Nurses’ Risk Without Using Smart Pumps

Webcast

June 17, 2011

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*All speakers reported they had no disclosures
Nurses risk without using smart pumps.


**Why write on this topic?**

- Low initial use of the IV smart pump library
- Valid concerns and barriers to nurses using the IV smart pumps
- Nagging legal questions that remained unanswered – liability risks for direct care nurses
- Focus on providing safe effective care

**Smart Pump Adoption**

- Evolving use and recognition of safety value
  - ~65% adoption in acute care*
  - Transitioning from “this is how we’ve done it” to evidence-based practice
  - Newer technologies are not plug and play
- Challenges to full adoption are varied
  - Interdisciplinary approach
  - Recognize impact on workflow
- Limited appreciation of inherent risks

Errors in the Medication Use Process

<table>
<thead>
<tr>
<th>Sources of harm</th>
<th>Prescribing</th>
<th>Transcribing</th>
<th>Dispensing</th>
<th>Administering</th>
</tr>
</thead>
<tbody>
<tr>
<td>28%</td>
<td>11%</td>
<td>10%</td>
<td>51%</td>
<td></td>
</tr>
<tr>
<td>Errors intercepted</td>
<td>48%</td>
<td>33%</td>
<td>33%</td>
<td>2%</td>
</tr>
<tr>
<td>Errors</td>
<td>39%</td>
<td>12%</td>
<td>11%</td>
<td>38%</td>
</tr>
</tbody>
</table>

Leape, L. L. et al. JAMA 1995;274:35-43

IV Medication Errors

- IV medications are associated with 54% of potential ADEs and increased risk of harm
  - Drugs administered IV have immediate bioavailability
  - Many "high-alert" drugs, which have a narrow therapeutic range, are given by infusion


IV Medication Administration Errors

- Few prospective studies offer detailed analysis regarding the incidence and causes of IV medication administration errors

- Limited research findings suggest:
  - Wrong rate errors are common, particularly with injection of bolus doses
  - Errors associated with IV infusion pumps occur frequently and are diverse in nature
**IV Medication Administration Errors**

- Recent high-profile reports of injury and death have created greater sense of urgency
  - Indianapolis and LA heparin errors
  - Bupivacaine-related death (IV instead of epidural)

**State Confirms Medical Error in Death Of Teen**

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**Why Do Events Happen?**

- **Event Triggers**
  - Human Errors
  - Equipment Failures
  - External Events
  - Can start a chain of events

- **System Barriers to Stop Event**
  - Policies, Education, Self-Checking etc.

**Reason: Systems & Accountability**

- 5 Rights of Medication Administration
- Processes (eg, BMV, IV Smart Pumps)
- Critical Thinking (Nursing Process)
Professional Accountability

- Licensure
- Authoritative bodies
- Commitment to safe patient care
- Mistake Happen:
  - Fatigue
  - Cognitive bias
  - Workplace culture
  - Communication

Legal Issues: Failing to Use Available Technology

- Five Elements Needed to Prove Any Type of Negligence
  - 1) That there was a duty, a legally recognized relationship between the parties;
  - 2) That there is a standard of care at issue, a required level of action or conduct;
  - 3) That a breach of that duty occurred, failing to meet the requisite standard of care;
  - 4) That the defendant's actions or conduct was the cause in fact and proximate cause of the plaintiff's harm;
  - 5) That there were actual damages or injuries resulting the defendant's breach of their duty to act according to the standard of care.

- A plaintiff must show that use of the specific available technology has become sufficiently widespread or readily available so that not using the technology would deviate from the generally accepted standard of reasonable care for nurses
  - 1932 T.J. Hooper case
  - This case is the benchmark for all technology negligence cases, including medical malpractice

Legal Issues: Hospital Liability

- Liability for an employer resulting from the actions of its employee is based upon agency theory liability
  - Any employee acting on behalf of the employer is executing a principal-agent relationship, where the employer is the principal and the employee the agent.
  - That authority exposes the hospital to liability when a nurse's actions, which are being conducted on behalf of the principal—the hospital—lead to the injury of a patient.

