Implementing & Optimizing Commercial Clinical Decision Support

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1. Describe the opportunities and challenges of commercial, Clinical Decision Support (CDS).

2. Describe a strategic approach to effectively implementing drug-dose CDS.

3. List specific ways to optimize drug-dose CDS.
Optimizing Drug-Dose Alerts Using Commercial Software Throughout an Integrated Healthcare System

Saiyed, SM. et al. JAMIA. 2017, 1-6
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CaroMont Health and Epic

- 1 tertiary care community hospital
- 2 ED locations
- 46+ Service sites
- 500 staff physicians
- 1,000 nurses
- **Annual Visits**
  - Admissions: 20,000+
  - ED Visits: 108,000+
  - Ambulatory/OP visits: 817,000+
- Epic 2015 Enterprise Version
- Hospital Live in 2015
- Clinics Live in 2014
What Are the Causes of Burnout in Family Physicians?

- Too many bureaucratic tasks: 5.3
- Spending too many hours at work: 4.7
- Feeling like just a cog in a wheel: 4.6
- Increasing computerization of practice (EHRs): 4.5
- Income not high enough: 4.1
- Maintenance of certification requirements: 4.0
- Too many difficult patients: 4.0
- Insurance issues: 4.0
- Lack of professional fulfillment: 3.9
- Too many patient appointments in a day: 3.9
- Threat of malpractice: 3.9
- Inability to provide patients with the quality care that they need: 3.7
- The impact of the Affordable Care Act: 3.7
- Difficult employer, colleagues, or staff: 3.7
- Compassion fatigue (overexposure to death, violence, and/or other loss in patients): 3.5
- Inability to keep up with current research and recommendations: 3.1
- Family stress: 3.1
CPOE

- LeapFrog identify Drug-drug, drug-allergy, drug-diagnosis, and drug-dose alerts to reduce med errors
- Drug alerts over ridden 49-96 %
- Few studies describe strategies to optimize & improve
- Aim was to quantify drug alerts and identify strategies to implement
Drug-Dose Checking

- Up to 60% of prescribing errors are dosing errors
- Dosing errors represent the most common type of preventable preventable adverse drug events
- 5-8% of all orders have dosing errors (~1/3 may be clinically significant)

Where do dose warnings come from?

- Medication Database Vendors
- Medi-span ® or First DataBank ®
9 Types of Drug-Dose Checking

- Below minimum daily dose
- Below minimum frequency dose
- Below minimum duration dose
- Below minimum single dose
- Exceeds maximum duration dose
- Exceeds maximum frequency dose
- Exceeds maximum daily dose
- Exceeds maximum single dose
- Exceeds daily prn dose

~90% of Epic customers have drug-dose checking turned on
1. Describe the opportunities and challenges of commercial, drug alerts.

2. Describe a strategic approach to effectively implementing drug-dose checking.

3. List specific ways to optimize drug-dose checking.
Team

- Family Medicine (CMIO), Internal Medicine – Pediatrics (CMIO), Internal Medicine (Informatics)
- Informatics Pharmacist
- Evaluated all strategies
Drug-Dose Checking Strategy

- Drug-dose CDS should improve patient safety.
- Drug-dose CDS need optimization to be effective.
- Optimized drug-dose CDS should enhance sensitivity and specificity, reduce false positive alerts
- Reducing clinical low risk alerts and more effect alert
Dose Warning Analysis

- Report from EHR
- Looked at three months of data
- Save in Excel, narrow down to warnings you plan to un-filter
- Use pivot tables to target most frequent warnings for deeper analysis
1. Describe the opportunities and challenges of commercial, drug alerts.

2. Describe a strategic approach to effectively implementing drug-dose checking.

3. List specific ways to optimize drug-dose checking.
Methods - Strategies

- Turned off incomplete information drug-dose alerts.
- Turned off minimum drug-dose alerts.
- Increased single drug-dose threshold to 125%.
- Increased daily drug-dose threshold to 125%.
- Increased dose frequency drug-dose threshold by 2 doses per day.
- Changed drug specific maximum single and daily drug-dose alert parameters on top 1% of alerting drugs.
Methods - Overview

- Default drug-dose alerts from Epic electronic health record using default Medi-Span® drug data.

- 1st quarter 2013 silent alerts for all drug-dose alerts (single dose, daily dose, dose frequency, and dose duration alerts), in different care settings and patient ages.

- System-wide and drug specific strategies analyzed to optimize drug-dose alerts.

