Learning Objectives

• Describe the qualities of effective trigger tools to optimize adverse drug event detection rates.
• Explain the required parameters of a titration order.
• Recognize the requirements for identity proofing and dual factor authentication for electronic prescribing of controlled substances (EPCS).
• Discuss the benefits of proper use of clinical decision support (CDS) systems to help reduce alert fatigue.

Optimizing Trigger Tools for the Detection of Adverse Drug Events

Speaker: Arturo R Aguirre, PharmD
Clinical Pharmacist at Northwestern Medicine Lake Forest Hospital

What are trigger tools?

Definition: A trigger tool is a marker which can identify potential adverse drug events because of a correlation between the marker and the event.

In 2004, the Institute for Healthcare Improvement (IHI) developed Global Trigger Tools, which are tools used to identify adverse drug events (ADEs).

Trigger Tools Examples:
- Lab values
- Antidote administration
- Vital signs
- Prescriber orders
- Positive microbiology cultures
- ICD-10 codes
- Operation records
- Discharge dates
- Readmission dates

What are the qualities of a good trigger tool?

- Dedicated location in the EMR
- Consistently charted
- High association with the adverse drug event (ADE)
- Easily defined
Why is it important?
The Joint Commission - Standards Interpretation and Elements of Performance

The organization collects data to monitor its performance (PI.01.01.01)
- The organization collects data on the following: Adverse events related to using moderate or deep sedation or anesthesia.

The hospital responds to actual or potential adverse drug events, significant adverse drug reactions, and medication errors. (MM.07.01.03)
- The hospital has a written process to respond to actual or potential adverse drug events, significant adverse drug reactions, and medication errors.
- The hospital complies with internal and external reporting requirements for actual or potential adverse events, significant adverse drug reactions, and medication errors.

ADE reports to meet TJC standards
- Hypoglycemia as a result of antidiabetic agents
- Bleeding as a result of anticoagulants
- Acute kidney injury as a result of nephrotoxic medications
- Anaphylactic reactions from the administration of any medication
- Respiratory depression as a result of the use of sedatives

Examples from experience

Detection of Opioid Related Adverse Events
Trigger Tool: Naloxone administration
Layered Rules:
1. Naloxone given in the emergency department
2. Oral buprenorphine/naloxone
3. Naloxone infusions
4. Respiratory rate >12 within 90 minutes of naloxone
   or
5. Oxygen saturation <90% within 90 minutes of naloxone

Results
PPV = 72% Naloxone alone
- Inclusion
  • Patients who received naloxone
- Exclusion
  • Patients who received naloxone in the emergency department

PPV = 89% Naloxone plus
- Inclusion
  • Patients who received naloxone within 24 hours of receiving an opioid
- Exclusion
  • Naloxone given in the emergency department
  • Oral buprenorphine/naloxone
  • Naloxone infusions
  • RR >12 within 90 minutes of naloxone

Detecting Inpatient Hypoglycemic Events
Trigger Tool 1: PPV = 46%
- Two consecutive blood glucose ≤ 65mg/dL

Trigger Tool 2: PPV = 61%
- Single blood glucose ≤ 50mg/dL

Layered Rules:
1. Antidiabetic administration within preceding 24 hours
2. Flag if subsequent BG reading >100mg/dL within 5 minutes
Conclusions

- Trigger tools can be useful for identifying adverse drug events
- Layering trigger tools with restricting criteria can potentially increase in the PPV
- Once refined, the tool could be used to track rates of adverse events over set periods of time with little to no chart review

Which of the following is NOT an example of describable qualities for a trigger tool?

A. INR has a definite location in the EMR.
B. Respiratory rate is inconsistently charted.
C. Methylnaltrexone has a high association with opioid induced constipation.
D. Quality literature exists which defines over anticoagulation with warfarin.

Which of the following is LEAST likely to be an example of an effective trigger tool?

