Case Study from Parallon

Improving Compliance with the Smart Pump drug library across a large hospital system – Part 2

Monday, July 10, 2017
AAMI Foundation

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- National Coalition to Promote Continuous Monitoring of Patients on Opioids
- National Coalition for Alarm Management Safety

- **NEW:** National Coalition to Promote the Safe Use of Complex Healthcare Technology

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A Case Study from Parallon: Improving Compliance with the Smart Pump Drug Library Across a Large Hospital System

Part 2

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INOVA Regional Pharmacy Director- East Division, Alexandria, VA

Project Completed while Division Director of Medication Safety
HCA West Florida Division
Outline of Today’s Review

• Background

• Impetus for change

• Project

• Implementation

• Outcome

• Lessons Learned
Background- Organizational Overview

Parallon Business Solutions

- A subsidiary of HCA
- Headquartered in Franklin, Tennessee
- Parallon partners with hospitals and healthcare systems to improve their business performance supply chain management
- Pharmacy services
- 176 HCA US hospitals
Background- Organizational Overview

HCA Divisions

- Capital
- Central & West Texas
- Continental
- East Florida
- Far West
- Gulf Coast
- HCA International
- Mid America
- Mountain
- North Florida
- North Texas
- San Antonio
- South Atlantic
- TriStar
- West Florida
Background- Organizational Overview

West Florida Division

Map of West Florida Division

Citrus Memorial Hospital
502 W. Highland Blvd
Inverness, FL 34452
Phone: (352) 726-1551

Fawcett Memorial Hospital
21298 Olean Blvd
Port Charlotte, FL 33952
Phone: (941) 629-1181
Impetus for Change

Events (late 2014)

2 errors related to transfer of patient from one facility to another. Both Patient transferred on a heparin drip.
Impetus for Change

Events (late 2014)

- HCA: high alert medication policy
- Review of libraries
- 5 facilities had no wireless
- CQI data review
- Compliance with library use average <50% across the Division
Impetus for Change- Baseline Data

Total Guardrail infusions

- Q4 2014
- Q1 2015

Supply Chain Solutions
Impetus for change: What the literature said

Key Points

Smart pumps reduce but do not eliminate programming errors.

The literature noted a number of limitations of current smart pumps, including lower compliance rates of using smart pumps, overriding soft alerts, non-intercepted errors, and the possibility of using the wrong drug library.

Opportunities for improvement of smart pumps include upgrading drug libraries, developing standardized drug libraries, decreasing the number of unnecessary warnings, and developing stronger approaches to minimize workarounds.

Conclusion. A smart-pump CQI program is an effective tool for enhancing the safety of i.v. medication administration. The ongoing refinement of the drug library through the development and implementation of key interventions promotes the growth and sustainability of the smart-pump initiative systemwide.

Am J Health-Syst Pharm. 2013; 70:680-6
Impetus for Change

A safe, practical and effective customized library is critical to patient safety and successful compliance
Where to Start?

'Sorry to be a nuisance, but I think my phone charger got mixed up in here somehow.'
Plan

Establish one library for Division to use

• Get buy-in Senior Management
• Use data to get facility/pharmacy commitment
• Each facility to have Pharmacy champion participate
• Required conference call meeting attendance or backup
Establish one library for Division to use

- Develop the why message
- Determine workload expectations of Division Team
- Monthly Webex required attendance
- Timeline established
- Work with Division Team to get wireless in all
Project

- Libraries from 16 facilities combines and analyzed
- Pharmacy Champions request made
- Role of DDMS
- Six month timeline
Project

- DOPs engaged
- Champions chosen
- Nursing leadership on-board
- Roles discussed
Project

ROLE of CHAMPION
• Attend meetings
• Engage nursing at facility
• Communicate progress and information to pharmacy leadership
• Vote at weekly/ monthly meetings
• Represent facility
• Understand data
• Lead project at facility level

ROLE of FACILITATOR
• Establish meetings and agendas
• Design structure of project
• Delegate areas of work
• Hold people accountable
• Organize requests
• Build library
• Establish and push out library
• Work with leadership to remove barriers
• Provide data to champions
Project

Examination of current state

Excel
- Drugs
- Concentrations
- Minimums
- Maximums
- Piggybacks
- PCAs

Issues
- Different
- 4-5 concentrations for some continuous infusions
- All over the board
- Different concentrations and solutions

PCAs
- Hydromorphone 0.2mg/ml, 0.4mg/ml, 0.5mg/ml
- Morphine 1mg/ml, 2mg/ml
Project

Five Areas of Division of Labor
• Policy, Change form
• Pediatrics and Profile Selection
• Continuous Infusion - Adult
• PCA & Intermittent infusion - Adult
• Clinical Advisories
Smart Pump Meetings

