- Ursodiol often remains on a patient’s medication list even after it is no longer indicated, causing higher pill burden, increased risk for drug-drug interactions, and higher cost to the patient.

Objectives

Primary Objective
- Evaluate the proportion of cystic fibrosis patients taking ursodiol who may no longer be indicated

Secondary Objectives
- Analyze the initial indication of patients with opportunity for ursodiol removal
- Analyze the initial indication of cystic fibrosis patients who were taking ursodiol, but correctly taken off

Methods

Retrospective Chart Review
- IRB-approved review
- Descriptive statistics used for analysis

Inclusion/Exclusion Criteria
- Cystic fibrosis patients receiving ursodiol
- No exclusions were needed for assessment
- January 1, 2014 - July 31, 2019

Data Collected
- Pre/Adults patient care team designation
- Sex
- Cystic fibrosis mutation
- Length of treatment duration
- Initial ursodiol indication

Results

Distribution of ursodiol use

Breakdown of patients with opportunity for ursodiol removal

Initial Indication Categories (N = 79)

Discussion
- There are quite a few patients (16.4%) that could be candidates for the removal of ursodiol from their medication list.
- Of this group that was flagged for possible ursodiol removal, 43.0% of them have already started due to elevated liver enzymes which have since resolved.
- Seven of the fourteen patients (50%) that are no longer taking ursodiol were stopped after their liver enzymes normalized for at least 6 months.
- Other reasons to potentially discontinue ursodiol therapy included resolution of TPN-induced cholecystitis after discontinuing TPN.
- Resolution of cholestasis after cholecystectomy

Limitations:
- Small sample size (N = 79)
- Subjuctive interpretation of indication for therapy based on chart documentation
- Progression in disease can change initial indication for ursodiol
- Medication lists are not always up-to-date, especially if the patient receives primary care elsewhere

Conclusions
- The prevalence of continued prescribing of ursodiol when it is no longer indicated is relevant.
- When the initial ursodiol indication is for elevated liver enzymes, it is important to continuously reassess the patient’s need for this medication

References

Disclosures
Authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.
Implementation of a penicillin oral dose-graded challenge without skin testing at an academic pediatric institution

Mara Rubin, PharmD; Jessica Tansmore, PharmD; Juan D. Chaparro, MD; Jessica Hehmeyer, MHA; Charlo Macias, MHA; Joshua Watson, MD; Maria Vegh, RN, MSN, CPN; David Stukus, MD

Background

- Self-reported penicillin allergies are highly prevalent: 1
- Compared with adults, pediatric penicillin allergies are more common: 1
- More commonly a result of viral-induced exacerbations: 1
- Less likely to be a serious allergen reaction: 1
- Penicillin allergy mislabeling impacts: 1
- Antecedent appropriateness, treatment efficacy, duration, adverse effects, and expense: 1
- Antibacterial resistance and antimicrobial stewardship: 1

Methods

- Historically recommended prior to oral challenges to reduce risk of severe acute challenge reactions: 1
- Resource- and time-intensive: 1
- High rate of false positives: 1
- Penicillin oral dose-graded challenges: 1
- Appropriate for non-IgE- and delayed-onset adverse reactions: 1
- Specificity of 100% negative predictive value of 89.1%, and positive predictive value of 100%: 1
- Limited to prolonged courses as an outpatient: 1

Objectives

- Implement oral dose-graded challenges without prior skin testing: 1
- Remove documented penicillin allergies from the electronic medical record: 1

Methods Continued

- Results reflective of oral dose-graded challenges completed through an electronic medication record order set: 1
- On-duty nursing is required to execute the challenge: 1
- Allergies listed as intolerances were not included and likely to be eligible for the challenge: 1
- Current screening tool triggers to re-evaluate each patient during each admission, so total eligible patients may be falsely elevated: 1

Limitations

- Pediatric patients with mild, non-IgE-reported penicillin allergies are an appropriate patient population for an oral dose-graded challenge without prior skin testing: 1
- Penicillin oral dose-graded challenges in the inpatient setting provide an opportunity to clarify reported penicillin allergies: 1