A. INR > 6
B. The phrase “opioid overdose” in clinical notes
C. Administration of the drug flumazenil
D. Blood glucose levels < 65

Sources


Causative Opioid Agents: Naloxone Plus

Norco, 1% Morphine, 3% Fentanyl, 23% Hydromorphone, 53% Remifentanil, 16%

Potential vs True Events: Naloxone Plus

<table>
<thead>
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<th>Observation Floors</th>
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<tr>
<td>Medicine/Cardiology Floors</td>
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<td>50</td>
<td>60</td>
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</table>
Clear Concise Titration Orders
Michelle Geurink, RPh
OSF Healthcare System

Definitions

• Titration Order: orders in which the medication dose is either progressively increased or decreased in response to the patient’s status

• Required Elements
  • Medication name
  • Medication route
  • Initial or starting rate of infusion (dose/min)
  • Incremental units the rate can be increased or decreased
  • Frequency for incremental doses (how often dose(rate) can be increased or decreased)
  • Objective clinical endpoint (RASS score, CAM score, etc)

Workgroup Recommendations-EMR Build

<table>
<thead>
<tr>
<th>Type of Drug</th>
<th>Proposed Actions to be Taken</th>
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</thead>
<tbody>
<tr>
<td>Non-titrable drug</td>
<td>Remove range buttons if present. MD call “Do Not Titrate – Call provider for dose adjustments” in administration instructions.</td>
</tr>
<tr>
<td>Titratable drug with single indication and one order set</td>
<td>Order Administration Instructions “step up” – Implement EHR smart text for providers to change “Do not titrate” button to “Titrate” button. Use Titrate instructions from acceptable order set.</td>
</tr>
<tr>
<td>Titratable drug with multiple indications and one order set</td>
<td>Hard-stop question: “Titrate” or “Do not Titrate” OR selection of indications that have administration instructions that match the order sets. OR Unit ordering to Order Set.</td>
</tr>
<tr>
<td>Titratable drug with multiple indications and no matching order set</td>
<td>Hard-stop question: “Titrate” or “Do not Titrate” OR selection of indications that have administration instructions that match the order sets. Allow for build of orders will be Medication Orders Policy.</td>
</tr>
</tbody>
</table>

Stoplight—Identify Medications

Pre-Test Question

• Which of the following orders would be considered a clear, concise titration order:
  a) DS ½ NS w/20 KCl at 125 mL/hr
  b) Dopamine infusion titrate to keep MAP 60-65
  c) Fentanyl infusion 25 mcg/hr
  d) Propofol infusion 5-50 mcg/kg/min, titrate per MD new order only
  e) Precedex infusion 0.2-0.7 mcg/kg/hr
  Goal for Sedation: RASS Score of -2 to 0
  Initiate at: 0.2 mcg/kg/hr
  Titrated by: 0.1 mcg/kg/hr
  Interval: Every 30 minutes
  Call physician if not at sedation goal at maximum of ordered dose range, for hypotension and for bradycardia

  a) None of the above
EMR Build

- Example at order entry (content based on SME workgroup):

Accountability-Hard Stop
CMO & CNO Support

- Patient List
  - Patient with titratable medication order
  - Display of order
- Report
  - Meets requirements (compliant)
  - Doesn’t meet requirements (non-compliant)

EHR Build

- Rules
  - Pediatric
  - Adult
- Preference Lists (ala carte ordering)
- Order Sets

Phase I: EHR Changes
(Tools/Scripts to do the right thing: provide clarity & meet expectations)

- Accountability-Hard Stop
  - Patient List
    - Patient with titratable medication order
    - Display of order
  - Report
    - Meets requirements (compliant)
    - Doesn’t meet requirements (non-compliant)

Organ Recovery/Gift of Hope
Hypothermia order sets

Very Low Volume Medications
- Esmolol
- Clevidipine
- Procainamide
- Lidocaine
- Naloxone
- Furosemide

Low Volume Medications
- Epinephrine
- Nitroglycerin
- Vasopressin
- Nitroprusside
- Milrinone
- Amiodarone

Medium Volume Medications
- Phenylephrine
- Diltiazem
- Nicardipine
- Midazolam
- Lorazepam

High Volume Medications
- Norepinephrine
- Fentanyl
- Dexmedetomidine
- Propofol
- Dopamine
- Oxytocin

Phase II: Change Management & Soft Stop
Embracing Decisions: Leadership and Mission Partner Accountability

Focused Feedback
Phase I: EHR Changes
(Tools/Scripts to do the right thing: provide clarity & meet expectations)
Phase II: Change Management & Soft Stop

Embracing Decisions: Leadership and Mission Partner Accountability

Percentage of Complete Titrate Orders Across OSF Healthcare

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<th>Week</th>
<th>Order Complete</th>
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<td>10</td>
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<td>2</td>
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<td>92%</td>
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<td>3</td>
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<td>4</td>
<td>93%</td>
<td>13</td>
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<tr>
<td>5</td>
<td>94%</td>
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<td>95%</td>
</tr>
<tr>
<td>6</td>
<td>95%</td>
<td>15</td>
<td>96%</td>
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</table>

