A Multi-Disciplinary Program to Decrease the Rate of Preventable Harm from Medication Events

Michigan Pharmacist Association
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Objectives:

• Describe 3 operational risk points impacting the safe administration of U-500 insulin

• Evaluate two examples of how to monitor total daily dose of acetaminophen

• Recognize at least two risk factors for hyperkalemia

• 480-bed health-system providing a full range of inpatients and outpatient services, including tertiary level services such as cardiac and neurosurgery.
Pharmacy Systems, Inc.

• Partnership with Allegiance Health since 2013.
• Mission: To provide high quality, cost-effective hospital pharmacy management services that exceed client expectations

- 100+ Pharmacy Partnerships
- 20 Supply Chain Partnerships
- 4 Rehabilitation Partnerships
- More than 400 team members
- Direct management of 1,700+ healthcare professionals
- 95%+ market share of hospitals outsourcing pharmacy services in our region
- 99%+ client retention rate

Aligned Vision – Patient Safety

Improve Quality and Patient Safety:

• Improve adverse drug reaction capture rates to at least 1% of discharges.
• Implement at least 2 programs to decrease the rate of patient harm from preventable adverse drug reactions.
• Implement at least 1 program to improve medication systems reliability and/or decrease the rate of patient harm from medication events.

“Big Picture” Safety Strategy

• Report ALL medication events and review for trends
• Report “all” Good Catches – Near Miss events and review trends
• Recognition of top reporters
• Review use of antidotes and reversal agents
• Review ICD-10 diagnosis for at risk events
“Big Picture” Safety Strategy

Baseline ADR Capture

- Allegiance Health ADR capture rate was below AHRQ inpatient rate of 1.29 ADR / 100 Discharges at baseline.

- Allegiance Health ADR capture rate was below estimated occurrence rate at baseline.
  - Red = Actual ADRs observed in random chart audit using Institute for Healthcare Improvement (IHI) Trigger Tool (20 inpatients > 1 day LOS)
Baseline ADR Preventability

- High variability seen in baseline ADR preventability vs. literature
  - Allegiance Health’s focus adjusted to inpatient events preventable from the health system’s perspective (includes outpatient/MTM).

Methods to Increase ADR Capture

- Emerging literature regarding integration of safety algorithms into hospital EMRs for real-time identification and potential prevention of ADRs.

Allegiance ADR Capture Improvements

- Added medical records (ICD9/10) and sequential MUEs to improve ADR capture.
- Better ADR capture observed (< est. occurrence rate)

Programs to Increase ADR Capture Added

- Improved ADR Data Capture
Pharmacy Systems, Inc. ADR Capture Pilot

- Improvement noted vs. baseline at 14 hospitals with specific PI interventions (> 6 points above median)
- Run chart trends suggest outcomes were not improving on their own prior to pilot analysis and suggest program impact.

Baseline (CY2013) Improvement (CY2014) Follow-Up Monitoring

Pharmacy Systems, Inc. ADR Capture Pilot

- Dual Medication Safety Goals: Improve ADR capture and drive safety-related change using hospital-specific data and published literature.

Process Improvement In Action

- Step 1 – Quantify baseline ADR capture rate
  - National benchmarks (IHI/AHRQ)
  - Hospital-specific (IHI Trigger Tool)
- Step 2 – Develop plan to improve ADR capture
  - ICD9/10 “E-Codes”, Sequential MUEs, and staff education
- Step 3 – Analyze existing data for safety signals
  - Inpatient hyperkalemia
  - Anticoagulation management
Process Improvement In Action

• **Step 4** – Analyze literature-based safety areas
  - Acetaminophen maximum dose adherence (inpatient)
  - Nephrotoxicity (aminoglycosides/vancomycin)

• **Step 5** – Use MUE process to establish incidence for safety signals
  - Helps determine if still relevant to target perceived areas of need
  - Helps prioritize areas of focus

“PDCA” Performance Improvement Cycle

- **Step 6** – Use PDCA (Plan/Do/Check/Act) and MUE process to drive change and prevent ADRs.
- Set meaningful performance goals in advance (i.e., “A to B by C”)
- Measure progress toward goals using run charts

Targeting Zero Event Rates

- “Zero” can be an achievable safety metric.
- Challenge your metrics and goals, consider wording in terms of preventable harm.
  - **CLABSI Example** (CDC reports 12-25% mortality from CLABSI)

  *CLABSI Example Appears Courtesy of Lorri Gibbons, RN, MSHL, CPHQ, Vice President of Quality and Safety, South Carolina Hospital Association (Presented at the Institute for Healthcare Improvement 27th Annual National Quality Forum, December 2015).*

Proposed Goal: Management proposes a 25% reduction in central line associated bloodstream infections.
Allegiance Health Safety Signals

- 3 common drugs/drug classes:
  - potassium
  - acetaminophen
  - insulin

Framework for Improvements

1. What are we trying to accomplish?
2. How will we know that a change is an improvement?
3. What changes can we make that will result in improvement?