Group reports

- Used 2 sources for min/max and rates (Micromedex, Lexicomp, etc)
- Groups reported out – controversies or gray areas vetted
- SurveyMonkey
- Once “done”- lead switch and double check
Smart Pump Meetings

- Voting anyomous
- Delay review
Profile Names

- Adult Critical Care
- Pediatric Critical Care
- Neonatal
- Pediatrics
- Adult Med-Surg
- Oncology

- What about oncology
- What about OB
- Are there policies across the Division which guide drugs use by unit
- Are there areas (ie CVICU) which need anesthesia medications
Profile Names

Adult Critical Care
Adult
Pediatric Critical Care

Adult Critical Care
Adult Med-Surg
Oncology
Pediatrics
Pediatric Critical care
Neonatal
# Moving to Standardization N= 226 surveys

## Table 2

Concentrations of Selected Drugs Used for Adult Patients at Surveyed Institutions (n = 223)a

<table>
<thead>
<tr>
<th>High-Acute Drug</th>
<th>No. (% Reporting Use)</th>
<th>No. (%) With Single Standard Concentration</th>
<th>No. Concentrations Reported</th>
<th>Most Commonly Used Concentration</th>
<th>No. (%) With a Standard Using Most Common Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amiodarone (bolus)</td>
<td>76 (34)</td>
<td>72 (32)</td>
<td>10</td>
<td>1.5 mg/mL</td>
<td>65 (86)</td>
</tr>
<tr>
<td>Amiodarone (infusion)</td>
<td>156 (70)</td>
<td>140 (63)</td>
<td>15</td>
<td>1.8 mg/mL</td>
<td>132 (85)</td>
</tr>
<tr>
<td>Dobutamine</td>
<td>192 (86)</td>
<td>140 (63)</td>
<td>14</td>
<td>2000 µg/mL</td>
<td>80 (42)</td>
</tr>
<tr>
<td>Dopamine</td>
<td>197 (88)</td>
<td>136 (62)</td>
<td>13</td>
<td>1600 µg/mL</td>
<td>103 (52)</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>155 (70)</td>
<td>110 (49)</td>
<td>37</td>
<td>4 µg/mL</td>
<td>40 (26)</td>
</tr>
<tr>
<td>Esmolol</td>
<td>158 (71)</td>
<td>141 (63)</td>
<td>6</td>
<td>10 µg/mL</td>
<td>129 (82)</td>
</tr>
<tr>
<td>Fentanyl (PCA or i.v.)</td>
<td>102 (46)</td>
<td>76 (34)</td>
<td>9</td>
<td>10 µg/mL</td>
<td>42 (41)</td>
</tr>
<tr>
<td>Heparin</td>
<td>178 (80)</td>
<td>176 (79)</td>
<td>6</td>
<td>50 units/mL</td>
<td>87 (49)</td>
</tr>
<tr>
<td>Insulin</td>
<td>168 (75)</td>
<td>159 (71)</td>
<td>10</td>
<td>1 unit/mL</td>
<td>146 (87)</td>
</tr>
<tr>
<td>Labetalol</td>
<td>146 (65)</td>
<td>127 (57)</td>
<td>17</td>
<td>1 mg/mL</td>
<td>67 (46)</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>178 (80)</td>
<td>111 (50)</td>
<td>4</td>
<td>4 mg/mL</td>
<td>111 (62)</td>
</tr>
<tr>
<td>Midazolam</td>
<td>141 (63)</td>
<td>126 (57)</td>
<td>16</td>
<td>1 mg/mL</td>
<td>86 (61)</td>
</tr>
<tr>
<td>Milrinone</td>
<td>124 (56)</td>
<td>114 (51)</td>
<td>6</td>
<td>200 µg/mL</td>
<td>112 (90)</td>
</tr>
<tr>
<td>Morphine (PCA or i.v.)</td>
<td>112 (50)</td>
<td>87 (39)</td>
<td>13</td>
<td>1 mg/mL</td>
<td>77 (69)</td>
</tr>
<tr>
<td>Nesiritide</td>
<td>121 (54)</td>
<td>119 (53)</td>
<td>5</td>
<td>6 µg/mL</td>
<td>117 (97)</td>
</tr>
</tbody>
</table>

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American Journal of Health-System Pharmacy November 2011, 68 (22) 2176-2182; DOI: https://doi.org/10.2146/ajhp110001
# Moving to Standardization

