Optimization of drug-drug interaction alerts in an effort to reduce pharmacist alert fatigue in a hospital system

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Optimization of drug-drug interaction alerts in an effort to reduce pharmacist alert fatigue in a hospital system

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Disclosure Statement

• These individuals do not have anything to disclose concerning possible financial or personal relationships with commercial entities (or their competitors) that may be referenced in this presentation:

- Jose Ojeda, B.S., Pharm.D.
- Kristina Lee, Pharm.D., BCPS
- Claudia Chang, Pharm.D., BCPS
- Frances Ordieres-Gonzalez, Pharm.D.
- Aman Rai, Pharm.D.
• Assess the impact of drug-drug interaction alerts on pharmacists during order verification
A drug-drug interaction (DDI) occurs when one medication affects either the pharmacokinetics or pharmacodynamics of another medication. These interactions can modify the therapeutic efficacy of a medication or increase potential risks. DDIs can result in preventable adverse drug events (ADEs), which can cause harm to patients.
A clinical decision support (CDS) system is a health information technology program that assists with clinical decision-making tasks.

CDS systems are capable of reducing the frequency of preventable ADEs.

Studies have found that only around 10% of the alerts fired by CDS systems are applicable in all the circumstances they fire.

Despite their benefits, medication-related alerts are often ignored and have high override rates.

References:
Alert Fatigue

• Alert fatigue occurs when both important and non-important alerts are ignored because of the mental exhaustion and time required to look through too many alerts.

• Such nuisance alerts interrupt workflow and distract from patient care, leading to the routine override of alerts.

• There is a lack of evidence when it comes to deciding which alerts should be removed and which should be kept as part of the CDS system.

• The decision to manage these alerts is usually institution-specific.

Baptist Health South Florida (BHSF) system-wide initiative

- Baptist Hospital of Miami
- Doctors Hospital
- Corporate Enterprise
- Fishermen’s Hospital
- Homestead Hospital
- Miami Cancer Institute
- Mariners Hospital
- South Miami Hospital
- West Kendall Baptist Hospital
Primary objective:
• Identify common DDI alerts that are consistently being overridden by pharmacists

Secondary objectives:
• Decrease the quantity of clinically insignificant DDI alerts firing to pharmacists
• Evaluate alert fatigue experienced by pharmacists during order entry/verification
Lights On Network® was used to identify the DDI alerts firing in November 2019.

Using Excel, the list was filtered to include only “major” alerts being overridden at least 95% of the time.

Top 50 alerts within this list were selected.

Top 50 alerts were reviewed by the Medication Safety and Clinical Optimization committees.
Methodology: Survey

- A pre-implementation survey was sent to pharmacists in the first two weeks of February
- Alerts were removed from Cerner on February 28th
- Pharmacists were provided a few weeks to interact with the updates to the system
- Post-implementation survey was sent the last two weeks of March
Methodology: Survey

Please answer the next 4 questions about yourself -

1. How many years have you been practicing as a pharmacist at Baptist Health South Florida?
   - Less than a year
   - 1-5 years
   - 6-10 years
   - More than 10 years

2. Which entity within Baptist Health South Florida do you work for?
   - Corporate Enterprise
   - Baptist Hospital of Miami
   - South Miami Hospital
   - West Kendall Hospital
   - Miami Cancer Institute
   - Homestead Hospital
   - Doctors Hospital
   - Fisherman’s Hospital
   - Mariners Hospital

3. What is your current position?
   - Clinical Pharmacist I or II
   - Clinical Specialist I or II
   - Clinical Coordinator or Clinical Manager
   - Other (please specify)

4. How many hours per week do you spend doing order entry/verification?
   - Less than 10 hours
   - 10-20 hours
   - 21-40 hours
   - More than 40 hours

Please answer the following 6 questions in regards to Drug-Drug Interaction (DDI) Alerts:

5. The DDI alerts fired by Cerner provide clinically relevant information that is useful to me
   - Strongly Disagree
   - Disagree
   - Neither agree nor disagree
   - Agree
   - Strongly Agree

6. The number of DDI alerts being fired by Cerner is just right
   - Strongly Disagree
   - Disagree
   - Neither agree nor disagree
   - Agree
   - Strongly Agree