Conclusions

- Expand the dose challenge to other inpatient units and outpatient settings to target more eligible patients: 1
- Expand scope of antibiotics to include intravenous formulations and other beta-lactams including cefazolin and cefepime: 1
- Retrospective review of patients who passed an oral dose-graded challenge and if they have received the drug subsequent to removal of their previously reported allergy: 1

Future Directions

- References

Disclosures

Implementation of a penicillin oral dose-graded challenge without skin testing at an academic pediatric institution
Mara Rubin, PharmD; Jessica Tansmore, PharmD; Juan D. Chaparro, MD; Jessica Hehmeyer, MHA; Charlo Macias, MHA; Joshua Watson, MD; Maria Vegh, RN, MSN, CPN; David Stukus, MD
Integrated pharmacy automation management reduced formula usage and improved exclusive breastfeeding rates in a Baby Friendly community hospital

David M. Dirig, Leonid Sokolskkiy, Maria Itani, Tammy Turner, and Tracey Ybarra

Background
- MUCCH is a 134-bed safety-net community hospital that opened in 2015.
- Built in 2018, Baby-Friendly Hospital Initiative participation since 2016.
- Level One Perinatal Department averages 90 neonates monthly.
- Founding state (baby formula).
- Materials management stocked baby formula on the nursing unit as supply.
- Multiple products. High per-levels. No utilization tracking.
- Study period (baby formula).
- Pharmacy stock formula dispensing in September 2018.
- Formula options streamlined to a single 2oz (60ml) product.
- Formula dispensed only from Pyxis MedStation per prescription order.

Objectives
- Leverage automation & electronic health record to manage formula logistics.
- Capitalize on Pyxis analytics to report formula dispensing patterns.
- Reduce formula use and improve exclusive breastfeeding rates.

Methods
- MUCCH Medication Management Automation.
  - BD Pyxis E2 (MedStation) interfaced to CareOne Millennium (version 2015.23).
  - Formula knockdown. If no stock formula option.
  - Consistent stock to streamline to a single formula option.
  - Prescriber order viewing on electronic health record for formula to be given.
  - Formula order built into electronic order set (pop-up) to promote appropriate neonatal nutritional choices. Formula hidden as undesirable (no one-off orders).
  - Smart order set: auto-validate in Pharmacy to prevent double dosing in Pharmacy.
  - Dispensing from Pyxis MedStation as profiled item (no override allowed).
  - Clinical Data Category (CDC) designed in Pyxis to query user before removal.
  - "Have you documented an alternative feeding method using mother’s own breastmilk? (e.g., spoon, cup, or syringe)?"
  - Formulary treated as a medication and included in Bar Code Med Administration.

Formulary Management Analysis Dashboard
- Formula dispensing activity (Pyxis) and CareOne patient-specific reports displayed monthly to inform leaders as to personnel ordering and dispensing patterns.
- Monthly reports on usage, breastfeeding percentage, and frequency analysis.
- Scatter-plots analysis indicated high-use and low-use patterns per month.
- User CDC responses analyzed for appropriate use and formula justification.

Results – Formula Logistics
- Cost: $2,500
- Spend: 70%
- Improvement: 10% after tool took over in Q2-18

Results – Low-use formula consumption
- Education to reduce "newborns" note chronological reduction in "formula balance" receiving ≤3 bottles during hospital stay after implementation of Pyxis CDC. Decreased frequency of low usage cases correlated with improved exclusive breastfeeding rates.

Summary
- Results of applying automation analytics to formula management included:
  - Formula spend decreased by 70%.
  - Monthly formula usage decreased by 25%.
  - Formula refill and rework workload decreased by 95%.
  - Percent of neonates receiving formula decreased by 90%.
  - Low-use consumption (≤3 bottles per neonate stay) decreased by 90%.
  - Bar Code Medication Administration order rate for formula exceeded 55%.
  - Exclusive breastfeeding rates at MUCCH increased by 33%.
  - Exclusive breastfeeding rates exceeded CMS, TUC, & California standards.