Percentage of “Blank” Orders Across OSF Healthcare

<table>
<thead>
<tr>
<th>Week</th>
<th>Blank Orders</th>
<th>Week</th>
<th>Blank Orders</th>
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<td>5%</td>
</tr>
<tr>
<td>3</td>
<td>7%</td>
<td>12</td>
<td>6%</td>
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<tr>
<td>4</td>
<td>8%</td>
<td>13</td>
<td>7%</td>
</tr>
<tr>
<td>5</td>
<td>9%</td>
<td>14</td>
<td>8%</td>
</tr>
<tr>
<td>6</td>
<td>10%</td>
<td>15</td>
<td>9%</td>
</tr>
</tbody>
</table>

Post-Test Question

- Which of the following orders would be considered a clear, concise titration order:
  a) D5 ½ NS w/20 KCl at 125 mL/hr
  b) Dopamine infusion titrate to keep MAP 60-65
  c) Fentanyl infusion 25 mcg/hr
  d) Propofol infusion 5-50 mcg/kg/min, titrate per MD new order only
  e) Precedex infusion 0.2-0.7 mcg/kg/hr

  Goal for Sedation: RASS Score of –2 to 0
  Initiate at: 0.2 mcg/kg/hr
  Titrate by: 0.1 mcg/kg/hr
  Interval: Every 30 minutes

  Call physician if not at sedation goal at maximum of ordered dose range, for hypotension and for bradycardia

  a) None of the above

Pre-Test Question

- Which of the following can be used for identity proofing:
  a) Fingerprint
  b) Single Sign on Badge
  c) Password
  d) Retinal Scan
  e) None of the above

Basics of EPCS

Michelle Geurink, RPh
OSF Healthcare System

Definitions- Interim Final Rule

- EPCS: Electronic Prescribing of Controlled Substances
- Individual Practitioner: May work either at an institutional or smaller practice that lacks dedicated department for medical credentialing and managing access to EPCS in computer system
- Institutional Practitioner: May perform certain security functions for EPCS (e.g. identity proofing and issuing two-factor authentication)
- Credential/Token: Something user possesses or controls that must be demonstrated to gain access to specific function
Definitions

- Identity Proofing: process of validating identity of potential user before he/she is granted an account or issued security to access account
- Two Factor Authentication
  - Something you know (Password)
  - Something you have (Hard Token)
  - Something you are (Biometric)
- Hard Token: cryptographic key stored on a hardware device (e.g., a PDA, cell phone, smart card, USB drive, one-time password device) rather than on a general purpose computer. A hard token is a tangible, physical object possessed by an individual practitioner

Identity Proofing

- Individual
  - Federally approved credential service providers (CSPs) or certification authorities (CAs)
  - The CSP or CA will be required to conduct identity proofing that meets National Institute of Standards and Technology Special Publication 800-63-1 Assurance Level 3.
  - Both in person and remote identity proofing acceptable.
- Institutional
  - DEA registrants
  - Credentialing offices
  - Must be in person
  - Not required to meet the requirements of National Institute of Standards and Technology Special Publication 800-63-1 for identity proofing.
  - A person designated by the institutional practitioner must check the individual

Issuance of Credentials

- Individual Practitioner
  - Issued after identity proofing by CA or CSP
- Institutional Practitioner
  - Must retain record of issuance of credential
    - Who issued
    - When issued
    - How delivered
      - Must be delivered by two methods (e.g., email and phone call)
      - How and by whom configured

EPCS

- Identity Proofing
- Two-Factor Authentication
- Auditing & Reporting
- Workflow Policies

- Disk Space
  - Interface message retention and auditing
- Event logging for auditing of access to interface messages

- Reports
  - DEA requires that prescribers review their controlled substance prescriptions monthly and that reports of controlled substances are also available to prescribers on demand.
  - EPCS Daily Incident Report
    - Daily review of incidents
      - Failed Logins
      - Failed authentications
      - Interface stop and starts
      - Security changes
      - Event logging stops and starts
      - Deletions or attempted deletions of EPCS orders

EPCS for IT—Disk Space and Reports
EPCS for IT--Access

- The action of granting practitioner access control to sign electronic prescriptions must be performed by two separate persons
  - Both must be designated to manage access
  - One must grant access
  - Other approves granting of access
- Access revoked promptly if
  - Two factor authentication lost/stolen/compromised
  - DEA registration expires
  - DEA registration revoked
  - No longer authorized to use EPCS application

