Glycemic control in hospitalized patients with diabetes mellitus as a secondary diagnosis admitted to the medical floor of SOCH 7/2013 – 7/2014

Erlin J. Marte
Introduction

• About 25% of patients with type 1 and 30% of patients with type 2 diabetes mellitus (DM) are admitted each year for treatment of conditions other than diabetes.

• These patients tend to have a higher A1C value.

Introduction

• In-hospital hyperglycemia is considered an important independent marker of poor clinical outcome and mortality.

Introduction

• In non-critically ill patients and patients post non-cardiac surgery, elevated mean glucose values have been associated with adverse outcomes, such as increased length of stay (LOS), rate of complications and mortality.

Introduction

• Main goals in patients with diabetes requiring hospitalization are:
  – To minimize disruption of the metabolic state.
  – Prevent an untoward result.
  – Return the patient to a stable glycemic balance as quickly as possible.
Introduction

• There is adequate experimental and observational data to recommend avoidance of marked hyperglycemia in patients with or at risk for infection, although the precise glycemic target or threshold for non-critically ill patients has not yet adequately been determined.


Introduction

• The Randomized study of Basal-Bolus Insulin Therapy (RABBIT)-2 trial showed a lower frequency of the composite outcome of perioperative complications, including wound infection, pneumonia, bacteremia, respiratory failure, and acute kidney injury in patients treated with basal-bolus therapy, with better glycemic control achieved compared with the use of sliding scale only.
• A 2012 meta-analysis concluded that there is potential benefit of glycemic control in the range of 100 to 180 mg/dl in patients hospitalized in non-critical care setting.

• The consensus statement by the ADA/AACE and the clinical practice guideline of the endocrine society recognizes the lack of evidence for specific glycemic goals in non-critically ill patients and suggests
  – Pre-meal glucose goals of <140 mg/dL (7.8 mmol/L) for general hospitalized patients.
  – All random glucose <180 mg/dL (10.0 mmol/L)


• Other recommendations
  – Measurement of HbA1c on admission.
  – Frequent revision of scheduled insulin therapy.
  – Nutritional assessment.
Despite these recommendations, there is increasing evidence suggesting suboptimal management of DM in noncritically ill hospitalized patients.


• The aim of this study is to:
  – Describe the glycemic control of non-ICU hospitalized diabetic patients admitted to our Institution.
  – To describe current clinical practices being applied to the care of this population (i.e. therapeutic strategies being implemented and their modifications in response to elevated or low glucose values).
  – Adherence to current recommendations.
Methods

- This is a retrospective observational study conducted at Sisters of Charity between 07/01/2013 and 07/01/2014.
Inclusion Criteria

- Patients between the ages of 18 and 80 years admitted to the Internal Medicine team with an international classification of disease, ninth revision, clinical modification (ICD-9) diagnoses code for diabetes as a secondary diagnoses.

- Patients with LOS of at least 3 days but no more than 7 days
Exclusion Criteria

• Patients admitted for diabetic ketoacidosis, hyperosmolar hyperglycemic state, and gestational diabetes.
• Patients requiring steroid therapy during admission.
• Patients transferred to the medical, surgical, or neurosurgical ICU.
• Patients with criteria for ICU setting.
Data Collection

• Record review
  – Clinical data were extracted for the first 3 days of admission and for the last 24 hours prior discharge.

• In order to maintain confidentiality a numeric code was used for each patient.
Sorian Data Collection

- Patient demographics
  - Race
  - Age
  - Gender
  - Weight
  - Height

- Type of diabetes
- Medications before admission.
- Medical comorbidities,
- History of DM complications
- HbA1c
- FHx of DM
- Primary admission diagnoses
Primary outcome

• Prevalence of hyperglycemia (glucose > 180 mg/dl) and hypoglycemia (glucose < 70 mg/dl) among non-critically ill hospitalized patients.
Secondary Outcomes

• Process of Care:
  – # of Glucose fingertip measurements
  – Hemoglobin A1C
  – Nutritional Evaluation.
Measurements

Bedside fingertip blood Glu-

• Recorded

Mean Gluc-value per patient

• Calculated

1st 24 hours
1st 3 days
Last 24 hours

• documented
Glucose management was classified as:

- Insulin Therapy
  - Long Acting Formulation Only.
  - Short acting formulation only.
  - Long and short acting combination
  - Sliding Scale (SSI) Only
- Oral Agents Only.
- Oral Agents plus Insulin.

Note: The amount of insulin administered during the first 24 hours was compared to the amount of insulin administered on the last 24 hours to assess changes in dosing.
Patient classification

Controlled:

- Mean BG < 180 and > 70 mg/dl

Uncontrolled:

- Mean BG > 180 mg/dl
2555 patients were admitted with DM as secondary diagnosis.