834,911 orders and 104,098 alerts
### Results: Drug-dosing alerts by category, care setting

<table>
<thead>
<tr>
<th>Alert type</th>
<th>Baseline Drug-Dose alerts, % (n)</th>
<th>ED, % (n)</th>
<th>IP, % (n)</th>
<th>OP, % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below minimum daily dose</td>
<td>24% (24,508)</td>
<td>12% (1684)</td>
<td>24% (12,922)</td>
<td>40% (9,902)</td>
</tr>
<tr>
<td>Below minimum frequency</td>
<td>10% (10,330)</td>
<td>7% (718)</td>
<td>50% (5,163)</td>
<td>43% (4,449)</td>
</tr>
<tr>
<td>Exceeded maximum duration</td>
<td>5% (4,972)</td>
<td>5% (245)</td>
<td>16% (816)</td>
<td>79% (3911)</td>
</tr>
<tr>
<td>Exceeded maximum frequency</td>
<td>16% (16,566)</td>
<td>17% (2,840)</td>
<td>55% (9,143)</td>
<td>28% (4,583)</td>
</tr>
<tr>
<td>Exceeded maximum daily dose</td>
<td>23% (24,183)</td>
<td>15% (3,662)</td>
<td>59% (14,177)</td>
<td>26% (6,344)</td>
</tr>
<tr>
<td>Exceeded maximum single dose</td>
<td>23% (23,539)</td>
<td>20% (4,594)</td>
<td>54% (12,760)</td>
<td>26% (6,171)</td>
</tr>
<tr>
<td>Total</td>
<td>100% (104,098)</td>
<td>13% (13,743)</td>
<td>53% (54,981)</td>
<td>34% (35,371)</td>
</tr>
</tbody>
</table>
## Results: Impact of system level settings

<table>
<thead>
<tr>
<th>System Level Drug-Dose Alerts</th>
<th>Optimization of drug-dose alerts, % (n)</th>
<th>Optimized drug-dose alerts per hundred orders</th>
<th>Decrease in drug-dose alerting, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum drug-dose daily dose alerts (removed)</td>
<td>0% (0)</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Minimum drug-dose frequency alerts (removed)</td>
<td>0% (0)</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Maximum drug-dose duration alerts (removed)</td>
<td>0% (0)</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Maximum drug-dose single dose alerts (increased to 125% of threshold)</td>
<td>42% (19,503)</td>
<td>2.3</td>
<td>17%</td>
</tr>
<tr>
<td>Maximum drug-dose daily dose alerts (increased to 125% of threshold)</td>
<td>44% (21,052)</td>
<td>2.5</td>
<td>13%</td>
</tr>
<tr>
<td>Maximum drug-dose dose frequency alerts (increased to more than 2 dose/day of threshold)</td>
<td>14% (6,433)</td>
<td>0.8</td>
<td>61%</td>
</tr>
<tr>
<td><strong>Sub-Total System Level Drug-Dose Alerts</strong></td>
<td><strong>100%</strong> (46,988)</td>
<td><strong>5.6</strong></td>
<td><strong>45%</strong></td>
</tr>
</tbody>
</table>
## Results: Impact of “top” Drug Specific Settings

<table>
<thead>
<tr>
<th>Drug-Dose Alert Category</th>
<th>Optimization of drug-dose alerts, % (n)</th>
<th>Optimized drug-dose alerts per hundred orders</th>
<th>Decrease in drug-dose alerting, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual Level Drug-Dose Alerts</td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Maximum drug-dose single dose alerts (top 22 individual dose adjustment customized)</td>
<td>0% (0)</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Maximum drug-dose daily dose alerts (top 22 individual dose adjustment customized)</td>
<td>0% (0)</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Sub-Total Individual Drug-Dose Alerts</td>
<td>0% (0)</td>
<td>0</td>
<td>100%¹</td>
</tr>
<tr>
<td>Total</td>
<td>25,455</td>
<td>0.030</td>
<td>76%</td>
</tr>
</tbody>
</table>

1. Approximate
Discussion

- Commercial, Out of the box drug-dosing CDS produces high (~12%) alerting rates.

- Primary, system approaches decreased drug-dose alerting to 5% (46,988/834,911) of orders.

- Secondary, drug-specific approaches decreased drug-dose alerting to 3% (25,455/834,911).

- Simple approaches significantly decrease drug-dose alerts, while maintaining drug-dose alerts for potentially clinically significant drug-overdoses.
Lessons Learned

- Do not turn on “out of the box” drug-dose checking
- Conduct “silent” drug-dose checking analysis
- Develop system level setting strategy
- Develop sustainable individual drug strategy

Implement drug-dose checking to help our patient (and in the way not to drive prescribers or pharmacists crazy)!
Questions