Enhancing the Safety of IV Medications: Standardizing Concentrations, Reducing Clinically Insignificant Alerts, and Integrating with Electronic Health Records

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Clinical Pharmacy Specialist, Eskenazi Health
Objectives

1. Describe a process for developing a list of adult intravenous standard concentrations

2. Identify best practices for smart pump library review and optimization

3. Outline the key steps necessary for the integration of a health-system’s smart infusion pumps with an electronic health record

The presenters have nothing to disclose regarding conflicts of interest related to the content of this presentation.
Objectives

1. Describe a process for developing a list of adult intravenous standard concentrations

2. Identify best practices for smart pump library review and optimization

3. Outline the key steps necessary for the integration of a health-system’s smart infusion pumps with an electronic health record
Which of the following organization(s) has/have developed a list of adult intravenous standard concentrations?

a. American Society of Health-system Pharmacists (ASHP)
b. Indianapolis Coalition for Patient Safety (ICPS)
c. Infusion Nurses Society (INS)
d. A and B
e. A and C
f. A, B and C
Mission: Working together to make Indianapolis the safest place to receive healthcare in the nation


“Greater standardization of practices across hospitals within a local community (rather than having different versions of a practice implemented within each individual hospital) holds promise for making substantial improvements in patient safety......”
## Standardization in Indianapolis

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Standardizing Concentration Timeline

2003 – TJC issues NPSG #3B Limiting Concentration

2008 – TJC extends NPSG #3B to cover NICU and PEDS

2008 – ASHP HOD policy regarding national list of conc and dosing units cover NICU and PEDS

2009 – TJC includes standard conc in standard MM01.02.01

2010 – Infusion pump Informatics system at Purdue RCHE founded

2010 – ICPS standardizes concentrations Indy health-systems

2011 – USP publishes a list of common IV concentrations used in US

2014 – Indiana begins process to standardize concentrations statewide

2015 – ASHP Awarded contract from FDA to develop national standardized list of IV/oral concentrations and dosing units

2016 – ICPS begins process to reconcile Indiana, ICPS and ASHP list of concentration and dosing units

2016 – ASHP Publishes initial list of standardized IV concentrations

2017 – ICPS completes reconciled list of IV standard conc and dosing units

2017 – ICPS completes work on standard concentrations and toolkit
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Learning Activity #1
Think/Pair/Share Exercise

Pick one of the following concentrations to standardize at your institution and discuss the questions in the handout with a partner.

<table>
<thead>
<tr>
<th>IV Medication</th>
<th>Pick one drug/conc. to standardize</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin</td>
<td>2 units/mL, 1 unit/mL, 0.5 units/mL</td>
</tr>
<tr>
<td>Morphine (infusion)</td>
<td>1 mg/mL, 5 mg/mL, 10 mg/mL, 25 mg/mL</td>
</tr>
<tr>
<td>Rocuronium</td>
<td>1 mg/mL, 2 mg/mL, 5 mg/mL, 10 mg/mL</td>
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Learning Activity #1
Think/Pair/Share Exercise

Debrief with the group.

= ASHP selected standard concentrations

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Comparing the lists

• Chartered work the coalition workgroup
  • Deliverables, timeframe, membership, criteria, project scope
    • Example criteria: Cost/effort vs Potential safety benefit, implications of deciding outside ASHP list, dosing units, future changes to ASHP list

• Surveyed health-systems to determine dosing units and current IV concentrations
  • Scoped to include IV concentrations for adults
  • Open ended answers allowed for some flexibility
  • Shared openly

• Survey comparison results
## Comparing the lists

<table>
<thead>
<tr>
<th></th>
<th>ICPS Original List</th>
<th>ASHP List</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of drugs on</strong></td>
<td>27 medications</td>
<td>32 medications</td>
</tr>
<tr>
<td>the list</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Concentrations</strong></td>
<td>One</td>
<td>Up to 3 concentrations</td>
</tr>
<tr>
<td><strong>listed per drug</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dosing unit</strong></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>standardization</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>included</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Date completed</strong></td>
<td>March 2010</td>
<td>October 2016</td>
</tr>
</tbody>
</table>
### The New ICPS List

- 36 med/conc pairs
- One PCA listed
- 4 meds on ICPS list that are not ASHP list
- 5 concentrations on ICPS list do not match ASHP
- ICPS more selective