7. I have the time during order entry/verification to review every DDI alert fired by Cerner
   - Strongly Disagree
   - Disagree
   - Neither agree nor disagree
   - Agree
   - Strongly Agree

8. Baptist Health South Florida is currently trying to optimize drug-drug interaction alerts
   - Strongly Disagree
   - Disagree
   - Neither agree nor disagree
   - Agree
   - Strongly Agree

9. I estimate that I override approximately ___% of DDI alerts:
   - Less than 40%
   - Between 41-60%
   - Between 61-80%
   - More than 80%

10. Do you have any other comments regarding DDI alerts? (Free response)
### Results: Top 50 DDI Alerts

<table>
<thead>
<tr>
<th>Alert Name</th>
<th>Alert Name</th>
<th>Alert Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lorazepam &amp; morphine</td>
<td>Morphine &amp; tramadol</td>
<td>Clopidogrel &amp; enoxaparin</td>
</tr>
<tr>
<td>Hydromorphone &amp; morphine</td>
<td>Fentanyl &amp; morphine</td>
<td>Oxycodone &amp; temazepam</td>
</tr>
<tr>
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<td>Potassium chloride &amp; prochlorperazine</td>
</tr>
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<td>Morphine &amp; oxycodone-acetaminophen</td>
<td>Hydromorphone &amp; temazepam</td>
<td>Lisinopril &amp; potassium chloride</td>
</tr>
<tr>
<td>Haloperidol &amp; prochlorperazine</td>
<td>Diphenhydramine &amp; potassium chloride</td>
<td>Carvedilol &amp; ipratropium-albuterol</td>
</tr>
<tr>
<td>Ondansetron &amp; tramadol</td>
<td>Heparin &amp; ketorolac</td>
<td>Lorazepam &amp; oxycodone-acetaminophen</td>
</tr>
<tr>
<td>Fentanyl &amp; ondansetron</td>
<td>Fentanyl &amp; oxycodone-acetaminophen</td>
<td>Clonidine &amp; metoprolol</td>
</tr>
<tr>
<td>Fentanyl &amp; hydromorphone</td>
<td>Hydromorphone &amp; zolpidem</td>
<td>Insulin lispro &amp; levofloxacin</td>
</tr>
<tr>
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<td>Meperidine &amp; morphine</td>
<td>Dexamethasone &amp; oxycodone-acetaminophen</td>
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<tr>
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<td>Chlorpromazine &amp; morphine</td>
<td>Levofloxacin &amp; methylprednisolone</td>
</tr>
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<td>Losartan &amp; potassium chloride</td>
<td>Enalapril &amp; potassium chloride</td>
</tr>
<tr>
<td>Aspirin &amp; enoxaparin</td>
<td>Alprazolam &amp; morphine</td>
<td>Alprazolam &amp; hydromorphone</td>
</tr>
<tr>
<td>Diltiazem &amp; metoprolol</td>
<td>Oxycodone-acetaminophen &amp; zolpidem</td>
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<td>Oxycodone-acetaminophen &amp; temazepam</td>
<td></td>
</tr>
</tbody>
</table>
Top 50 DDI by Type of Interaction

- CNS Depression (n=29) - 58%
- Bleeding (n=4) - 6%
- Bradycardia (n=3) - 6%
- Hyperkalemia (n=3) - 6%
- Serotonin Syndrome (n=3) - 6%
- Reduced Efficacy (n=2) - 8%
- Ulceration (n=2) - 8%
- Miscellaneous (n=4) - 4%
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<td>Oxycodone-acetaminophen &amp; temazepam</td>
<td></td>
</tr>
</tbody>
</table>

Total Alerts Removed = 23/50
## Results: DDI Alerts (November vs March)

<table>
<thead>
<tr>
<th>DDI Alerts</th>
<th>November 2019</th>
<th>March 2020</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total number of alerts firing</strong></td>
<td>161,758</td>
<td>99,329</td>
<td><strong>39%</strong></td>
</tr>
<tr>
<td>• Alerts being overridden</td>
<td>140,948 (87%)</td>
<td>73,095 (74%)</td>
<td><strong>13%</strong></td>
</tr>
<tr>
<td>• Top 50 DDI alerts accounted for</td>
<td>73,873 (46%)</td>
<td>23,182 (23%)</td>
<td><strong>23%</strong></td>
</tr>
</tbody>
</table>
DDI Alerts Fired and Overridden by Pharmacists