- A hospital could potentially be liable if a nurse chooses not to use the Smart pump or other safer available technology
  - Respondeat Superior: An employer is liable to a third person for any injury which results proximately from tortious conduct of an employee acting within the scope of his or her employment.
  - If it is deemed that the nurse breached a standard of care in not using the smart pump within the scope of employment, the hospital employing the nurse would likely be vulnerable to a lawsuit.
Legal v. Patient Safety

- Essentially two different frameworks, with two different purposes
- Our job is to reconcile the two—it can be done

Legal System

- Focus on ultimate responsibility
- Plaintiff v. defense mindset
- Discovery methods
- Tendency to discourage open information sharing

Patient Safety

- Focus on systems
- Focus on human factors—study of how humans interact with the environment
- Focus on culture: ask why the error occurred rather than who did it
- Focus on sharing and fixing system related issues
Legal Issues: Standards of Care

- The standard of reasonable care used for nurses in tort lawsuits is determined by the state law where the suit is filed.
  - Twenty-nine states and Washington, District of Columbia, apply a national standard of care, meaning a nurse is expected to act with the general skill ordinarily found in the profession.
  - Twenty-one states use a locality standard of care in which nurses are measured against the common nursing skill found in their local community or a similar location.

- Determining a jurisdiction’s appropriate standard of care at trial is usually established through the use of expert witnesses.
  - Expert witnesses in these cases are often nursing professionals who provide testimony regarding the local standards of care including the available technologies and their use within the nurses’ scope of practice.
  - In appropriate standard of care cases where a technology is becoming more prevalent, courts are more likely to apply a national standard of reasonable care.

Legal Issues: Case Example and Malpractice Concerns

- Alef v. Alta Bates Hospital
  - Nurses monitored the fetal heart rate of a woman in labor using the auscultation method.
  - The court found that the nurses were negligent in failing to use the available electronic fetal monitoring because it would have detected the decelerations in heart rate, which may have prevented the brain damage to a newborn.

- If the negligence was sufficiently severe resulting in serious, permanent injury or death, a nurse could be liable both civilly and criminal for their failure to use available technology

- A malpractice insurance policy should never be seen as a safety net for failing to uphold your duty and responsibility as a medical provider.
"Our systems are too complex to expect merely extraordinary people to perform perfectly 100 percent of the time. We must put in place systems to support safe practice and prevent harm to patients."

Jim Conway, quoted in "Nurses strengthen resolve to protect patients." Indianapolis Star, October 1, 2006 in response to an error that occurred in the community

Five Years After To Err Is Human
What Have We Learned

- What are the barriers to safe care?
  - Complexity
  - Individual, professional autonomy
  - Fear
  - Hierarchical authority structure
  - Diffuse accountability
  - Lack of leadership
  - Difficulty of measuring patient safety
  - Reimbursement structure

Leape, Berwick, 2005

Smart pump library

- Meaningful limits and alerts
- Nursing feedback during library development
- Expectations -culture of compliance
- Responsive mechanism to solicit continuing feedback
Analytics – initial areas of focus

- Entries with top alerts and overrides
- Entries in profiles with lowest compliance
- Entries identified by practitioner feedback

Alerts reductions

<table>
<thead>
<tr>
<th>Drug</th>
<th>10/09 GR alerts per 1000 infusions</th>
<th>5/11 GR alerts per 1000 infusions</th>
<th>Reduction in GR alerts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  vasopressin</td>
<td>4.82</td>
<td>0.52</td>
<td>89%</td>
</tr>
<tr>
<td>2  HYDROMorphone PCA</td>
<td>3.81</td>
<td>1.12</td>
<td>72%</td>
</tr>
<tr>
<td>3  heparin</td>
<td>3.06</td>
<td>0.57</td>
<td>81%</td>
</tr>
<tr>
<td>4  anticoag citrate</td>
<td>3.02</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>5  potassium chloride</td>
<td>2.99</td>
<td>0.83</td>
<td>72%</td>
</tr>
<tr>
<td>6  NATALizumab</td>
<td>2.38</td>
<td>0.0075</td>
<td>100%</td>
</tr>
<tr>
<td>7  fentaNYL</td>
<td>1.42</td>
<td>0.69</td>
<td>51%</td>
</tr>
<tr>
<td>8  dexmedetomidine</td>
<td>1.41</td>
<td>0.29</td>
<td>79%</td>
</tr>
<tr>
<td>9  morphine PCA</td>
<td>1.25</td>
<td>0.33</td>
<td>74%</td>
</tr>
<tr>
<td>10 propofol</td>
<td>1.11</td>
<td>0.32</td>
<td>71%</td>
</tr>
</tbody>
</table>