<table>
<thead>
<tr>
<th>Medication</th>
<th>ICPS &quot;New&quot; Standard</th>
<th>ASHP Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alteplase (Treatment)</td>
<td>1 mg/mL</td>
<td>1 mg/mL</td>
</tr>
<tr>
<td>Amiodarone</td>
<td>1.8 mg/mL</td>
<td>1.5 mg/mL, 3.6 mg/mL</td>
</tr>
<tr>
<td>Argatroban</td>
<td>1 mg/mL</td>
<td>1 mg/mL</td>
</tr>
<tr>
<td>Bumetanide</td>
<td>0.25 mg/mL</td>
<td>0.25 mg/mL</td>
</tr>
<tr>
<td>Cisatracurium</td>
<td>2 mg/mL</td>
<td>2 mg/mL</td>
</tr>
<tr>
<td>Dexametomidine</td>
<td>4 mCg/mL</td>
<td>4 mCg/mL</td>
</tr>
<tr>
<td>DilTIAzem</td>
<td>1 mg/mL</td>
<td>1 mg/mL</td>
</tr>
<tr>
<td>DOBUTamine (adults)</td>
<td>4000 mCg/mL</td>
<td>4000 mCg/mL</td>
</tr>
<tr>
<td>DOpamine</td>
<td>3200 mCg/mL</td>
<td>1600 mCg/mL, 3200 mCg/mL</td>
</tr>
<tr>
<td>EPINEPHrine</td>
<td>20 and 40 mCg/mL</td>
<td>20 mCg/mL, 40 mCg/mL</td>
</tr>
<tr>
<td>Eptifibatide</td>
<td>750 mCg/Ml</td>
<td></td>
</tr>
<tr>
<td>Esmolol</td>
<td>10 mg/mL</td>
<td>10 mg/mL, 20 mg/mL</td>
</tr>
<tr>
<td>FentANYL</td>
<td>10 mCg/mL</td>
<td>10 mCg/mL, 50 mCg/mL</td>
</tr>
<tr>
<td>Furosemide</td>
<td>10 mg/mL</td>
<td>2 mg/mL, 10 mg/mL</td>
</tr>
<tr>
<td>Heparin</td>
<td>100 units/ml</td>
<td>100 units/mL</td>
</tr>
<tr>
<td>HYDROMorphone</td>
<td>0.2 mg/ml</td>
<td>0.2 mg/ml, 1 mg/ml</td>
</tr>
<tr>
<td>Insulin</td>
<td>1 unit/ml</td>
<td>1 unit /mL</td>
</tr>
<tr>
<td>Isoproterenol</td>
<td>4 mCg/mL</td>
<td>4 mCg/mL</td>
</tr>
<tr>
<td>Labetolol</td>
<td>2 mg/mL</td>
<td>5 mg/mL</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>4 mg/mL</td>
<td>8 mg/mL</td>
</tr>
<tr>
<td>LORazepam</td>
<td>1 mg/mL</td>
<td>1 mg/mL</td>
</tr>
<tr>
<td>Mag Sulfate (Obstetric)</td>
<td>0.04 gram/ml</td>
<td></td>
</tr>
<tr>
<td>Morphine Drip</td>
<td>1 mg/mL, 5 mg/mL</td>
<td>1 mg/mL, 5 mg/mL</td>
</tr>
<tr>
<td>Morphine PCA</td>
<td>1 mg/mL</td>
<td></td>
</tr>
<tr>
<td>Midazolam</td>
<td>1 mg/mL</td>
<td>1 mg/mL</td>
</tr>
<tr>
<td>Milrinone</td>
<td>200 mCg/mL</td>
<td>200 mCg/mL</td>
</tr>
<tr>
<td>NiCARdipine</td>
<td>0.2 mg/ml</td>
<td>0.1 mg/ml, 0.5 mg/mL</td>
</tr>
<tr>
<td>Nitroglycerin</td>
<td>200 mCg/mL</td>
<td>200 mCg/mL</td>
</tr>
<tr>
<td>Nitroprusside</td>
<td>200 mCg/mL</td>
<td>200 mCg/mL, 500 mCg/mL</td>
</tr>
<tr>
<td>Norepinephrine</td>
<td>32 mCg/mL</td>
<td>16 mCg/mL, 32 mCg/mL, 128 mCg/mL</td>
</tr>
<tr>
<td>Phenylephrine</td>
<td>80 mcg/ml, 400 mcg/ml</td>
<td>80 mCg/ml, 400 mCg/ml</td>
</tr>
<tr>
<td>Procainamide</td>
<td>4 mg/ml</td>
<td></td>
</tr>
<tr>
<td>Propofol</td>
<td>10 mg/mL</td>
<td>10 mg/mL</td>
</tr>
<tr>
<td>Rocuronium</td>
<td>2 mg/mL</td>
<td>10 mg/mL</td>
</tr>
<tr>
<td>Vasopressin</td>
<td>0.4 units/ml, 1 unit/ml</td>
<td>0.2 unit/mL, 1 unit/mL</td>
</tr>
<tr>
<td>Vecuronium</td>
<td>1 mg/mL</td>
<td>1 mg/mL</td>
</tr>
</tbody>
</table>
The New ICPS List