INPATIENT HYPERKALEMIA PREVENTION

GAY ALCENIUS, PHARM.D.
CLINICAL COORDINATOR AND RESIDENCY PROGRAM DIRECTOR
Hyperkalemia – Why should we monitor?

• Background:
  – Incident of hyperkalemia estimated to be 3% in the general population.


Hyperkalemia – Why do we monitor?

• Background:
  – Hyperkalemia episodes were the most frequently reported ADR from 4 of 6 drug classes causing inpatient ADRs.

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>ADR Events Captured (Baseline Totals by Drug Class)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE Inhibitors</td>
<td>20.00%</td>
</tr>
<tr>
<td>Warfarin</td>
<td>15.00%</td>
</tr>
<tr>
<td>Replacement Preparations</td>
<td>10.00%</td>
</tr>
<tr>
<td>Opiate Agonists</td>
<td>5.00%</td>
</tr>
<tr>
<td>Aldosterone Receptor Antagonists</td>
<td>0.00%</td>
</tr>
<tr>
<td>Angiotensin II Receptor Antagonists</td>
<td>0.00%</td>
</tr>
<tr>
<td>Preparations</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

Inpatient Hyperkalemia

• Baseline analysis / safety signal validation:
  – McKesson HMM report created to evaluate rate of potentially preventable hyperkalemia in high risk patients:
    • Cockcroft-Gault ClCr < 50 mL/min with ACE, ARB, aldosterone antagonists and/or potassium repletion solutions.
    • Suggested analysis sample size = 20 patients (MSC evaluated 86).
  – Overall inpatient hyperkalemia rate = 9/86 (10.5%)  
    • Potentially preventable hyperkalemia rate = 3/86 (3.5%)
  – Clinical Team discussion
    • Team agreed with MSC that 3.5% was a high enough rate and was worth targeting.
    • Decentralized pharmacist monitoring program was developed and implemented.
Hyperkalemia – Why do we monitor?
• Past Errors and Adverse Events
• Review renal function
• Review medications with increase risk
  - ACE Inhibitors
  - Spironolactone
  - ARBs
  - Potassium Replacement
  - Trimethoprim / Sulfamethoxazole
• Pharmacy monitoring
• Accurate medication history

Hyperkalemia – How do we monitor?
Need accurate history of what was ordered and given
• Pharmacy daily report to identify at risk patients
• New item to be added with high potassium level and any at risk med (Bactrim, Spironolactone, ACE, etc.)

Inpatient Hyperkalemia
1. What are we trying to accomplish?
   - Reduce harm from preventable hyperkalemia due to over-repletion in high-risk patients.
2. How will we know that a change is an improvement?
   - If we achieve a < 1% rate of preventable harm within 12 months...
3. What changes can we make that will result in improvement?
   - Staff education, new pharmacist monitoring program and computer interaction alerts.
   - Reduce the rate of preventable ADRs due to hyperkalemia in the inpatient setting to less than 1% within 1 year
Inpatient Hyperkalemia

• Clinical team engagement to evaluate and integrate other potential causes of potentially preventable hyperkalemia beyond initial safety signal.
  – BMJ co-trimoxazole publication - new custom HMM alert created for drug interaction not flagged by vendor.

Hyperkalemia – How are doing?

• Performance Improvement Measurement
  – Initial success observed post-implementation (2015 Q1)
  – Working with staff to re-prioritize hyperkalemia risk assessment and intervention strategies in 2016.
  – Planning monthly sampling of results vs. quarterly in 2016.
  – Quicker identification of process trends, less impact of missing data

Inpatient Hyperkalemia

• Next Steps – PDCA Cycle
  – HMM “real time” alert for work queue added Jan-2016
  – Paper-based daily report continues
  – Monthly monitoring by Med Safety Coordinator and clinical pharmacists for more rapid performance improvement cycling potential to achieve and maintain goal performance.
Acetaminophen –
Maximum Daily Dose Adherence

- Literature-Based Hospital Safety Target
  - Acetaminophen toxicity is the leading cause of acute liver failure.
  - Due to the presence of multiple medications that contain acetaminophen, hospital inpatients may be at risk for receiving higher than recommended doses of acetaminophen.
- Acetaminophen overdose (receiving more than 4g in a 24 hour period) has been reported to occur in hospital inpatients at a rate as high as 6.6%.