Conclusion
- MUCCH sought to improve essential care by collaborating with this Baby Friendly Hospital Initiative to promote breastfeeding and prioritize the use of breast milk over formula. By implementing required ordering of formula by prescribers only via EHR order set, pharmacy dispensing automation, and nursing medial staff education, formula spend and usage decreased while exclusive breastfeeding rates increased without adversely affecting prescribers, pharmacy, or nursing workflow.

Disclosures
Intravenous methylnaltrexone for the treatment of opioid-induced constipation in critically ill pediatric patients

Kimberly Johnstone, PharmD; Christopher McPherson, PharmD, BCPPS; Ahmed Said, MD, PhD; Michael Lahart, PharmD, BCPPS

Table 1. Patient Characteristics and Response to Methylnaltrexone at Time of Dose Administration

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Doses before first dose</th>
<th>Doses administered within 24 hours</th>
<th>Response to a Dose</th>
<th>Adverse Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>Male</td>
<td>3 (2-3)</td>
<td>2 (0-2)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>&gt;1 year</td>
<td>Female</td>
<td>2 (1-2)</td>
<td>1 (0-1)</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Figure 1. Mechanism of action of methylnaltrexone in OIC

Figure 2. Patient Response to Methylnaltrexone Administration Based on Number of Doses

Preliminary Conclusions

- Methylnaltrexone is effective in treating OIC in critically ill pediatric patients.
- Patients responded to methylnaltrexone over a wide variety of dose requirements.
- Methylnaltrexone was well-tolerated and safe in this patient population.

Presented at the 54th Annual meeting of the American College of Clinical Pharmacy (ACC-PHARM) on December 13, 2015 in Las Vegas, Nevada.
Medication use evaluation of eculizumab at a free-standing pediatric institution
Christopher R.T. Stang, PharmD and Michael Storey, PharmD, MS, BCPS

Background
- Eculizumab is a monoclonal antibody that binds to complement protein C5 resulting in the inhibition of terminal complement complex.
- This inhibition has been used to treat processes such as intravascular hemolysis, thrombotic microangiopathy (TMA), post-bone marrow transplant (BMT), and solid organ transplant rejection (SOTR).
- The only FDA-approved pediatric indication for eculizumab with specific weight-based dosing is atypical hemolytic uremic syndrome (aHUS).
- Eculizumab is recommended to be given via intravenous infusion over 35 minutes in adults and 1-4 hours in pediatric patients.
- Patients receiving concurrent medications, plasma exchange, or infusions of fresh frozen plasma are recommended to receive supplemental doses of eculizumab.
- Eculizumab therapy is associated with an increased risk of infections, notably meningitis and encapsulated bacterial infections, thus it’s recommended to receive the meningococcal vaccine two weeks prior to initiation of therapy.
- At Nationwide Children’s Hospital, eculizumab is utilized for various indications by different services.
- There is no consensus pediatric dosing recommendations for eculizumab when the indications outside of aHUS.

Objectives

Primary
- Evaluate dosing, indications, and service lines utilizing eculizumab

Secondary
- Monitor safety and efficacy of eculizumab

Methods

- Single-center retrospective chart review

- Inclusion Criteria:
  - Patients who received eculizumab between August 1st, 2013, and August 1st, 2015.
  - Eculizumab administered during inpatient admissions and outpatient infusion clinic.
  - Patient demographics, therapy characteristics, safety, efficacy, and logistical data points were collected from the electronic medical record.
  - Descriptive statistics were utilized for all analyses.

- The Institutional Review Board determined this study to be quality improvement and did not require a formal review.

Table 1. Patient Demographics (n = 25)

<table>
<thead>
<tr>
<th>Median Age, years</th>
<th>Range</th>
<th>8.8</th>
<th>5.50 – 28.50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Weight, kg</td>
<td>Range</td>
<td>22.2</td>
<td>11.4 – 56.5</td>
</tr>
<tr>
<td>Male, n (%)</td>
<td></td>
<td>12</td>
<td>48</td>
</tr>
</tbody>
</table>