- 34 med/unit pairs
- 3 meds on ICPS list that are not ASHP list
- Non-weight based units selected for “pressors”
- Easier than concentrations

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<tr>
<th>Medication</th>
<th>ICPS Standard</th>
<th>ASHP Standard</th>
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<tr>
<td>Amiodarone</td>
<td>mg/min</td>
<td>mg/min</td>
</tr>
<tr>
<td>Argatroban</td>
<td>mCg/kg/min</td>
<td>mCg/kg/min</td>
</tr>
<tr>
<td>Bumetanide</td>
<td>mg/hour</td>
<td>mg/hour</td>
</tr>
<tr>
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<td>mCg/kg/min</td>
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<td>mCg/kg/hour</td>
<td>mCg/kg/hour</td>
</tr>
<tr>
<td>DilTIAZem</td>
<td>mg/hour, mg/min (SVT)</td>
<td>mg/hour</td>
</tr>
<tr>
<td>DOBUTamine</td>
<td>mCg/kg/min</td>
<td>mCg/kg/min</td>
</tr>
<tr>
<td>DOPamine</td>
<td>mCg/kg/min</td>
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<td>mg/hour</td>
<td>mg/hour</td>
</tr>
<tr>
<td>Heparin</td>
<td>units/hours or units/kg/hour</td>
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</tr>
<tr>
<td>HYDROmorpheine</td>
<td>mg/hour</td>
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Challenging aspects of consensus

• Getting the list of medications to work on
  • Alteplase (therapeutic use vs. catheter-directed use)
  • Special cases for certain medications (e.g. diltiazem, insulin)

• Difficult issues
  • Is ASHP done with the list?
  • Cisatracurium, Amiodarone, Infusion vs PCA
  • Drugs with variation – Rocuronium, Vasopressin, Lidocaine
  • Dosing units – weight based vs non-weight based
    • Annals of Pharmacotherapy, Vol. 51 (3) 194-202
    • Dosing units – eptifibatide maximum weight based dosing
Self-Assessment Question #1

Which of the following organization(s) has/have developed a list of adult intravenous standard concentrations?

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d. A and B
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<td>CareFusion/BD</td>
<td></td>
</tr>
<tr>
<td>EPIC</td>
<td>CareFusion/BD</td>
<td></td>
</tr>
<tr>
<td>Sunrise</td>
<td>Hospira</td>
<td></td>
</tr>
<tr>
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<td>CareFusion/BD</td>
<td></td>
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<td>EPIC</td>
<td>CareFusion/BD</td>
<td></td>
</tr>
<tr>
<td>Sunrise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPIC</td>
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</tr>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Self-Assessment Question #2

Every drug causing alerts identified during the regular review process should be investigated?

a. True
b. False
Types of Alerts

- Dosing
  - Deviation from standards
  - Bolus doses
  - Concentration limits
- Duration
  - Standard concentrations
  - Wildcards
  - Adults vs. Pediatrics
- Rate
  - Minimum
  - Maximum
- Concentration
  - Soft min
  - Soft max
  - Hard max
# General Problem Solving

<table>
<thead>
<tr>
<th>Question</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct profile?</td>
<td>Med/Surg vs. ICU</td>
</tr>
<tr>
<td>Correct medication name?</td>
<td>Piperacillin vs. piperacillin/tazobactam</td>
</tr>
<tr>
<td>Intermittting vs. continuous dosing?</td>
<td>Nafcillin, cefepime, etc.</td>
</tr>
<tr>
<td>Bolus vs. continuous dosing?</td>
<td>Pantoprazole</td>
</tr>
<tr>
<td>Correct therapy?</td>
<td>Argatroban, alteplase, etc.</td>
</tr>
<tr>
<td>Correct weight?</td>
<td>Kg vs. lbs</td>
</tr>
<tr>
<td>Correct dosing units?</td>
<td>Gram vs. mg</td>
</tr>
</tbody>
</table>
Alert Review: Lorazepam

