Inpatient Management of Diabetes

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Objectives

• Discuss goals of glucose control in the inpatient setting
• Define barriers to glucose control in the inpatient setting
• Provide a treatment plan for glucose control during the hospitalization
• Discuss other diabetes issues that should be addressed before discharge

Inpatient Diabetes Care

• Prevalence of diabetes is growing
• 12% to 25% of patients in a hospital bed have some degree of hyperglycemia
• Half of the USD spent on diabetes is spent on inpatient care of diabetes
• Increased length of stay

Why keep BG in control during hospitalization?

• Reduce
  – Morbidity
  – Mortality
  – Health care costs
• Improve wound healing
• Prevent nosocomial infections

Inpatient Hyperglycemia

• Diabetic patients
• Undiagnosed diabetic patients
• Transient Hyperglycemia
  – Medication induced hyperglycemia
  – Stress hyperglycemia

Target Blood Glucose Concentrations in Hospitalized Patients

<table>
<thead>
<tr>
<th>Patient Type</th>
<th>Target BG (mg/dL)</th>
<th>Recommended Insulin Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critically ill in intensive care settings</td>
<td>140-180</td>
<td>Intravenous</td>
</tr>
<tr>
<td>Non-critically ill in acute care setting</td>
<td>Pre-meal: &lt;140</td>
<td>Subcutaneous (scheduled)</td>
</tr>
<tr>
<td></td>
<td>Random: &lt;180</td>
<td></td>
</tr>
</tbody>
</table>

2009 Consensus Statement on Inpatient Glycemic Control from AACE/ADA
Inpatient Hyperglycemia Treatment

- Insulin is the preferred method of achieving glycemic control
  - Critical Care: intravenous insulin infusion
  - Non-critical care: SQ insulin (scheduled)
    - Basal
    - Nutritional
    - Supplemental (correction)

Physiologic Subcutaneous Insulin Guidelines

- Total daily dose = 0.3-0.6 units/day/kg
- Basal insulin = 50% of daily dose
- Prandial insulin = 50% of daily dose (divided into three doses)

<table>
<thead>
<tr>
<th>Patient type</th>
<th>Multiplier: Units/day/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight; older age; hemodialysis</td>
<td>0.3</td>
</tr>
<tr>
<td>Normal weight</td>
<td>0.4</td>
</tr>
<tr>
<td>Overweight</td>
<td>0.5</td>
</tr>
<tr>
<td>Obese; glucocorticoids; insulin resistance</td>
<td>≥0.6</td>
</tr>
</tbody>
</table>

Inpatient Consideration to Insulin

- Prolonged tx with sliding-scale insulin regimens only is not recommended
- Changes in medications and severity of illness
- Nutritional Status
  - NPO, nausea/vomiting, different types of diets
- Timeliness of medication administration with mealtimes

Insulins Available for Physiologic Protocols in Hospitalized Patients

<table>
<thead>
<tr>
<th>Type of insulin</th>
<th>Time of onset</th>
<th>Duration of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basal insulin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glargine</td>
<td>1 to 2 hours</td>
<td>24 hours</td>
</tr>
<tr>
<td>Detemir</td>
<td></td>
<td>18 to 24 hours</td>
</tr>
<tr>
<td>NPH</td>
<td></td>
<td>14 to 24 hours</td>
</tr>
<tr>
<td><strong>Nutritional and correctional insulin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lispro</td>
<td>10 to 30 minutes</td>
<td>3 to 6 hours</td>
</tr>
<tr>
<td>Aspart</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glulisine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular human insulin</td>
<td>30 to 60 minutes</td>
<td>4 to 12 hours</td>
</tr>
</tbody>
</table>

Avoiding Noninsulin Agents

- Hypoglycemia
  - Sulfonylureas
  - Short-acting insulin secretagogues
- Metformin
  - Renal insufficiency
  - Unstable hemodynamic status
  - Need for imaging studies with radiocontrast dye
- Thiazolidinediones
  - Congestive Heart Failure
  - Hemodynamically unstable
- Pramlintide, exanatide, & the dipeptidyl peptidase inhibitors

“High-Alert Medication”
Institute for Safe Medication Practice

- Standardizing concentration for all IV insulin infusions
- Prepare IV infusions in pharmacy
- Separating different types of insulin
- Avoiding “u”
- Educating hospital personnel
  - Standard management protocols
  - Include treatment for hypoglycemia on all insulin protocols
When noninsulin agents are appropriate

- Ingesting regular meals
- Stable
- No contraindications
- Transitioning to outpatient care

Discharge

- Self-monitoring of BG and explanation of home BG goals
- Define hyper- and hypoglycemia, treatment and prevention
- Identifying the health care provider who will be responsible for diabetes care after discharge
- Dietary information (consistent eating)
- Information about diabetic medication (when and how to take)
- Sick day management

References