Table 1. Therapy Characteristics

<table>
<thead>
<tr>
<th>Indication (n)</th>
<th>TMA post-BMT</th>
<th>TMA</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMA</td>
<td>5</td>
<td>20</td>
<td>46</td>
</tr>
<tr>
<td>Complement-mediated SOTR</td>
<td>7</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>CRRT</td>
<td>2</td>
<td>20</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 2. Initial Dosing by Indication

<table>
<thead>
<tr>
<th>Eculizumab dose per kg, mg</th>
<th>0.375</th>
<th>0.75</th>
<th>1.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial dose, mg/kg (n)</td>
<td>600</td>
<td>1200</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Use and Efficacy

| Alive at 1 year, n (%)    | 17 (77) |
| Death by indication       |        |
| TMA                       |        |
| Meningococcal prophylaxis |        |
| Death by indication       | 4      |
| Meningococcal prophylaxis | 10     |

Discussion

- Most patients were initiated on eculizumab while inpatient, likely the result of acute processes that eculizumab was used to treat.
- Ordering service was aligned with their respective indication: BMT and TMA, morphology and aHUS, and transplant services and complement-mediated SOTR.

Dosage
- Initial doses were largely consistent with labeled dosing for pediatric aHUS.
- Patients receiving supplemental doses were timed appropriately.
- Several patients did not receive supplemental doses.

Safety
- Under half of patients did not receive a meningococcal vaccine prior to the first dose.
- This likely reflects the complex, acute nature in which patients needed eculizumab therapy in this cohort.
- A high proportion of patients did not have a clearly defined discontinuation criteria.
- The majority of patients received 1 year after therapy initiation, with most of the dosing occurring in patients with TMA.

Limitations
- Patients receiving eculizumab via home health care were not detected by the initial report.
- Lack of documentation created difficulty accessing the need for supplemental doses.
- Only labeled recommendations for meningococcal prophylaxis were evaluated.
- Correlates to infectious disease and antibiotic prophylaxis were observed.

Conclusions
- Most patients received eculizumab off-label, which is expected given the population studied in this review.
- Generally, the initiation of eculizumab utilized dosing similar to approved dosing monographs.
- Meningococcal prophylaxis was provided when possible.
- A lack of defined treatment parameters and goals were common, with few indications for discontinuation.
- No safety signals were observed.

References


Disclosures

- Authors of this presentation have nothing to disclose concerning possible financial or commercial conflicts of interest that may have influenced the content of this presentation.
Pediatric emergency department acute agitation pharmacological management pathway update

Anna Dugovich, PharmD Candidate 2021, Kimberly Shipp, PharmD, BCPS, BCPPS, Lauren Yates, PharmD and Meredith McCauley, PharmD

Department of Pharmacy, Nationwide Children’s Hospital, Columbus, Ohio

Purpose

To maximize the safety and efficacy of acute agitation medication use in the emergency department (ED) at a pediatric teaching hospital

Background

- Acute agitation is a state of behavioral dyscontrol that will likely result in harm to the patient or healthcare workers without intervention
- Despite the lack of clear guidelines, a standardized pathway can help enhance safety and efficacy of acute agitation medications used
- Nationwide Children’s Hospital (NCH) uses an acute agitation pathway in the ED which includes the treatment options outlined in Figure 1.2

Figure 1. Acute Agitation Medications on Current Pathway

- **IV Options:**
  - Lorazepam: 0.05-0.1 mg/kg/dose (max 4 mg)
  - Haloperidol: 2 mg (max 4 mg) at 45 mg/kg
  - Dihydropyridine PO: 1 mg/kg/dose (max 50 mg) recommended with haloperidol for prophylaxis of extrapyramidal symptoms (EPS)

- **Pill Options:**
  - Lorazepam: 0.05-0.1 mg/kg/dose (max 4 mg)
  - Haloperidol: 2 mg (max 4 mg) at 45 mg/kg
  - Dihydropyridine PO: 1 mg/kg/dose (max 50 mg) recommended with haloperidol for prophylaxis of extrapyramidal symptoms (EPS)

- Possible areas of improvement within the current pathway include:
  1. Minimize sedation risk with medication administration to decrease time to patient evaluation
  2. Increase medication options with evidence in agitation to allow for individualization of agitation
  3. Decrease risk of EPS with antipsychotic administration to avoid unnecessary discontinuation of pharmacotherapies