- Override (n = 203)
- Reprogram (n = 14)
- Cancel (n = 7)
- Other (n = 8)
## Alert Review: Lorazepam

<table>
<thead>
<tr>
<th>Drug</th>
<th>Issues</th>
<th>Discussion</th>
<th>Guardrails (Drug Dosing Limits) Changes</th>
<th>Education (Nursing or Pharmacy)</th>
<th>Safety Catches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Care ED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lorazepam</td>
<td>- Majority of alerts were for bolus doses above soft max of 4 mg – most of these (n = 182 alerts) were for a dose of 5 or 6 mg.</td>
<td>- One patient that received multiple bolus doses of 8-10 mg was a burn patient on a continuous infusion at a very high rate due to his extent of injury, age, metabolism, etc. and this was appropriate.</td>
<td>- Overall, recommend increasing soft bolus max to 6 mg to decrease alert fatigue for nursing staff as these were mostly clinically appropriately. Also, the Alcohol Withdrawal Protocol now recommends a 6 mg bolus if the CIWA score is 25 or greater.</td>
<td>- Nursing education will be needed to inform them of the new increased bolus dosing option.</td>
<td>- One bolus dose of 20 mg was caught and reprogrammed.</td>
</tr>
<tr>
<td>Total alerts: 232</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overrides: 203</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Re-programmed: 14</td>
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<td></td>
</tr>
<tr>
<td>Cancelled: 7</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Other: 8</td>
<td></td>
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</tr>
</tbody>
</table>
Total Lorazepam Alerts (CC/ED)

- 232 alerts in 3Q2011
- 6 alerts in 1Q2012
Alert Fatigue

False Alert = “Clinically Insignificant Alert”

Dulling effect causes end users to ignore potential safety issues

TJC NPSG 06.01.01: “Improve the safety of clinical alarm systems”

ICPS Smart Pump Alert Fatigue Workgroup
**ICPS Smart Pump Workgroup**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Variability within and lack of consistent process for managing smart pump drug libraries across institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td>To minimize the number of clinically insignificant alerts presented to end users through development of a Consensus Statement</td>
</tr>
<tr>
<td>Methods</td>
<td>• Interdisciplinary group (i.e. pharmacists, nurses, engineers)</td>
</tr>
<tr>
<td></td>
<td>• Six Sigma methodologies to achieve process standardization</td>
</tr>
<tr>
<td></td>
<td>• Prioritized current state needs and barriers</td>
</tr>
<tr>
<td>Results</td>
<td>• ICPS Consensus Statement</td>
</tr>
<tr>
<td></td>
<td>• Crosswalk of terminology between manufacturers</td>
</tr>
<tr>
<td></td>
<td>• Clinical Advisories guidelines</td>
</tr>
<tr>
<td></td>
<td>• Policy template</td>
</tr>
<tr>
<td></td>
<td>• Culture of shared learning</td>
</tr>
</tbody>
</table>

Learning Activity #2
Think/Pair/Share

• Consider current state practices at your institution for reviewing alerts and managing drug libraries
• Collaborate with a partner
• Share processes for reviewing each of these targeted areas
• Discuss gaps and areas for improvement
ICPS Consensus Statement: Drug Libraries Review Process

1. Individuals Involved
2. Timeline/Schedule
3. Content for Review
4. Approval Process
5. Communication & Education
6. Follow-up
Recommendation 1: Individuals Involved

Pharmacy → Nursing → Medication Safety
Recommendation 2: Timeline/schedule for Review

**Annually**
- All profiles reviewed at least once per year

**Quarterly**
- Individual/grouped profiles facility-specific
- Not every profile reviewed each quarter

**Monthly**
- Additional reviews as needed
- Follow-up on medication incidents, etc.
Recommendation 3: Content for Review

- Top ten drugs
- Formulary updates
- Bedside audits
- Compliance with dosing limits
- Compliance per profile