- Nov-19: 161,758, 87.1% overridden
- Dec-19: 172,552, 87.7% overridden
- Jan-20: 185,768, 88.0% overridden
- Feb-20: 172,319, 84.3% overridden
- Mar-20: 99,329, 73.6% overridden

The chart shows the number of DDI alerts fired and the percentage overridden by pharmacists from November 2019 to March 2020.
## Survey Demographics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Pre-implementation (n=94)</th>
<th>Post-implementation (n=55)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BHSF entity:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Baptist Hospital of Miami</td>
<td>30 (32%)</td>
<td>19 (35%)</td>
</tr>
<tr>
<td>• South Miami Hospital</td>
<td>26 (28%)</td>
<td>18 (33%)</td>
</tr>
<tr>
<td>• West Kendall Baptist Hospital</td>
<td>15 (16%)</td>
<td>6 (11%)</td>
</tr>
<tr>
<td>• Homestead Hospital</td>
<td>11 (12%)</td>
<td>4 (7%)</td>
</tr>
<tr>
<td>• Miami Cancer Institute</td>
<td>7 (7%)</td>
<td>4 (7%)</td>
</tr>
<tr>
<td>• Corporate Enterprise</td>
<td>3 (3%)</td>
<td>3 (5%)</td>
</tr>
<tr>
<td>• Doctors Hospital</td>
<td>2 (2%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td><strong>Amount of years working for BHSF:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Less than a year</td>
<td>30 (32%)</td>
<td>13 (24%)</td>
</tr>
<tr>
<td>• 1 to 5 years</td>
<td>15 (17%)</td>
<td>22 (41%)</td>
</tr>
<tr>
<td>• 6 to 10 years</td>
<td>17 (18%)</td>
<td>6 (11%)</td>
</tr>
<tr>
<td>• More than 10 years</td>
<td>31 (33%)</td>
<td>13 (24%)</td>
</tr>
<tr>
<td><strong>Current position:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Clinical Pharmacist I or II</td>
<td>54 (57%)</td>
<td>31 (56%)</td>
</tr>
<tr>
<td>• Clinical Specialist I or II</td>
<td>16 (18%)</td>
<td>11 (20%)</td>
</tr>
<tr>
<td>• Clinical Coordinator or Clinical Manager</td>
<td>5 (5%)</td>
<td>2 (4%)</td>
</tr>
<tr>
<td>• Other</td>
<td>19 (20%)</td>
<td>11 (20%)</td>
</tr>
<tr>
<td><strong>Amount of hours per week doing order entry:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Less than 10 hours</td>
<td>21 (22%)</td>
<td>15 (28%)</td>
</tr>
<tr>
<td>• Between 10 to 20 hours</td>
<td>26 (28%)</td>
<td>10 (19%)</td>
</tr>
<tr>
<td>• Between 21 to 40 hours</td>
<td>36 (38%)</td>
<td>25 (46%)</td>
</tr>
<tr>
<td>• More than 40 hours</td>
<td>11 (12%)</td>
<td>4 (7%)</td>
</tr>
</tbody>
</table>
Pharmacist Survey

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Mean ± S.D. Pre-Implementation Likert Scale*</th>
<th>Mean ± S.D. Post-Implementation Likert Scale*</th>
</tr>
</thead>
<tbody>
<tr>
<td>The DDI alerts fired by Cerner provide clinically relevant information that is useful to me</td>
<td>3.50 ± 1.0</td>
<td>3.70 ± 1.0</td>
</tr>
<tr>
<td>The number of DDI alerts being fired by Cerner is just right</td>
<td>2.50 ± 1.2</td>
<td>3.00 ± 1.1</td>
</tr>
<tr>
<td>I have the time during order entry/verification to review every DDI alert fired by Cerner</td>
<td>2.65 ± 1.2</td>
<td>2.80 ± 1.1</td>
</tr>
<tr>
<td>BHSF is currently trying to optimize DDI alerts</td>
<td>3.60 ± 1.0</td>
<td>4.20 ± 0.6</td>
</tr>
</tbody>
</table>