Methods

- Review literature to find current evidence on methods to treat acute agitation in pediatric patients
- Collaborate with pharmacists and a psychiatrist to review information
- Finalize changes with agreement from Psychiatry and ED staff

Results

1. Minimize Risk of Sedation with Medication Administration
   - Management of agitation must be balanced with the risk of sedation associated with use of sedatives and benzodiazepines (BDZ)
   - Utilization of lowest effective dose for sedation minimizes risk of sedation
   - A maximum dose of 2 mg for lorazepam orally or intramuscularly is recommended to manage agitation while avoiding over-sedation

2. Additional Medication Options with Evidence in Agitation
   - Dihydropyridine PO: 0.5 mg/kg/dose (max 1 mg)
   - Must be individualized based on patient-specific history whenever possible

Figure 2. Summary of Evidence Based Medication for Agitation

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lorazepam</td>
<td>0.05-0.1 mg/kg/dose (max 4 mg)</td>
<td>Can give acute dose of home antipsychotic if appropriate</td>
</tr>
</tbody>
</table>
| Haloperidol| 2 mg (max 4 mg) at 45 mg/kg | Possible areas of improvement within the current pathway include:
| Dihydropyridine PO | 1 mg/kg/dose (max 50 mg) recommended with haloperidol for prophylaxis of extrapyramidal symptoms (EPS) |

3. Decrease EPS Risk with Antipsychotic Administration
   - Antipsychotics, especially those with higher potency, have the potential to cause acute dystonia (AD) and tardive dyskinesia (TD)
   - ADT can be frightening for the patient and degrade the relationship between patient and doctor
   - Dihydropyridine can be used as prophylaxis or treatment for ADT in the absence of EPS
   - Usual dihydropyridine dose is 1 mg/kg/dose (max 50 mg) but there is little information on its lower dose could be used for EPS prophylaxis
   - Brimonidine can also be used as prophylaxis or treatment of ADT at a dose of 0.02-0.05 mg/kg/dose (max 2 mg) with a lower chance of sedation

Conclusions

- Decrease lorazepam to lowest effective dose for agitation
- Current: Lorazepam 0.05-0.1 mg/kg/dose (max 4 mg)
- Proposed Change: Lorazepam 0.05 mg/kg/dose (max 2 mg)
- Additional Medication Options with Evidence in Agitation
- Due to evidence in agitation, add oral clonazepam and risperidone and intramuscular ziprasidone
- Current: Risperidone PO: 0.5 mg/kg/dose (max 40 mg)
- Haloperidol IM: 2 mg (max 4 mg) at 45 mg/kg
- Proposed Addition: Ziprasidone IM: 5-10 mg, clonazepam PO: 0.02-0.05 mg/kg/dose (max 2 mg) with haloperidol administration
- Add guidelines for evidence driven medication selection
- Decrease EPS with Antipsychotic Administration
- Due to increased risk of EPS with high potency antipsychotics, add low dose dihydropyridine as required prophylaxis when administering intramuscular haloperidol
- Current: Dihydropyridine PO: 1 mg/kg/dose (max 50 mg) recommended prophylaxis with haloperidol administration
- Proposed Change: Dihydropyridine IM: 0.5 mg/kg/dose (max 25 mg) or lorazepam 0.02-0.05 mg/kg/dose (max 2 mg) with IM haloperidol administration

References


Acknowledgements

Meredith Chapman, MD, Department of Psychiatry at Nationwide Children’s Hospital

Disclosures

Authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.
Pharmacist impact on medication reconciliation in patients discharged from a pediatric complex care inpatient service

Elaine Yung, PharmD; Dan Rieck, PharmD; Kayla Petkus, PharmD, BCACP

Nationwide Children’s Hospital Department of Pharmacy, Columbus, OH

Background
- Inaccurate medication lists lead to an increased risk of medication-related errors.
- 21% of all reported of adverse drug events in 2016 were from the Complex Care service at a large free-standing pediatric hospital.
- 95% of admitted patients have their medications reviewed daily by an inpatient pharmacist.
- Joint Commission requires that medication reconciliation occur at admission and transition of care, and discharge.
- Pharmacists have the knowledge and skills to assist in providing medication reconciliation.