100 patients who met the inclusion/exclusion criteria were randomly selected.
Baseline Characteristics

- **Age**: 62 +/- 11

- **Gender**:
  - Male: 43
  - Female: 57

- **Type of DM**:
  - Type I: None
  - Type II: 100
Baseline Characteristics

- **HbA1c**
  - 8.46 +/- 2.4

- **BMI**
  - 32.2 +/- 8.9

- **Mean glucose value on admission**
  - 200.88
Most common comorbidities

- **HTN**
  - 91%

- **DL**
  - 29.5%

- **CHF**
  - 9.1%
Process of Care

HbA1c on admission ordered for
- 87%

Median # of Glu-fingertips measurements/Day
- 4 (first 3 days)
- 2 (On discharge)

Nutrition assessment
- 7%
<table>
<thead>
<tr>
<th></th>
<th>1&lt;sup&gt;st&lt;/sup&gt; 24 hours</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; day of H</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; day of H</th>
<th>Last 24 hours</th>
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<tbody>
<tr>
<td>Mean Glucose</td>
<td>202.76</td>
<td>184.18</td>
<td>174.53</td>
<td>164.84</td>
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<tr>
<td></td>
<td>Controlled (&lt;180)</td>
<td>Uncontrolled (&gt;180)</td>
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<tr>
<td><strong>1&lt;sup&gt;st&lt;/sup&gt; 24 hours</strong></td>
<td>38% (Mean Glucose 140)</td>
<td>62% (Mean Glucose 239.7)</td>
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<tr>
<td><strong>2&lt;sup&gt;nd&lt;/sup&gt; day of H</strong></td>
<td>38% (Mean Glucose 142.5)</td>
<td>62% (Mean Glucose 209.7)</td>
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<tr>
<td><strong>3&lt;sup&gt;rd&lt;/sup&gt; day of H</strong></td>
<td>51% (Mean Glucose 150)</td>
<td>49% (Mean Glucose 199.9)</td>
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<tr>
<td><strong>Last 24 hours</strong></td>
<td>67% (Mean Glucose 152.5)</td>
<td>33% (Mean Glucose 189.9)</td>
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<tr>
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<td>Long acting-SSI</td>
<td>Long/Short acting-SSI</td>
<td>SSI Only</td>
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<td><strong>Controlled</strong></td>
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<td>1&lt;sup&gt;st&lt;/sup&gt; 24 hours</td>
<td>28.9%</td>
<td>2.6%</td>
<td>68.5%</td>
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<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; day</td>
<td>47%</td>
<td>7.8%</td>
<td>45.2%</td>
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<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; day</td>
<td>53%</td>
<td>12%</td>
<td>35%</td>
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<tr>
<td>Last 24 hours</td>
<td>68%</td>
<td>31%</td>
<td>1%</td>
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<tr>
<td><strong>Uncontrolled</strong></td>
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<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; 24 hours</td>
<td>69%</td>
<td>8.2%</td>
<td>22.8%</td>
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<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; day</td>
<td>74%</td>
<td>10.2%</td>
<td>15.8%</td>
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<td>3&lt;sup&gt;rd&lt;/sup&gt; day</td>
<td>53%</td>
<td>14%</td>
<td>33%</td>
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<tr>
<td>Last 24 hours</td>
<td>57%</td>
<td>16%</td>
<td>27%</td>
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Pv: 0.03, 0.11, 0.89, 0.17
Discussion

• Management of noncritically ill diabetic patients is still suboptimal. In the Mayo clinic study, they found that throughout admission, 20 to 25% of patients were hyperglycemic.
  – In our case is as high as 63% with an average of 51%

Discussion

• This is due to
  – Inappropriate insulin choice (type/combination):
    • The use of SSI as treatment instead of as a correction factor.
    • The relative minimal use of a combination of short/long acting Insulin.
    • The lack of intensification of therapy
    • Possible concern hypoglycemia.
Conclusion

• This study provides a descriptive overview of the current state of glycemic control in our institution and also provides interesting insights into the therapeutic strategies being applied.

• New strategies need to be applied to achieve adequate glycemic targets and avoid adverse outcomes related to sustain hyperglycemia.
Recommendations

• Familiarize yourself with the CHS-Glucose control protocol.
  – Which makes temporal relationship between glucose level and amount of insulin given.
• Do not use SSI as a sole therapeutic method
• Calculate the amount of insulin needed on a daily basis and do not be afraid of hypoglycemia.
Limitations

• Source of data
  – Chart review depends on proper documentation.
• Unable to evaluate the rationale in therapy.
• Unable to determine if glucose values represented premeal or postmeal state.
• Relatively small sample size.
Other references

Acknowledgement

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Comments/Questions