Medication Safety & Electrolyte Administration

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Objectives

• Define and identify ‘high alert medications’
• Identify potential weaknesses / areas of concern
• Outline safe medication use recommendations
• Promote utilization of policy & procedures
• Encourage reporting of errors & near misses

High Alert Medications

• The Institute of Safe Medication Practices (ISMP) defines high alert medications as:
  – Drugs that bear a heightened risk of causing significant patient harm when used in error
  – Mistakes may or may not be more common, but the consequences are clearly more devastating to patients
  – Often impossible to reverse the effects of inappropriate electrolyte administration and could be deadly
ISMP High Alert Medications

- Adrenergic agonists
- Adrenergic antagonists
- Anesthetic agents
- Antiarrhythmics
- Anticoagulants
- Antithrombotics
- Cardioplegic solutions
- Chemotherapy agents
- Electrolytes & fluids
- Epidural & intrathecal meds
- Insuls & oral hypoglycemics
- Liposomal forms of drugs
- Narcotics/Opiates
- Neuromuscular blockers
- Parental nutrition preparations
- Radiographic agents
- Sedatives

Common Examples

- Electrolyte solutions:
  - Potassium chloride
  - Potassium phosphates
  - Calcium chloride
  - Calcium gluconate
  - Magnesium sulfate
  - Sodium bicarbonate
  - Sodium phosphate
- Non-isotonic fluids:
  - Sodium chloride 3%
  - Dextrose 50%
  - Sterile water

Create an Error Prevention Plan

- Create awareness
  - Provide education and information to all healthcare personnel
- Identify problems
  - Can be actual or potential problems
  - Review adverse drug reaction reports
  - Review literature
  - Confer with a multidisciplinary group within your organization
- Make improvements
Create an Error Prevention Plan

**Goal:**
Prevent High Risk Medication Errors

**Desired Outcome:**
Reduce poor patient outcomes

**Strategy:**
1. Identify weakness
2. Install Error Traps

**Measure/Target:**
Assess data on medication-related error occurrences

**Results:**
Modify strategy as necessary

CREATE AWARENESS

Raising Awareness

- **High Risk Medications Lists:**
  - ISMP - Institute for Safe Medication Practices
  - JCAHO - Joint Commission
  - CMS - Centers for Medicare and Medicaid Services

- **Joint Commission requires healthcare organizations to:**
  - Maintain a policy of high risk medications for the institution
  - Design safeguards to prevent medication errors
### Differences in Perception

2014 ISMP survey of health care professionals that appropriately identified select high alert medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Nurses</th>
<th>Pharmacists</th>
<th>Practitioner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentrated Electrolytes</td>
<td>88.2%</td>
<td>91.2%</td>
<td>81.9%</td>
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<tr>
<td>Chemotherapy</td>
<td>85.4%</td>
<td>86.8%</td>
<td>74.6%</td>
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<td>Insulin</td>
<td>86.7%</td>
<td>89.0%</td>
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<tr>
<td>Neuromuscular blockers</td>
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<tr>
<td>Anticoagulants</td>
<td>80.2%</td>
<td>75.7%</td>
<td>74.6%</td>
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<tr>
<td>Opiates</td>
<td>71.0%</td>
<td>70.6%</td>
<td>62.7%</td>
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<tr>
<td>Sedatives</td>
<td>57.8%</td>
<td>38.2%</td>
<td>53.7%</td>
</tr>
<tr>
<td>Magnesium sulfate</td>
<td>49.9%</td>
<td>24.3%</td>
<td>27.1%</td>
</tr>
</tbody>
</table>

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### Types of Errors

2014 ISMP survey of healthcare professionals - the types of errors respondents reported involving high alert medications

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IDENTIFY PROBLEMS

Reasons errors may occur

- Dosing errors
- Calculation errors
- Concentration errors
- IV admixture errors
- Duplicate therapy
- Look-alike/sound-alike drugs
- Adverse drug reactions (ADRs)
- Contamination
- Incompatibilities

Areas of Potential Weakness

- Departments where workflow is fast-paced
  - Emergency department
  - Critical care
  - Surgery
  - Trauma
- Special concern for:
  - Look-alike medications
  - Sound-alike medications
  - Concentrated medications
MAKE IMPROVEMENTS