Zhou et al 2012

Acetaminophen –
How do we monitor total daily dose?

- Review Pyxis data
- Review Medication Use Evaluation
- Review products available
- Review order sets –see new I-Form
- Provide feedback to physician and nursing provider (Newsletter)
What are we trying to accomplish?

How will we know that a change is an improvement?

What changes can we make that will result in improvement?

**AIM**

Achieve an inpatient acetaminophen overdose rate of less than 0.1% within one year.

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**Acetaminophen Max Dose**

- **Baseline analysis of Pyxis® Data**
  - Gross doses > 4g/calendar day: 162/13,760 patients (1.2%)

- **Excel download of raw Pyxis dispensing data**
  - Allows look at almost entire hospital population
  - Calendar dates vs. rolling 24 hour
  - Use Pivot tables to calculate total acetaminophen exposure for all encounters
  - Sort patients by total exposure > 4g all encounters
  - Eliminates the majority of patients and focuses review
  - Review acetaminophen exposure per calendar day
  - eMAR verification of sample of higher risk patients

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**Acetaminophen Max Dose**
Acetaminophen Daily Dose Monitoring – How are we doing?

- Performance Improvement Measurement
  - eMAR verified inpatient-overdose rate < 0.1% within 12 months of goal.
  - Continued periodic monitoring planned in 2016

U-500 INSULIN SAFETY

KEVIN J. SZYSKOWSKI, RPH
MEDICATION SAFETY COORDINATOR

U-500 Insulin – What does ISMP say?

- Build alerts and hard stops into electronic prescribing to warn about potential prescribing errors (e.g., hard stop for required verification of all U-500 insulin orders).
- Insulin among the most frequent drugs involved in student nurse-related errors.
- Rethink safe use of strengths above U-100. Same Name – multiple Strengths
U-500 Insulin Background

- ISMP reports that it has received growing numbers of medication error reports involving U-500 insulin. These errors were often due to the unavailability of syringes with a corresponding concentration/scale and the use of U-100 insulin syringes to draw up doses.
- Prior to 2015 at Allegiance Health, the use of insulin 500 unit/mL was prohibited by hospital policy; however, some use via the “home medication” route occurred.
- No formal processes in place for handling U-500 insulin.
- Overall adverse drug event (ADE) rates for insulin-related issues were 15/1,168 (1.284%) and 11/1,367 (0.805%) in 2013 and 2014 (through November), respectively.

U-500 Insulin – Why do we draw up?

Past Errors and issues…..

- In 2014, one ADE occurred with a 5-fold overdose of insulin administered using U-500 insulin processed via the “home medication” route. Hypoglycemia occurred requiring treatment with dextrose 50%.
- Only 1 ADE was specifically attributed to U-500 insulin, but anecdotal experience suggested opportunities for system improvement with U-500 insulin exist.
- Multidisciplinary Team developed new process in an attempt to make potentially preventable harm from U-500 insulin a “never” event within the hospital.

U-500 Insulin Errors

1. What are we trying to accomplish?
   Reduce harm from misadventures with U-500 insulin (high risk, low vol.)

2. How will we know that a change is an improvement?
   If we achieve a 0% rate of harm within 6 months...

3. What changes can we make that will result in improvement?
   Staff education, new multidisciplinary policy/procedure.

AIM
To have zero preventable medication errors associated with U-500 insulin by June 1, 2015
U-500 Insulin – Goals and Timeline

Project Goal:
• To have zero preventable medication events associated with U-500 insulin by June 1, 2015

U-500 Insulin – Why do we draw up?
• High risk of 5 fold overdose
• Infrequent – easy to see what we expect
• Multi-disciplinary – each to be missed by the patient, nurse, physician or pharmacist
• Can be ordered wrong, drawn up wrong as the wrong product, wrong dose, or charted wrong.

U-500 Insulin – What we changed?
• Added U-500 to CPOE / Pharmacy
• Made change to use patient own or charge
• Pharmacy draws up dose – check between tech and pharmacist
• Bar-code can be scanned
• Accurate history of what was ordered and given
U-500 Insulin – New Procedures

U-500 Insulin – Project Outcome
• Performance Improvement Measurement
  • Goal to achieve “zero” within 6 months was met and sustained for 12 months.
  • January 2016 – One occurrence of a 5-fold under-dose occurred with new policy/processes in place.

Takeaways
• High level review of safety data is important to provide program focus.
• Pharmacy Systems, Inc. partnership and alignment of safety/quality goals at Allegiance helped drive change.
• Safety improvements made in:
  – Potentially preventable hyperkalemia
  – Acetaminophen over-exposure
  – U-500 insulin processes
Thank you!!

Questions???