Lessons Learned: Interdisciplinary collaboration to reduce hypoglycemic events

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Objectives

- List recommended strategies to optimize glycemic control
- Describe interventions to minimize hypoglycemic events
Inpatient Diabetes and Glycemic Control

Morbidity
- Infection
- Length of stay

Economic
- 22% inpatient days
- $87 billion USD

Mortality
- Cardiac surgery
- Surgical ICU

Table 1. Association between mean blood glucose concentrations and risk of mortality in hospitalized patients

<table>
<thead>
<tr>
<th>Mean BG (mg/dL)</th>
<th>Adjusted Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-110</td>
<td>1</td>
</tr>
<tr>
<td>111-145</td>
<td>1.31 (1.26-1.36)</td>
</tr>
<tr>
<td>146-199</td>
<td>1.82 (1.74-1.90)</td>
</tr>
<tr>
<td>200-300</td>
<td>2.13 (2.03-2.25)</td>
</tr>
<tr>
<td>&gt; 300</td>
<td>2.85 (2.58-3.14)</td>
</tr>
</tbody>
</table>

Moghissi EG. Am J Health-Syst Pharm 2010;67(Suppl 8):S3-S8

Negative Outcomes Associated with Inpatient Hyperglycemia

- Longer hospital stays
- Infection
- Disability after discharge
- Death
Balancing Efficacy and Safety

**Hyperglycemia**
- Infection, illness, stress
- Poor or worsening diabetes control
- Holding diabetic medications
- Fluids/nutrition: D5W, TPN
- Medications: glucocorticoids
- Newly diagnosed diabetes (DKA, HHS)

**Hypoglycemia**
- Change in nutritional status: NPO, TF
- Change in clinical status: medications
- Failure of clinician to make appropriate adjustments
- Poor coordination of BG testing and administration of insulin with meals
- Poor communication upon transfer
- Errors in order writing and transcription

Poor Patient Outcomes

Therapeutic Index

**Dose/response: Drug A**

**Dose/response: Insulin**

Therapeutic Response

Efficacy

Toxicity

Dose

Hypoglycemia

Euglycemia

Dose
Systematic Barriers to Improved Management of Hyperglycemia

- Fear of hypoglycemia
- Skepticism about benefits of adequate glycemic control
- Inadequate knowledge and understanding
- Lack of integrated information systems
- Time and resources

Components of An Effective Strategy to Optimize Glycemia

- Appropriate level of administrative support
- Multidisciplinary steering committee to promote development of initiatives
- Assessment of processes, quality, and barriers
- Development and implementation of interventions
- Metrics for evaluation
Alegent Health Lakeside Hospital

- 16 ICU beds
- 104 acute care beds
- 650 physicians on staff
- 126 full-time registered nurses
- 494 Full-time Employees

Hypoglycemia at Lakeside

- Increasing trend in Q1 2011
- No clear reason identified
- Initial solution: Education
  - Insulin pharmacokinetics
  - Insulin subcutaneous protocol
    - Mealtime administration – prandial & correctional
    - Hypoglycemia management
Find a process to improve
Organize a team who knows the process
Clarify current knowledge of the process
Understand causes of process variation
Select the process improvement
Plan the improvement
Do the improvement
Study the effectiveness of the change
Act to hold the gain

Morning blood glucose monitoring, meal consumption, and prandial insulin administration

Nursing department
Pharmacy department
Quality: Patient safety officer
Diabetes educators
Food and nutrition
Clinical informatics
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POCT, insulin administration, and meal time were not coordinated:

Issues identified:
- Shift change
- Culture
- Knowledge and competency
- System administration times
- Med work list view for each shift
- Dining on-call
- Override tracking
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Objective:
Decrease the interval of time from POCT to meal and insulin administration to 30 minutes or less for breakfast meal.

Plan:
Table tent cards
Insulin nursing in-service
Notify RN when meal ordered

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Action:
CNA shift report
CNA tells RN once meal ordered
Dietary instructs patient to push the call light when the order
CNA/RN staffing coordination

Chart review:
Baseline
Post-intervention
Find a process to improve
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Blood glucose monitoring and insulin administration with morning meal

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Post intervention</th>
<th>Random audit</th>
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</thead>
<tbody>
<tr>
<td>27.1</td>
<td>56.7</td>
<td>86.7</td>
<td></td>
</tr>
<tr>
<td>32.6</td>
<td>76.7</td>
<td>93.3</td>
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</table>

*Point-of-care testing
Morning mealtime and insulin aspart administration

![Graph showing number of insulin doses vs. minutes from meal with Baseline, Post-intervention, and Random audit lines.]

Time between POCT* and morning meal

![Graph showing number of insulin doses vs. minutes from POCT with Baseline, Post-intervention, and Random audit lines.]

*Point-of-care testing
Does improved prandial insulin administration yield fewer hypoglycemic events?

Dextrose 50% Syringe Use

- Limited data
- Unable to conclude cause and effect
- Plausible association
- D50W is a surrogate for glucometrics

Glucometrics: Measuring inpatient glycemic control

Definitions
- Target population
- Hypoglycemia
- Hyperglycemia
- Euglycemia

Units of Analysis
- Glucose value
- Patient
- Monitored-patient day

Measures of Control
- Rate of hypoglycemia
- Rate of hyperglycemia
- Mean glucose value
- Percent patient days within target
- Hyperglycemic index

Schnipper JL et al. Hospital Medicine;3(5):566-575
Lessons Learned

• Poor glucose control is associated with adverse outcomes
• Inpatient blood glucose is influenced by many factors and requires a multidisciplinary approach to effectively manage.
• A team approach to coordinating patient care can improve insulin administration and may minimize hypoglycemic events.

Resources

• American Diabetes Association (ADA): http://professional.diabetes.org/ResourcesForProfessionals.aspx?cid=60378&typ=17
• American Society of Health-System Pharmacists (ASHP): http://www.ashp.org/
• Institute for Healthcare Improvement (IHI): http://app.ihi.org/map/tool/#Process=800ef016-724c-4276-a0e7-ec053d57131b
• Yale glucometrics: http://metrics.med.yale.edu/main
References


Questions?