## Proposed Standard Concentrations

<table>
<thead>
<tr>
<th>Medication</th>
<th>Concentration(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adult patients</strong></td>
<td></td>
</tr>
<tr>
<td>Amiodarone (bolus)</td>
<td>1.5 mg/mL</td>
</tr>
<tr>
<td>Amiodarone (infusion)</td>
<td>1.8 mg/mL</td>
</tr>
<tr>
<td>Dobutamine</td>
<td>2000 µg/mL</td>
</tr>
<tr>
<td>Dopamine</td>
<td>1600 µg/mL</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>16 µg/mL</td>
</tr>
<tr>
<td>Esmolol</td>
<td>10 mg/mL</td>
</tr>
<tr>
<td>Fentanyl (PCA or i.v.,)</td>
<td>20 µg/mL</td>
</tr>
<tr>
<td>Heparin</td>
<td>100 units/mL</td>
</tr>
<tr>
<td>Hydromorphone (PCA or i.v.,)</td>
<td>0.2 mg/mL</td>
</tr>
<tr>
<td>Insulin</td>
<td>1 unit/mL</td>
</tr>
</tbody>
</table>
Moving to Standardization- proposed standard concentrations

<table>
<thead>
<tr>
<th>Medication</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labetolol</td>
<td>2 mg/mL</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>4 mg/mL</td>
</tr>
<tr>
<td>Midazolam</td>
<td>1 mg/mL</td>
</tr>
<tr>
<td>Milrinone</td>
<td>200 µg/mL</td>
</tr>
<tr>
<td>Morphine (PCA or i.v.)</td>
<td>1 mg/mL</td>
</tr>
<tr>
<td>Nesiritide</td>
<td>6 µg/mL</td>
</tr>
<tr>
<td>Norepinephrine</td>
<td>16 µg/mL</td>
</tr>
<tr>
<td>Phenylephrine</td>
<td>160 µg/mL</td>
</tr>
<tr>
<td>Propofol</td>
<td>10 mg/mL</td>
</tr>
<tr>
<td>Vasopressin</td>
<td>1 unit/mL</td>
</tr>
<tr>
<td>Vecuronium</td>
<td>1 mg/mL</td>
</tr>
</tbody>
</table>
## Moving to Standardization

**Concentrations of Selected Drugs Used for Neonatal Patients at Surveyed Institutions (n = 36)**

<table>
<thead>
<tr>
<th>High-Alert Drug</th>
<th>No. (%) Reporting Standard Concentration</th>
<th>No. (%) With Single Standard Concentration</th>
<th>No. Concentrations Reported</th>
<th>Most Commonly Used Concentration(s)</th>
<th>No. (%) With Standard Using Most Common Concentration(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alprostadil</td>
<td>24 (67)</td>
<td>20 (56)</td>
<td>9</td>
<td>10 µg/mL</td>
<td>13 (54)</td>
</tr>
<tr>
<td>Dobutamine</td>
<td>25 (69)</td>
<td>9 (25)</td>
<td>16</td>
<td>1000, 2000, and 4000 µg/mL</td>
<td>6 (24)</td>
</tr>
<tr>
<td>Dopamine</td>
<td>25 (69)</td>
<td>8 (22)</td>
<td>15</td>
<td>800, 1600, and 3200 µg/mL</td>
<td>6 (24)</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>23 (64)</td>
<td>7 (19)</td>
<td>20</td>
<td>60 µg/mL</td>
<td>3 (13)</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>24 (67)</td>
<td>12 (33)</td>
<td>14</td>
<td>10 µg/mL</td>
<td>7 (29)</td>
</tr>
<tr>
<td>Heparin</td>
<td>13 (36)</td>
<td>9 (25)</td>
<td>7</td>
<td>100 units/mL</td>
<td>4 (31)</td>
</tr>
<tr>
<td>Insulin</td>
<td>22 (61)</td>
<td>14 (39)</td>
<td>11</td>
<td>0.1 unit/mL</td>
<td>9 (41)</td>
</tr>
<tr>
<td>Midazolam</td>
<td>17 (47)</td>
<td>12 (33)</td>
<td>9</td>
<td>0.1 mg/mL</td>
<td>6 (35)</td>
</tr>
<tr>
<td>Milrinone</td>
<td>16 (44)</td>
<td>10 (28)</td>
<td>8</td>
<td>200 µg/mL</td>
<td>7 (44)</td>
</tr>
<tr>
<td>Morphine</td>
<td>23 (64)</td>
<td>13 (36)</td>
<td>6</td>
<td>0.1 mg/mL</td>
<td>5 (22)</td>
</tr>
<tr>
<td>Norepinephrine</td>
<td>11 (31)</td>
<td>8 (22)</td>
<td>9</td>
<td>10 and 16 µg/mL</td>
<td>2 (18)</td>
</tr>
</tbody>
</table>
# Change Form

**Smart Pump Request Form**

- Name of facility requesting ________________ Date of request ______
- Name of person at facility requesting ________________
- Date Facility Smart Pump team approved change request ________________

<table>
<thead>
<tr>
<th>Drug Name and concentration</th>
<th>Profile(s) affected</th>
<th>Change requested</th>
<th>Reason for request</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Provide literature citation or attach literature to support request
Which IV Medications Caused Heartburn?