Alerts reductions

<table>
<thead>
<tr>
<th>Drug</th>
<th>Select Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>vasopressin</td>
<td>Education, addition of hard limit</td>
</tr>
<tr>
<td>HYDROMorphone PCA</td>
<td>Limit adjustments differentiated by profile, system medication use evaluation</td>
</tr>
<tr>
<td>heparin</td>
<td>Movement of most indications to units/kg/hr dosing, education and advisory to program dose instead of rate</td>
</tr>
<tr>
<td>anticoag citrate</td>
<td>Limit adjustment</td>
</tr>
<tr>
<td>potassium chloride</td>
<td>Limit adjustment, system-wide infusion strategy</td>
</tr>
<tr>
<td>NATALizumab</td>
<td>Label/Alerts entry revised to eliminate VTBI mismatch</td>
</tr>
<tr>
<td>fentaNYL</td>
<td>Limit adjustment</td>
</tr>
<tr>
<td>dexmedetomidine</td>
<td>Limit adjustment (new literature)</td>
</tr>
<tr>
<td>morphine PCA</td>
<td>Limit adjustment, system medication use evaluation</td>
</tr>
<tr>
<td>propofol</td>
<td>Limit adjustment</td>
</tr>
</tbody>
</table>
Library changes released quarterly

Communication to staff

Practice data generated

Requests reviewed by Drug Policy

System Drug Policy

Site data

System data

Library change requests

Site Analytics Team

Pharmacy, Quality Management, Risk Management

Nursing

System Analytics Team

Drug Policy, Quality Management, Risk Management

Action planning

Other practitioners and committees

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**System Compliance Report**

(For example only; not actual data)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Guardrail Compliance</td>
<td>92%</td>
<td>93%</td>
<td>93%</td>
<td>94%</td>
<td>92%</td>
<td>87%</td>
<td>88%</td>
</tr>
<tr>
<td>Total # infusions</td>
<td>1900000</td>
<td>170000</td>
<td>16000</td>
<td>140000</td>
<td>17000</td>
<td>24000</td>
<td>30000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>April 2011</th>
<th>March 2011</th>
<th>Sept 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td>91%</td>
<td>93%</td>
<td>91%</td>
</tr>
<tr>
<td>goal</td>
<td>= 90%</td>
<td>= 90%</td>
<td>&lt; 85%</td>
</tr>
<tr>
<td>90%</td>
<td>93%</td>
<td></td>
<td>n/a</td>
</tr>
<tr>
<td>100%</td>
<td>n/a</td>
<td>94%</td>
<td>n/a</td>
</tr>
<tr>
<td>85%</td>
<td>n/a</td>
<td>89%</td>
<td>85%</td>
</tr>
<tr>
<td>80%</td>
<td></td>
<td>87%</td>
<td>85%</td>
</tr>
<tr>
<td>75%</td>
<td></td>
<td></td>
<td>91%</td>
</tr>
<tr>
<td>70%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25%</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>20%</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>15%</td>
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<td></td>
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<tr>
<td>10%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Guardrail Compliance**

- 90%: > 90% compliance
- 85%: = 80% - 89% compliance
- 80%: < 80% compliance

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A tale of one profile ... pediatrics

February 2011 – system compliance 75%

- Analyzed data
- Engaged System Pediatric Nursing Committee
- Added value to the library
- Re-educated staff on profile age limits

April 2011 – system compliance 90%
Reprogrammed entries in neonatal and pediatric profiles
April 2011 (n=136)