Objectives

Primary Objective: Determine the impact of pharmacist interventions on the reduction of medication-related errors during discharge medication reconciliation for Complex Care patients transitioning from hospital to community settings.

Secondary Objectives:
- Examine types of medication-related errors.
- Quantity of medication-related errors associated with multiple floor transfers during the hospital admission.

Methods

Chart reviews of patients discharged from the Complex Care inpatient service at Nationwide Children’s Hospital were completed using electronic health records to analyze medication-related errors.

- Medication-related error: any preventable error that may lead to inappropriate medication use or patient harm.
- Pre-intervention: pharmacist and student pharmacist conducted discharge medication reconciliation, completed Monday - Friday, 8am - 5pm.
- Post-intervention: no pharmacist involvement.
- The pre and post-intervention review were evaluated by the same pharmacist.

Results

<table>
<thead>
<tr>
<th>Table 1: Pre-intervention (n=30 patients)</th>
<th>T1 Post-intervention (n=30 patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tranfections</td>
<td>15.2 ± 1.3</td>
</tr>
<tr>
<td>Primary age (years)</td>
<td>8.9 ± 0.8</td>
</tr>
<tr>
<td>Male (%)</td>
<td>70</td>
</tr>
<tr>
<td>Discharge medications</td>
<td>19.9 ± 1.5</td>
</tr>
<tr>
<td>Discharge medication errors</td>
<td>2.2 ± 0.1</td>
</tr>
</tbody>
</table>

Table 2: Interception (n=13 patients)

<table>
<thead>
<tr>
<th>Table 3: Post-Intervention (n=30 patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preventing medication errors</td>
</tr>
</tbody>
</table>

Figure 1: Medication Errors, n=30 patients

Discussion

Baseline characteristics were similar between the two groups.

Primary Objective: Pharmacy discharge medication reconciliation slightly decreased the amount of medication-related errors.

Secondary Objectives:
- Most common error found on discharge medication lists were incorrect routes (37.9%), so Complex Care patients often receive medications via gastric and/or jejunal tubes.
- Patients with >3 transfers tended to higher numbers of discharge medications and errors compared to patients transferred ≤3 times.

Conclusions

Discharge medication reconciliations help reduce medication-related errors. Although this study did not see a significant difference, additional studies implementing pharmacy-led discharge medication reconciliations should be conducted to demonstrate the reduction in medication-related errors. The survey of pharmacists as the main obstacle to completing any medication reconciliations is lack of time due to other job responsibilities.

Future Directions:
- Standardize the definition of medication reconciliation and documentation processes.
- Determine cost-benefit analysis of medication reconciliations.
- Identify patients with >3 transfers as a population that may be at higher risk for discharge medication errors.
- Implement medication reconciliations in multiple inpatient and outpatient settings.

Disclosures

Authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.
Quantification of Safety Outcomes Associated with Attention Deficit Hyperactivity Disorder (ADHD) Medications in Children and Youth with Special Health Care Needs (CYSHCN)

Lionel Sielatchom-Noubissie; Evan Atchley; Lucas Orth, PharmD, BCPPS; Allison Blackmer, PharmD, FCCP, BCPS, BCPPS

University of Colorado Anschutz School of Pharmacy and Pharmaceutical Sciences

Children's Hospital Colorado

Background
- CYSHCN, comprising approximately 10% of all children in the United States, may be predisposed to receiving ADHD medications due to a high incidence of behavioral and developmental disorders.
- ADHD medications are commonly prescribed, but are associated with adverse events (AEs) such as weight, appetite, and gastrointestinal upset.
- AEs may worsen, and CYSHCN due to complex comorbidities, polypharmacy, and altered pharmacokinetics & pharmacodynamics. To date, the safety of ADHD medications has not specifically been evaluated in CYSHCN.