When available

- Good-catches
- Patient outliers
- ISMP Action Alerts
- Medication errors

At a minimum

Recommendation 4: Approval Process for Changes

<table>
<thead>
<tr>
<th>Interdisciplinary Committee Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication Safety</td>
</tr>
<tr>
<td>Patient Safety</td>
</tr>
<tr>
<td>Smart Pump Committee</td>
</tr>
</tbody>
</table>

Recommendation 5: Communication & Education

- Central Supply
- CPOE Alerts
- One Page Sheet
- Safety Huddle
- Pump Safety Day
- BioMed
- Audits
- EMS
- Facilities
- Morning Report
- Emails
- Supply Chain

Recommendation 5: Communication & Education

Central Supply

CPOE Alerts

One Page Sheet

Safety Huddle

Pump Safety Day

BioMed

Audits

EMS

Facilities

Morning Report

Emails

Supply Chain

Recommendation 5: Communication & Education

Central Supply

CPOE Alerts

One Page Sheet

Safety Huddle

Pump Safety Day

BioMed

Audits

EMS

Facilities

Morning Report

Emails

Supply Chain

Recommendation 6: Follow-up & Continued Review

Previous Top Ten Drugs

Changes from previous quarter

Assess for improvements

Follow-up & Continued Review
Alerts per Device

Median No. Alerts per Device

Month and Year


7.2

3.6

### Clinical Advisories

#### Rules for Creating Advisories

1. Operation focused (not clinically focused)
2. Descriptive – make sure it includes quantitative or objective values (actual cutoffs, values, etc.) not open for interpretation
3. Must be actionable at the time of programming the pump, or focus on special techniques
4. Contain a specific strategy to alert a different user (VTBI for amiodarone)
5. In general, monitoring, vitals, etc. should be general knowledge for the drug and should not be included as an advisory
6. Remove any lab related alerts
7. Error prevention, ISMP recommendations, or response to multiple drug errors/sentinel event reviews may warrant a specific advisory
8. If independent nursing double-check required, indicate that upon programming
9. Any new advisories should be approved through Med Safety, Smart Pump Committee, or equivalent
Considerations

• A standardized, consensus-driven process should be used for smart pump drug library review and optimization

• Our approach can help other health-systems to reduce the number of clinically insignificant alerts presented to end users

• An interdisciplinary approach to idea-sharing can yield additional project results (e.g. clinical advisory standardization, policy templates, etc.)
Self-Assessment Question #2

Every drug causing alerts identified during the regular review process should be investigated?

a. True
b. False
Objectives

1. Describe a process for developing a list of adult intravenous standard concentrations

2. Identify best practices for smart pump library review and optimization

3. Outline the key steps necessary for the integration of a health-system’s smart infusion pumps with an electronic health record
Self-Assessment Question #3

Which step should the pharmacist-lead first complete when preparing for their institution’s integration of smart infusion pumps with an electronic health record?

a. Cross walk of the drug libraries to streamline duplications and discrepancies
b. Barcoding of all smart infusion pumps
c. Analysis of orderable drug product in electronic health record and programmable drug terms in smart infusion pump library
d. Dosing unit alignment
## Standardization in Indianapolis

<table>
<thead>
<tr>
<th>Electronic Health Record Vendor</th>
<th>SMART Infusion Pump Vendor</th>
<th>Pump Interoperability Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPIC</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Cerner</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>EPIC</td>
<td>CareFusion/BD</td>
<td>✔</td>
</tr>
<tr>
<td>Sunrise</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>EPIC</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>VistA (to Cerner)</td>
<td></td>
<td>✗</td>
</tr>
</tbody>
</table>
Interoperability
# Justification of Interoperability

## Patient Safety
- Accurate medication administration
- Decrease opportunity for human error
- Enhanced I&O documentation
- Reduced potential for transcription error with programming

## Revenue
- Decreased documentation failures to help support billing
- Increased revenue – capturing Start/Stop times

## Improved Documentation
- Scanning ensures correct patient MRN captured on infusion pump
- Administration rates, titration changes, and volumes are easily captured and verified from the flowsheets with interoperability

---

Implementation Milestones

1. Project Kick-Off
2. Workflow Analysis
3. Education Development
4. Education
5. Go-Live
6. Dataset Alignment
7. Server and Software Installation
8. System Validation
9. Full Record Testing
Learning Activity #3
Develop Plan

For the remainder of the presentation, consider the necessary Resources and Key Stakeholders you would need to include (or did include) with each Implementation Milestone of Interoperability at your institution.
In-Scope/Out-of-Scope