Examples of good catches

<table>
<thead>
<tr>
<th></th>
<th>Initial programming</th>
<th>Reprogrammed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancomycin, neonate UNDER 1 kg</td>
<td>11 mg/8.2 mL</td>
<td>11 mg/0.3 mL</td>
</tr>
<tr>
<td>Peripheral IV, neonate 1-2.5 kg</td>
<td>22.7 mL/hr</td>
<td>2.7 mL/hr</td>
</tr>
<tr>
<td>Fat emulsions, neonate OVER 2.5 kg</td>
<td>14.9 mL/hr</td>
<td>2.2 mL/hr</td>
</tr>
<tr>
<td>Maintenance IV fluids, 5-9.9 kg</td>
<td>200 mL/hr</td>
<td>12 mL/hr</td>
</tr>
</tbody>
</table>

Engaging staff

- Accessible mechanisms to provide feedback
- Data distribution
- Direct observation/compliance rounds
- Nursing communications
  - Data set revision communications
  - Newsletter articles
  - Patient safety poster
- Continuing education

Aurora Health Care

Library change requests
(n=357*)

<table>
<thead>
<tr>
<th>Request type and outcome</th>
<th>Requestor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declined</td>
<td>Committee</td>
</tr>
<tr>
<td>Accepted</td>
<td>Pharmacist</td>
</tr>
<tr>
<td>change config</td>
<td>Nurse</td>
</tr>
<tr>
<td>change drug/conc</td>
<td>MD</td>
</tr>
<tr>
<td>change limit</td>
<td>2%</td>
</tr>
<tr>
<td>change text</td>
<td>5%</td>
</tr>
<tr>
<td>new drug/fluid</td>
<td>29%</td>
</tr>
<tr>
<td>remove drug/fluid</td>
<td>4%</td>
</tr>
</tbody>
</table>

* Excludes changes initiated by Drug Policy
### Example good catches

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Initial Programming</th>
<th>Reprogrammed</th>
<th>Times Initial Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>vasopressin</td>
<td>3 unit/min</td>
<td>0.03 unit/min</td>
<td>100</td>
</tr>
<tr>
<td>DOBUTamine</td>
<td>200 mL/hr</td>
<td>2.5 mL/hr</td>
<td>82</td>
</tr>
<tr>
<td>insulin</td>
<td>105 unit/hr</td>
<td>1.5 unit/hr</td>
<td>70</td>
</tr>
<tr>
<td>norepinephrine</td>
<td>105 mg/min</td>
<td>1.5 mg/min</td>
<td>70</td>
</tr>
<tr>
<td>dexametomidine</td>
<td>45 mg/kg/h</td>
<td>0.7 mg/kg/h</td>
<td>64</td>
</tr>
<tr>
<td>heparin</td>
<td>500 mL/hr</td>
<td>900 unit/hr</td>
<td>50</td>
</tr>
<tr>
<td>dopamine</td>
<td>200 mcg/kg/min</td>
<td>5 mcg/kg/min</td>
<td>40</td>
</tr>
<tr>
<td>propofol</td>
<td>100 mcg/kg/min</td>
<td>10 mcg/kg/min</td>
<td>50</td>
</tr>
<tr>
<td>nitroPRUSIDE</td>
<td>10 mcg/kg/min</td>
<td>0.8 mcg/kg/min</td>
<td>50</td>
</tr>
<tr>
<td>MIDAZolam</td>
<td>55 mg/h</td>
<td>5 mg/h</td>
<td>11</td>
</tr>
<tr>
<td>insulin.</td>
<td>111 unit/hr</td>
<td>11 unit/hr</td>
<td>10</td>
</tr>
<tr>
<td>fentaNYL</td>
<td>750 mg/hr</td>
<td>75 mg/hr</td>
<td>10</td>
</tr>
<tr>
<td>magnesium sulf.&amp;LD</td>
<td>20 gram/h</td>
<td>2 gram/hr</td>
<td>10</td>
</tr>
<tr>
<td>epoprostenol-INHALED</td>
<td>90 mg/kg/min</td>
<td>12 mL/hr</td>
<td>1.3</td>
</tr>
</tbody>
</table>

### Library release communication

**NEW DRUG(S) ADDED**
- cefTARoline (critcal care, med surg, med surg w/chemo profiles)

**OTHER CHANGES**
- Addresene FFR (ATTN: CATH LABS):
  - Bag entry changed from 90 mg/85 mL to 180 mg/60 mL
- OXYTOCIN L&D (DRUG entry):
  - Hard/non-overridable GR decreased to 40 milliunits/min
- POTASSIUM CHLORIDE:
  - Modified to allow slower infusions (i.e. 5 mEq/hr) without alerts