Objectives
1. Characterize the subset of CYSHCN receiving ADHD medications
2. Quantify safety outcomes associated with ADHD medications in CYSHCN

Methods
- Single-center, retrospective study of CYSHCN
- Inclusion criteria: age ≥3 years during the study period, had a healthcare visit with CYSHCN
- Exclusion criteria: No prior ADHD treatment
- Study design: Retrospective chart review
- Data sources: Electronic health records

Results
- Table 1: Characterization of CYSHCN Prescribed ADHD Medication
  - Stimulant use: 80.1% (224/412), Non-stimulant use: 19.9% (643/412)
  - Cautions in the use of ADHD medications in CYSHCN

Limitations
- Follow-up period may have been of insufficient duration to capture long-term AEs (e.g., exaggerated growth or development of neurodevelopmental AEs)
- Discontinuation data includes only index patient data (recovery outcomes in those transferred to more drug therapies are not captured)
- Unable to account for patients who up-titrated or used multiple medications during the pre-dosing ADHD medication initiation

Conclusions
- Most patients initiated on ADHD medications were white, <10 years old, and publicly insured
- The high proportion of patients with neurologic impairment was consistent with historical epidemiologic data for CYSHCN
- Emotional and behavioral problems occurred more frequently than in non-CYSHCN, but wide consultations and appetite suppression did not
- Discontinuation rates were higher than previously observed in CYSHCN and the general pediatric population

Implications
- Quality improvement initiatives incorporating pediatric pharmacists at the point of prescribing ADHD medications in CYSHCN may optimize outcomes
- Pediatric pharmacists may play an integral role in the follow-up care to optimize ADHD management, particularly monitoring and managing adverse effects

Disclosures
- The authors have no financial or personal relationships that could bias the presentation

References
1. J Med Ethics 2015;41:945-951
2. Pediatrics 2014;133:1216-1223
3. JAMA Psychiatry 2014;71:22-29
4. JAMA 2013;310:2222-2230
5. JAMA Pediatrics 2015;169:524-530
6. JAMA 2016;316:524-530
7. JAMA Pediatrics 2016;170:111-119
Background
Increasing incidence of NTM Disease
- Cystic Fibrosis (CF) patients vulnerable due to structural lung damage, impaired mucociliary clearance, and enhanced sputum virulence
- Incidence in CF patients increased from 1.3% to 12% over 30 years, but prevalence unknown
- Mycobacterium abscess which cause (MAC) and Mycobacterium avium complex (MAC) most common causative species

Need for Standardized NTM Treatment in CF Patients
- Cystic Fibrosis Foundation and Infectious Diseases Society of America/ American Thoracic Society guidelines not standardized
- Wide variability in NTM treatment exists in CF patients
- Biodistribution and drug selection is attributed to NTM regimens not reported

Objectives
Primary Objective
- Evaluate NTM regimens at a large CF center including both pediatric and adult programs
- Assess eradication rates and improvement in forced expiratory volume in one second (FEV1)

Secondary Objectives
- Determine the need for establishment of an optimal NTM treatment strategy for CF patients
- Retrospective, single-center chart review
- Demographics, NTM regimen duration, pulmonary function, and toxicity information collected
- Descriptive statistics performed

Inclusion Criteria
- Mycobacterium growth on acid fast bacillus (AFB) culture from January 1, 2003 – September 30, 2019
- Received NTM treatment

Exclusion Criteria
- Mycobacterium tuberculosis or Mycobacterium avium complex growth

Table 1. NTM Organisms

![Table 1. NTM Organisms](image)

Table 2. NTM Treatment Response

![Table 2. NTM Treatment Response](image)

Discussion
Evidence for Standardized NTM Treatment in CF
- In MAC, ethambutol, azithromycin, and Rifampin (most commonly rifampin) most frequently used
- In MAC, ethambutol, azithromycin, a combination (most commonly clarithromycin) on infection, and azithromycin
- Combination therapy, without rifampin most often used
- Anti-Tuberculosis drug utilized often higher than guideline recommendations
- Failure achieved in >90% of all CF patients treated for NTM after an average of 15 months
- FEV1 modestly improved after treatment for MAC and MABSC
- Over 50% experienced dermatitis with IV aminoglycoside; requiring alterations of initial treatment regimen
- Four patients actively receiving therapy

