Learning Objectives

• Discuss the benefits of an intravenous (IV) compounding workflow management system
• Describe how IV workflow systems can decrease drug expenses
• List the challenges of implementing an IV workflow system

Self-Assessment Questions

1. An IV workflow system can help with all of the following except:
   A. Ensuring correct diluent selection
   B. Ensuring correct product selection
   C. Documenting IV compounding procedure
   D. Eliminating a final pharmacist check

2. An IV workflow system can decrease drug expenses by assisting with all of the following except:
   A. Preventing drug selection errors
   B. Switching orders from IV to PO route
   C. Locating lost IV medications
   D. Confirming if a dose was already made

3. Which of the following is not a challenge to implementing an IV workflow system?
   A. Obtaining staff buy-in
   B. Demonstrating medication safety benefits
   C. Acquiring information technology resources
   D. Obtaining capital funds
IV Room Safety

“Sterile compounding is a significant but perilous core pharmacy process in dire need of improvement.” – ISMP Jan 2015

- Syringe pullback method deemed unsafe practice in 2010
- IV workflow system - Level 1 Recommendation (Best Practice)

History of IV Workflow Systems

- Introduced in November 2007
- Adoption seen in bigger institutions
- High-risk areas (i.e. pediatrics and oncology)

Barriers

- Pharmacist tradition
  - Discomfort
  - Distrust
- Viewed as an unnecessary expense
- Insufficient support staff

Benefits

Medication Safety

- Barcode Verification
- Automated calculations
- Automated beyond-use dating
- Standardized instructions

Improved Productivity

- Telepharmacy
- Automated IV work queue prioritization
- Discontinued dose function
- Documentation

Benefits

Waste Reduction

- Dose tracking
- Multi-use vial tracking

Data

- Turnaround time
- Workflow
- Productivity

Mount Sinai Hospital Medical Center

- Safety Net Hospital
- 319 bed teaching hospital in Chicago
  - Sinai Children’s Hospital - 74 beds
  - Level I Trauma Center
  - 60,000 emergency room visits annually
- Average daily census: 250 acute care
- Pharmacy staff
  - 52 full-time equivalents (FTEs)
  - 20 Technician FTEs
  - 32 Pharmacist FTEs
- Triage position is primarily responsible for checking compounded IVs
Mount Sinai Hospital Medical Center

- Timeline
  - March 14, 2012 - Contract signed
  - May 28, 2014 - Go-live
  - December 3, 2014 - Tracking system go-live

MSH IV Workflow Procedure

IV workflow system was implemented in the inpatient setting only

- Order Entry and Verification
- Drug and Diluent Selection
- Compound IV Product
- Pharmacist Inspection
- Delivery

Includes: pediatrics
Excludes: chemotherapy, total parenteral nutrition, and premix

Phase 1

IV Workflow System Implementation
**Implementation Challenges**

- "Takes more time"
- Could lead to bypassed medications
- Bypass – circumvent IV workflow system
- "Not safer"
- Technology is not perfect
- Learning curve for staff
- Picture quality
- Troubleshooting

**Time Study**

- Before IV workflow system – two time studies were performed involving STAT IV medications
  - 2011 – 8.7 minutes
  - 2012 – 7.2 minutes
- 5 months post-IV workflow system go-live (includes non-STAT medications)
  - 2015 = 3.7 minutes
- Suggests other operational inefficiencies affect turnaround time

**Prevented Errors**

- 174 prevented errors at drug selection over 10 month period*
- Common Errors
  - Incorrect electrolytes
  - Incorrect diluents
  - Sound alike-look alike