*Likert scale (1-5): 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree
DDI alerts provide clinically relevant information
The number of DDI alerts fired by Cerner is just right
I have time during order entry to review DDI alerts
BHSF is currently trying to optimize DDI alerts

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

- 3%
- 19%
- 15%
- 17%
- 4%

- 50%
- 52%
- 39%
- 34%

- 13%
- 16%
- 25%
- 36%

- 7%
- 6%
- 19%

- 10%
- 13%
- 7%

- 15%
- 17%
- 16%

- 4%
- 7%
- 34%

- 0%
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%
- 70%
- 80%
- 90%
- 100%
Post-Implementation Survey

DDI alerts provide clinically relevant information
- Strongly Disagree: 4%
- Disagree: 11%
- Neither Agree nor Disagree: 16%
- Agree: 49%
- Strongly Agree: 11%

The number of DDI alerts fired by Cerner is just right
- Strongly Disagree: 9%
- Disagree: 33%
- Neither Agree nor Disagree: 19%
- Agree: 31%
- Strongly Agree: 33%

I have time during order entry to review DDI alerts
- Strongly Disagree: 4%
- Disagree: 9%
- Neither Agree nor Disagree: 9%
- Agree: 36%
- Strongly Agree: 56%

BHSF is currently trying to optimize DDI alerts
- Strongly Disagree: 11%
- Disagree: 56%
- Neither Agree nor Disagree: 11%
- Agree: 19%
- Strongly Agree: 11%
# Pharmacist Survey

<table>
<thead>
<tr>
<th>I estimate that I override approximately ____% of DDI alerts:</th>
<th>Survey Responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 40%</td>
<td>17</td>
<td>18%</td>
</tr>
<tr>
<td>Between 41-60%</td>
<td>18</td>
<td>19%</td>
</tr>
<tr>
<td>Between 61-80%</td>
<td>41</td>
<td>44%</td>
</tr>
<tr>
<td>More than 80%</td>
<td>18</td>
<td>19%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>94</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Pre-Implementation**

<table>
<thead>
<tr>
<th>I estimate that I override approximately ____% of DDI alerts:</th>
<th>Survey Responses</th>
<th>Percentage</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>More than 80%</td>
<td>9</td>
<td>16%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>55</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Post-Implementation**

63%

**60%**
• There was a decrease in both the number of DDI alerts fired and percentage of alerts being overridden in the month of March

• After implementation, more pharmacists agreed or strongly agreed that the number of DDI alerts being fired by Cerner is just right (23% pre vs 39% post)

• Another area with demonstrated improvement is the perception that our system is working to optimize drug-drug interaction alerts (55% pre vs 89% post)

• Even though the percentage of alerts overridden decreased by 13% after implementation, pharmacist perception regarding the amount of alerts being overridden did not drastically change
Conclusion

• More needs to be done to improve alert fatigue in our system

• Not every alert with a high override should be removed

• Optimizing the alerts firing in a healthcare system should be an ongoing process
Study Limitations

• Short time period

• Due to COVID-19, institutions had a lower census in March

• Possibly biased results in the post-implementation survey

• Limited amount of responses for post-implementation survey

• Additional DDI alerts were turned off in certain PowerPlans
Assessment Question

Which of the following is **not true** regarding drug-drug interaction alerts?

A. Only around 10% of DDI alerts are applicable in all the instances they fire

B. Alert fatigue is a safety concern because it can lead to important alerts being ignored

C. A continuous process to evaluate DDI alerts is the best practice to reduce alert fatigue

D. Alert fatigue is only a concern for physicians
Which of the following is not true regarding drug-drug interaction alerts?

A. Only around 10% of DDI alerts are applicable in all the instances they fire

B. Alert fatigue is a safety concern because it can lead to important alerts being ignored

C. A continuous process to evaluate DDI alerts is the best practice to reduce alert fatigue

D. Alert fatigue is only a concern for physicians
Questions?