Limitations
- Retrospective chart review study design
- Limited to CF population
- Future Directions
- Further studies must be conducted to evaluate eradication in non-CF patients, costs associated with therapy, and an optimal regimen to minimize toxicity

Conclusions
- A high rate of NTM eradication was achieved in CF patients at our adult and pediatric CF center
- Standardizing treatment regimens for NTM disease would be a valuable opportunity to optimize outcomes

References

Disclosures
Review of levetiracetam doses utilized in status epilepticus in a pediatric emergency department

Julie Herman, PharmD. Candidate 2021, Daniel Rieck, PharmD., Jenny Steinbrenner, PharmD., BCPS
Department of Pharmacy, Nationwide Children’s Hospital, Columbus, Ohio

Background
- Nationwide Children’s Hospital (NCH) utilizes levetiracetam as its second line agent of choice for status epilepticus (SE).
- Current literature in pediatrics has not shown superiority between levetiracetam and levetiracetam as a second line agent in SE.
- NCH has considered levetiracetam as second line therapy due to improved side effect profile, less interactions, quicker administration and ease of monitoring.
- NCH does not have a standard for levetiracetam dosing in SE given the lack of consensus in the literature.
- American Epilepsy Society SE guidelines recommend levetiracetam doses of 80 mg/kg (max 4,000 mg).

Objectives
- Primary: Evaluate the levetiracetam doses utilized in the emergency department (ED) for SE.
- Secondary: Evaluate efficacy of initial levetiracetam administration.
- Determine use of additional anti-epileptic medications in SE.

Methods
- Single center, retrospective chart review.
- Patients electronic medical records were used to obtain baseline demographics, status epilepticus treatment pathway, history of seizures, and home anti-epileptic therapy.
- For the purpose of this study, levetiracetam dosages of ≤40 mg/kg were considered appropriate.
- Descriptive statistics were utilized for analyses.
- Approved by Institutional Review Board expedited review.

Results

<table>
<thead>
<tr>
<th>Levetiracetam Dosing for Status Epilepticus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose</td>
</tr>
<tr>
<td>40 mg/kg</td>
</tr>
<tr>
<td>40 mg/kg</td>
</tr>
<tr>
<td>40 mg/kg</td>
</tr>
</tbody>
</table>

Discussion
- Overall, 20 patients received levetiracetam for SE. In the ED with doses ranging from 9 mg/kg to 52 mg/kg, with an average levetiracetam dose of 36 mg/kg.
- Of these patients, dosing was nearly evenly divided between a typical (58%) and under dosed (42%).
- For patients appropriately dosed, 53.3% had SE resolution while 61.5% of patients underdosed had SE resolution.
- The average dose of underdosed patients was 25 mg/kg.
- All but 1 patient received at least 1 benzodiazepine prior to levetiracetam, and 9 patients received phenytoin prior to levetiracetam.

Limitations:
- Retrospective study design, small sample size.
- Recent literature supports higher dosing than what was defined appropriate in our study.
- Exclusion of patients participating in the Established Status Epilepticus Treatment Trial.

Conclusions
- Overall, there was wide variability in dosing of levetiracetam for SE in the ED. However, dosing was fairly evenly divided between appropriate (53.1%) and underdosed (42%).
- There was no clear improvement in SE resolution based on utilizing doses of ≤40 mg/kg.
- A future review utilizing intravenous 60 mg/kg for SE may provide better insight for SE resolution.

References

Disclosures
- Authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.
Use of ceftazidime-avibactam for infections caused by multidrug-resistant Gram-negative organisms at a pediatric institution

Ezinwanne Emelue, PharmD; Miranda Nelson PharmD, BCPPS; Christopher McPherson, PharmD, BCPPS; Jason Newland MD, MEd; David Rosen, MD, PhD

St. Louis Children’s Hospital, St. Louis, MO

Use of ceftazidime-avibactam for infections caused by multidrug-resistant Gram-negative organisms at a pediatric institution

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St. Louis Children’s Hospital, St. Louis, MO

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