EPCS Transmitting and Printing

- Electronic prescription must be transmitted from the practitioner to the pharmacy in its electronic form
- Intermediary (e.g. Surescripts) can NOT convert to fax if transmission fails
  - Intermediary must notify prescriber
    - If III, IV or V can then be printed, signed manually and faxed
    - This prescription must indicate that it was originally transmitted to, and provide the name of, a specific pharmacy, the date and time of transmission, and the fact that the
electronic transmission failed.
- May print copies of the transmitted prescription(s) if they are clearly labeled: “Copy only – not valid for dispensing.”
- Data on the prescription may be electronically transferred to medical records, and a list of prescriptions transmitted may be printed for patients if the list indicates that it is for informational purposes only.

Post-Test Question

- Which of the following can NOT be used for Two Factor Authentication
  a) Fingerprint
  b) Single Sign on Badge
  c) Password
  d) Retinal Scan
  e) All of the above can be used

A Genuine Intrigue with Alert Fatigue

Sarah Seward, Pharm.D.
PGY-2 Pharmacy Informatics Resident
Hospital Sisters Health System – St. Elizabeth's Hospital
Belleville, IL

Reflective Question

- Pharmacists:
  - Can you confidently say you have always read every alert that fires?
- Technicians:
  - Can you think of an instance where you bypassed a safety scan because “that’s just what I’m supposed to do”?

Background

- Many Electronic Medical Records (EMRs) implemented due to American Recovery and Reinvestment Act (2009)
  - Requires demonstration of “meaningful use” of EMRs by January 1st 2014
- Key components of EMRs are clinical decision support (CDS) systems
  - Generate interaction alerts and therapy warnings
I spy with my little eye... an anchor, a musical note, a snake and a small billy goat


Alert Fatigue

• “The mental state that is the result of too many alerts consuming time and energy, which can cause important alerts to be ignored along with clinically unimportant ones.”
  - Van Der Sijs et al

• Alert fatigue is very common
• CDS systems are meant to decrease prescribing errors
  • Only works if alerts are clinically meaningful

Balancing Alerts

Not Enough Clinical Decision Support (CDS) → Too many unimportant alerts → Too many alerts → Too few alerts

Van der Sijs Review

• Review of 17 publications on overriding safety alerts in CPOE systems
  • Alert override rates varied from 49%-96%
  • Adverse Drug Events (ADE) from overridden alerts varied 2.3%-6%
PGY-1 Experience With Alerts

- PGY-1 residency project at Wheaton Franciscan
- 485,652 alerts in August 2016
  - 86.5% override rate

Primary Target Categories

<table>
<thead>
<tr>
<th>Drug-Drug</th>
<th>Duplicate Medication</th>
<th>Drug Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>122,873</td>
<td>190,939</td>
<td>71,012</td>
</tr>
<tr>
<td>Top 19 = 49.1% of category</td>
<td>Top 21 = 30.2% of category</td>
<td>Top 36 = 4.9% of category</td>
</tr>
<tr>
<td>Severe = 59,102 (83.2%)</td>
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</table>

Primary Target Categories

- Drug-Drug
  - Duplicate Medication
  - Drug Disease

Drug-Drug Alerts

- Reduced by severity level

Drug-Disease Alerts

- Reduced by severity level

Duplicate Medication Alerts

Reduction in Alert Categories

<table>
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<tr>
<th>Alert Category</th>
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<th># of alerts February 2017</th>
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<tr>
<td>Duplicate Therapy</td>
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<td>Drug-dose</td>
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<td>Dose variance</td>
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<td>Drug allergy</td>
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<td>Pregnancy</td>
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<td>Lactation</td>
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<td>Geriatrics</td>
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<td>Total</td>
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### Reduction in Alert Categories

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<td>Drug allergy</td>
<td>122,871</td>
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<td>Drug reaction</td>
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<td>Pregnancy</td>
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<td><strong>Total</strong></td>
<td><strong>485,652</strong></td>
<td><strong>296,181</strong></td>
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### Conclusions
- Alert fatigue can lead to harmful patient outcomes
- CDS systems only useful if they provide meaningful alerts
- Correctly configured CDS system = reduce alert fatigue

### Questions?

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[Hospital Sisters Health System Logo]