**Medication Safety**

<table>
<thead>
<tr>
<th>Scanned Error Description</th>
<th>IV Compound Description</th>
<th>Scanned Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>dexmedetomidine - Incorrect drug for ONDANSETRON HCL</td>
<td>EXAMETHASONE PHOSPHATE 10MG/ONDANSETRON HCL 16MG,0.9% NA CL 50ML in 60.5mL</td>
<td>Sandoz</td>
</tr>
<tr>
<td>dexmedetomidine - Incorrect drug for 0.9% NA CL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incorrect drug for dextrose 5% in water sodium bicarbonate</td>
<td>potassium chloride 20mEq,dextrose 5% in water 1,000mL,sodium chloride 23.4% 34mEq in 1,000mL</td>
<td>Baxter Healthcare Corp #1</td>
</tr>
<tr>
<td>Incorrect drug for sodium chloride 23.4%</td>
<td>sodium bicarbonate 8.4% 50 mL vial</td>
<td></td>
</tr>
<tr>
<td>0.9% sodium chloride - Incorrect drug for cefTRIAXone 0.9%</td>
<td>Dilution: cefTRIAXone 40 mg/ml dilution in dextrose 5% in water - 100mL</td>
<td></td>
</tr>
<tr>
<td>sodium chloride - Incorrect drug for dextrose 5% in water</td>
<td>sodium chloride 0.9% 100mL</td>
<td></td>
</tr>
</tbody>
</table>

*May 26, 2014 to March 31, 2015

**Potential for Adverse Drug Event**

- Low 83%
- Moderate 7%
- High 7%
- Unknown 1%

**Prevented Errors - Cost Savings**

- Savings from Prevented Errors: $4,540
- Projected Annualized Savings: $5,500

Cost savings is insignificant in comparison to the prevention of an adverse drug event
Monitoring and Maintenance

- Inappropriate bypassing
- Safety features for different concentrated products
- Product library updates
- Experienced and inexperienced IV technicians
- Labels mistakenly crossing over from sister hospital

Phase 2
Dose Tracking Implementation

MSH IV Workflow Procedure

MSH IV Workflow Procedure

Waste

Dispensed IV Waste Results

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Dispensed IV Waste – Cost Savings

Estimated Savings Per Month
$2,300 - $4,600

Projected Annualized Savings
$27,000 - $55,000

Staff Survey for Tracking System

<table>
<thead>
<tr>
<th>Questions</th>
<th>Pre-Tracking RPh</th>
<th>Post-Tracking RPh</th>
<th>Pre-Tracking Tech</th>
<th>Post-Tracking Tech</th>
</tr>
</thead>
<tbody>
<tr>
<td>How much do you value the IV workflow system?</td>
<td>4.1</td>
<td>4.7</td>
<td>4.9</td>
<td>4.5</td>
</tr>
<tr>
<td>On average, how often do you receive missing IV medication inquiries?</td>
<td>4.9</td>
<td>4.8</td>
<td>4.2</td>
<td>3.5</td>
</tr>
<tr>
<td>How satisfied are you with our current missing medication tools?</td>
<td>3.1</td>
<td>3.8</td>
<td>4</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Scale: 1 - Very Low, 2 - Low, 3 - Somewhat Low, 4 - Somewhat High, 5 - High, 6 - Very High

Vancomycin Waste Discovery

Post Sample 1
216 Expired Vancomycin Bags

Post Sample 2
81 Expired Vancomycin Bags

- Batch 1250 mg, 1500 mg, and 1750 mg doses
- Refrigerate - 9 day expiration (Pharmacy)
- Room Temp - 24 hours (Nursing Floors)
- Implemented new procedure to refrigerate vancomycin bags on nursing floors
- Other wasteful discoveries: Pantoprazole and Cisatracurium

Return on Investment

<table>
<thead>
<tr>
<th>Annualized Cost Savings (GPO Pricing Adjusted)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevented Errors</td>
<td>$5,500</td>
</tr>
<tr>
<td>Dispensed IV Waste</td>
<td>$27,000 - $55,000</td>
</tr>
<tr>
<td>Total Hard Cost Savings</td>
<td>$32,500 - $60,500</td>
</tr>
</tbody>
</table>

Return on Investment* 30% to 142%

*Not including initial implementation or equipment costs

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Key Takeaways

• Key Takeaway #1
  • IV workflow systems do not replace a pharmacist final check or an IV trained technician

• Key Takeaway #2
  • IV workflow systems can deliver a ROI depending on size and scope of your institution

• Key Takeaway #3
  • Data is a powerful tool to drive positive change

Acknowledgements

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