**IN**
- Inpatient units
- Barcode medication administration
- Areas with frequent use of high-alert medications

**OUT**
- Procedural areas
- One step medications
- Areas with wireless infrastructure issues
- Unique workflows
Profile Consolidation

EH Apr.2017 (A)

Acuity Adaptable
Cardiac Diagnostics
Cath IR
Critical Care/ED
Epidural
Family Beginnings
Investigational Drug
NICU
Oncology
Pediatics

> Select a Profile and Confirm

PAGE UP
CONFIRM
PAGE DOWN

Adult
Cardiac Diagnostics
Cath IR
Epidural
NICU

> Select a Profile and Confirm

CONFIRM
PAGE DOWN

ESKENAZI HEALTH

PURDUE PHARMACY
Gap Analysis: Orderable Meds

Review of Orderable Medications
1. Complete gap analysis
   • EHR vs. data set
   • Data set vs. EHR
2. Identify medications built in one system that are missing from other
3. Add or delete based on need, formulary, and/or usage
Gap Analysis: Drug Library

Drug Library Review
1. Dosing units
2. Standard vs. wildcard
3. Dosing limits
4. Concentration limits
5. Infusion durations
Interoperability Testing

Initial Connectivity

• Confirm proper communication

40 Drug Testing

• Connectivity testing between infusion pump and EHR
• Testing inclusive of intermittent, continuous, and fluids
• Dosing units tested (e.g. mg, mg/kg, mg/m², mL/hr)

Full Record Testing

• All orderable medications on infusion pump dataset
• Alignment of EHR and pump configurations
Drug Therapies

“Behind the Scenes”
- Milligram vs. Gram
- Weight-Based Dosing

Indication-Based
- Vasopressin (Indications: Shock, Diabetes Insipidus, Gastrointestinal)

Patient Care Area
- Critical Care, Family Beginnings

Weight-Based
- Alteplase for Stroke (100 kg or Less vs. Greater than 100 kg)
# Interoperability Blacklist

<table>
<thead>
<tr>
<th>Medication</th>
<th>Justification for Blacklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylcysteine</td>
<td>Stepped infusion</td>
</tr>
<tr>
<td>Ampicillin/sulbactam; NICU</td>
<td>Multi-drug product; weight-based dosing</td>
</tr>
<tr>
<td>Immune globulin</td>
<td>Stepped infusion</td>
</tr>
<tr>
<td>Patient Controlled Analgesia (PCA)</td>
<td>Lack of functionality of PCA module with interoperability</td>
</tr>
<tr>
<td>Penicillin G</td>
<td>Dosing units not accepted (i.e. million units)</td>
</tr>
<tr>
<td>Rituximab</td>
<td>Stepped infusion</td>
</tr>
<tr>
<td>Sulfamethoxazole/trimethoprim</td>
<td>Multi-drug product; weight-based dosing</td>
</tr>
</tbody>
</table>
Safety Concerns and Troubleshooting

- Multiple Bags Per Dose
- Chemotherapeutic Agents
- Unique Dosing Units
- Stepped Infusion
- Total Parenteral Nutrition
- Infusions Greater Than 999 mL/hr
Data Set Management

**Process for Medication Modifications**
1. Request for medication edit or addition
2. Change made in EHR Test Environment
3. Change made in data set and placed on Alaris™ Systems Manager Test Server
4. Update references and resources
5. Sequence release to Production Environment for EHR and Alaris™ Systems Manager
6. Update smart infusion pumps with new data set
Which step should the pharmacist-lead first complete when preparing for their institution’s integration of smart infusion pumps with an electronic health record?

a. Cross walk of the drug libraries to streamline duplications and discrepancies
b. Barcoding of all smart infusion pumps
c. Analysis of orderable drug product in electronic health record and programmable drug terms in smart infusion pump library
d. Dosing unit alignment
Key Takeaways: Beginner

Gap Analysis of Standard Concentrations

Implement Pump Analytics Tools

Develop Policy and Procedures

Streamline Pump Libraries

Pump Integration
Key Takeaways: Expert

- Define Metrics for Pump and Alert Review
- Outline Reporting of Alerts
- Develop Timeline for Updates
- Reduction of Blacklist and Out-of-Scope
- Reporting and Monitoring
Enhancing the Safety of IV Medications: Standardizing Concentrations, Reducing Clinically Insignificant Alerts, and Integrating with Electronic Health Records

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