Ways to Make Improvements

- Implement fail-safes
- Add constraints
- Externalize error-prone processes
- Improve access to information
- Standardize
- Simplification
- Differentiation
- Reminders
- Redundancies
- Patient monitoring
- Failure mode and effects analysis

Procurement

- Standardize:
  - Order only standardized premixed bags of electrolytes
- Differentiate:
  - Ensure there are no similarly packaged/labeled fluids
- Add reminders:
  - Label all high alert meds with HIGH RISK warning labels
Storage

• Add Constraints:
  – Remove concentrated electrolytes from patient care areas
  – Store premixed bags only in the pharmacy or in locked automated dispensing cabinets

• Differentiate:
  – Segregate the storage of electrolytes from other fluids

Ordering

• Standardize:
  – Implement hospital-wide electrolyte protocols for administration of ALL electrolytes

• Simplify:
  – Utilize order sets or pre-printed orders for use with administration of IV electrolytes

• Add Constraints:
  – Set dose limits for IV electrolyte administration

Preparing

• Externalize error-prone processes:
  – Eliminate the potential for preparation errors
  – Use only standardized, manufactured, premixed bags of electrolytes and fluids
Dispensing

• Implement fail-safes:
  – Utilize electronic medical records and automated dispensing cabinets, if possible
  – Limit access to only pharmacy personnel for electrolyte dispensing, if possible
  – If not possible, designate only certain individuals to have access to these medications (ex. Charge Nurse)

Administration

• Implement fail-safes:
  – Implement barcode scanning whenever possible
  – Administer all IV electrolytes through rate-controlled programmable pumps
  – Use smart pumps when available, do not bypass inputting all the information

• Redundancies:
  – Utilize double checks (manual or automated)
Report Errors

- Encourage reporting of near misses and errors
  - You can't fix what you don't know is a problem!

- Create a culture of appreciation for error reporting
  - Do not penalize individuals for speaking up
  - Permit anonymous reporting

- Have open discussions with the healthcare team
  - Discuss errors or near misses that have occurred
  - Implement changes to prevent reoccurrence

ELECTROLYTE PROTOCOLS

General Recommendations

- Create a standardized protocol
  - Utilize order sets or preprinted order forms
  - Use standard concentrations of manufactured premixes

- Have an electrolyte level within previous 24 hours

- Never administer concentrated electrolytes
  - Always dilute them and administer via IVPB on a pump

- Recheck electrolyte level after administration
**Potassium IV Protocols**

- Have a previous level from within 4 hours
- May recheck a level 4 hours after administration
- Central line administration
  - Maximum rate: 20 mEq IV over 1 hour
  - Maximum concentration: 20 mEq / 50 mL
- Peripheral line administration
  - Maximum rate: 10 mEq IV over 1 hour
  - Maximum concentration: 10 mEq / 50 mL

**Magnesium IV Protocols**

- Have a previous level from within 24 hours
- May recheck a level 2 hours after administration
- Central or peripheral line administration
  - Maximum rate: 2 grams IV over 1 hour
  - Maximum concentration: 2 grams / 50 mL

**Phosphorus IV Protocols**

- Have a previous level from within 24 hours
- May recheck a level 2 hours after administration
- Should be ordered in mmol of phosphorus
  - Approximately 1 mmol phosphate = 1.5 mEq potassium (in KPO₄)
  - Use sodium phosphate for patients with:
    - Serum potassium >4.5 mEq/L and serum sodium <145 mEq/L
- Central line administration
  - Maximum rate: 15 mmol / 100 mL IV over 2 hours
- Peripheral line administration
  - Maximum rate: 15 mmol / 250 mL IV over 4 hours
Calcium IV Protocols

- Have a previous level from within 24 hours
- May recheck a level 2 hours after administration
- Administer through central line (highly preferred)
  - Central or peripheral line administration
    - Maximum rate: 2 grams IV over 1 hour
    - Maximum concentration: 2 grams / 100 mL

Conclusion

- Electrolytes are considered high alert medications
- We need to order, prepare, dispense, and administer electrolyte solutions with caution
- Stocking and carrying manufactured electrolyte solutions can help reduce errors
- Creation of protocols and use of standardized order sets are good ways to avoid errors
- Learn from near misses and errors to create safer practice in the future

Questions?

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References