**IMPORTANT TIPS AND REMINDERS**
- ALWAYS USE LIBRARY
- THE ONLY EXCEPTION: drug is not in library by generic name. If encountered, email Alaris account below.
- *OXYTOCIN POSTPART* IS IN GUARDRAILS FLUIDS:
  - Do not use basic infusion when programming dose on by rate postpartum!
- DIFFERENT PROFILES OFFER UNIQUE SAFETY SETTINGS:
  - Did you know the following profiles are available, how to access them, and when to use them?
    - Neonatal profiles: birth to 28 days and any patient in NICU
    - Pediatric profile: 28 days and older (not in NICU) to 12 years of age

**Library feedback/requests** - alaris.drug.library.feedback@aurora.org

### System Patient Safety Poster

**April 2010**

*Always use the Guardian library*
*Read alerts before you override*
*Program drug doses, not rates*
*Verify concentration*
*One dose, one infusion*
*Only use "BOLUS" function to break off a drip*
*Use admission weight or "Weight for New Calculation"*
*Codes are listed under "TZ"*

System Patient Safety Poster — Aurora Healthcare ©
Current limitations of smart pump technology and reporting

Limitations of human cognition in the presence of smart pump technology

Fine tuning IV smart pumps

- Listen to direct care nurses
- Involve an interdisciplinary team
- Eliminate unused therapies
- Evidence-based alarms
- Standardization
- Provide feedback – use the analytics

IV Smart Pump Limitations

- Limited number of therapies
- Human factors
Goal

- Prevent Catastrophic Patient Injury

- It will not be until interoperability between EMR, IV smart pumps, patient monitoring equipment, documentation, and direct care provider communication tools is fully created and implemented that most errors will be dramatically reduced.

Legal Issues: Massachusetts Cases

- A nurse’s error resulted in civil litigation for the nurse, medical professionals in the chain of command, and the hospital.
- There is an expectation that all personnel involved in the caretaking of a patient will provide reasonable and skilled medical care and when a breach in that duty occurs by the actions of a nurse, the potential liability will run up the chain of the command all the way to the medical institution itself.
- The circle for potential civil liability targets is much larger than the nurse who may have breached the duty of care.

Legal Issues: Hypothetical

- Our speaker has described a rate of compliance that’s very high, but not 100%. Assuming that the medications being administered are in the smart pump libraries, is 90% or 95% compliance with the use of the safety system sufficient?
- Once the technology is prevalent either in a particular locality or across the nation, any deviation from that technology is most likely negligence.
- Applying the reasonableness standard to this hypothetical, it may be viewed as highly unreasonable for a hospital to not have 100% usage rate of Smart Pump safety technology.
Legal Issues: Differences in Nurse Behavior

- The ultimate standard for nurses’ actions in a medical malpractice cases is carelessness.

- Questions to Ask
  - Was the nurse careless in their actions or failure to act?
  - Did the nurse fail to treat the patient in accordance with good, proper and acceptable medical practices, resulting in harm to the patient?
  - A plaintiff does not need to show the nurse acted with intent of harm or recklessness, but did they exercise the same degree of diligence and skill of the average, qualified nurse using Smart pump technology?

- Every single medical malpractice case has a fact specific, fact driven outcome.

ISMP Document

- “Effective approaches to Standardization and Implementation of Smart Pump Technology”:

Interventions:

- Walking rounds
- Review the analytics from the IV smart pumps
- Post “saves” & give feedback
- Listen to direct care registered nurses
- Work with the Team
- Make changes to the therapy library prn
- Provide oversight
- Set goals
Beyond “Be Careful”

• Science of safety is still young
• Advancing on learning curve with purposeful adoption of smart technologies and evidence-based practice
• Leadership is crucial
• Adoption of a Culture of Safety is KEY

Culture of Safety

• Corporate accountability for system design
• Managers accountable for facilitating safe behavioral choices with staff
  – Coaching at-risk behavior
• Frontline staff, middle managers, executives all accountable for safe behavioral choices

Questions

Please email
Educational Review Systems

sglass@edu-review.org

Replay www.carefusion.com
Safety and Clinical Excellence