- Esmolol
- Heparin
- Vasopressors
- Double triple strengths
- Nitroglycerin
- Emergency medications
- Dobutamine
## Table 2 BREVIBLOC Injection Presentations

<table>
<thead>
<tr>
<th>Product Name</th>
<th>BREVIBLOC PREMIXED Injection (Esmolol Hydrochloride)</th>
<th>BREVIBLOC DOUBLE STRENGTH PREMIXED Injection (Esmolol Hydrochloride)</th>
<th>BREVIBLOC Injection (Esmolol Hydrochloride)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Dose</td>
<td>2500 mg / 250 mL</td>
<td>2000 mg / 100 mL</td>
<td>100 mg / 10 mL</td>
</tr>
<tr>
<td>Esmolol Hydrochloride Concentration</td>
<td>10 mg/mL</td>
<td>20 mg/mL</td>
<td>10 mg/mL</td>
</tr>
<tr>
<td>Packaging</td>
<td>250 mL Bag</td>
<td>100 mL Bag</td>
<td>10 mL Vial</td>
</tr>
</tbody>
</table>

Brevibloc Package insert Baxter Healthcare Corporation, Deerfield, IL 60015 USA. July 2016
Which IV Medications Caused Heartburn?

Heparin
Part I

Concentration Standardization

• Complicated by national backorder
• About 60/40 one concentration over another
• Change of heparin concentration poses dangers of own
Which IV Medications Caused Heartburn

Heparin
Part II

Dosing issues
- Units/kg/hr (max dose limits for obese?)
- Versus units/hour
- What will nurses know about how it was or is ordered

Solution
- Two entries – with “therapies” entered for guidance
- Units/hour
- Making sure that the label/order entry also gives this information
<table>
<thead>
<tr>
<th>Vasopressors</th>
<th>Double/Triple/Quad Conc</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Various weight based or non weight based uses</td>
<td>• Max of 2 concentrations “allowed”</td>
</tr>
<tr>
<td>• Max doses- may impact policies and practice</td>
<td>• Agreement based on fluid restricted patients</td>
</tr>
<tr>
<td>• Some Infusions had optional or mandated criteria in software</td>
<td>• Practice of RPH staff level</td>
</tr>
<tr>
<td></td>
<td>• Various policies and practices</td>
</tr>
</tbody>
</table>
Which IV Medications Caused Heartburn?

Nitroglycerin

- One facility with “heart institute”
- Physicians mandated use of Nitroglycerin special dosing

Emergency medications

- Use on each profile?
- How to separate but ease to find?
- How to get OR to play?

Dobutamine

- Nuc Med dosing higher than critical care dosing
- Practice vs Evidence based
Examples of Prevented Errors

• Insulin 70 units/hour
• Diltiazem at 999ml/hr
• Vancomycin 1.5gm over 30 minutes
Hard-Wiring Success

Key Items

• Weekly dashboards
• Walking monitoring
• Bi-weekly calls
• Weekly near misses details
• Nursing buy-in at all levels

Other metrics we considered

a. # of high alert medications in library used (should go up)
b. Override of alerts (should go down)
c. Activity in online CQI data space (should be at least monthly)
Outcomes
Outcomes

Supply Chain Solutions

Severe Harms Averted

- All Hospitals

Q1 2015: 422.00
Q2 2015: 423.00
Q3 2015: 499.00

500
400
300
200
100
0

0
100
200
300
400
500

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Outcomes
Lessons learned

Special Libraries- add ons when NEW service lines get added
Special “Profiles”- everyone wants their own
Timeline for updates structured

Checklist for implementation

Trust but verify

Don’t forget :
Fluids
Anesthesia Engagement
Lessons learned

Other Pumps used within facilities

CADDs  Balloon pumps
PCEAs  PCAs
Anesthesia Syringe pumps  Syringe pumps
L&D
Summary

• Through establishment of a common cause
• A division level team with representation from all
• Engaging key nursing and quality leader
• Fair voting and equal ability to debate
• Took a division of 16 facilities from 53% to 88% compliance with smart pump usage in 10 months
• Status still 88% 18 months later
Future/Ongoing Initiatives
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