Mrs. B was referred by her orthopedic surgeon to your preoperative clinic to discuss medical management of her diabetes with her upcoming elective TKA.

What are the key components of preoperative, intraoperative, & postoperative care of diabetes management?

Objectives

- Define prevalence of DM in surgical population
- Understand the implications of DM in the perioperative period
- Explore the impact of surgery and DM
- Management of DM thru continuum of perioperative period
General Population
- 7.8% of population has DM (23.6 million)
- 12.4-38% of all hospitalized adults

Surgical Population
- ~1/3rd hyperglycemic
- 26% w/ known DM
- 12% no prior hx

Prevalence: Diabetes & Hyperglycemia

Impact of Surgery On Diabetes:
### Implications: Diabetes & Surgery

- Longer LOS
- Higher health care resource utilization
- Expenditures 2.3x greater
- Greater perioperative mortality

### Goals of Perioperative Diabetes Management:

- **ACTIVELY** maintain normoglycemia, avoid highs and lows
- MAINTAIN fluid & electrolyte balance
- PREVENT development of ketoacidosis (DM-1)
- IDENTIFY specific glycemic goals

### Insulin Requirements In Health and Illness:

- **Correction**
- **Nutritional**
- **Prandial**
- **Basal**
Physiological Insulin: Components

- Basal:
  - Targets fasting hyperglycemia
- Nutritional:
  - Targets IV dextrose, TPN, enteral feeds, nutritional supplements, or meals (prandial)
- Correction:
  - “supplemental” insulin for hyperglycemia

RABBIT 2 Trial: Randomized Study of Basal-Bolus Insulin Therapy in the Inpatient Management of Patients with Type 2 Diabetes

- Prospective, multicenter, randomized trial
- Insulin-naive type 2 diabetic pts on general medicine
- Compared basal-bolus vs. SSI
- Primary end point: mean daily blood glucose
- Secondary outcomes: # hypoglycemic events, # events severe hyperglycemia, LOS, & mortality rate

RABBIT 2 Trial: Basal-bolus

Total Daily Dose = 0.4 or 0.5 u/kg x pt's wt (kg)

\[ \text{Basal:bolus} = 50:50 \]

\[ \text{e.g. } Wt = 70kg \]

\[ \begin{align*}
    \text{TDD} & = 0.4 \text{u/kg} \times 70\text{kg} = 28 \text{ units} \\
    \text{Basal dose} & = 14 \text{ units} \\
    \text{Bolus dose} & = 14 \text{ units (~5 units AC)} 
\end{align*} \]
### Inpatient Glycemic Goals:

- **Noncritically Ill Patients**
  - Goals: premeal <140 mg/dl + all random <180 mg/dl
  - Adjust for prior control, goals of care, severe comorbidities
  - Preferred Agent: SQ insulin (basal + nutritional + correction)

- **Critically Ill Patients**
  - Preferred Agent: IV Insulin
  - Goals: 140–180 mg/dl (target closer to 140 mg/dl)
  - Avoid values <110 mg/dl

---

**RABBIT 2 Trial:**

<table>
<thead>
<tr>
<th></th>
<th>Basal-bolus</th>
<th>SSI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TDD</strong></td>
<td>22+/−2 (basal)</td>
<td>20+/−1 (bolus)</td>
</tr>
<tr>
<td><strong>Goal Mean Glc</strong></td>
<td>66%</td>
<td>38%*</td>
</tr>
<tr>
<td><strong>Mean Glc</strong></td>
<td>166+/−32</td>
<td>193+/−54*</td>
</tr>
<tr>
<td></td>
<td>147+/−36</td>
<td>165+/−41*</td>
</tr>
<tr>
<td></td>
<td>164+/−35</td>
<td>188+/−45*</td>
</tr>
<tr>
<td><strong>Hypoglycemia</strong></td>
<td>3%(0.4%)</td>
<td>3%(0.2%)</td>
</tr>
<tr>
<td><strong>Hyperglycemia</strong></td>
<td>0%</td>
<td>14%*</td>
</tr>
</tbody>
</table>

Glycemic control rapidly improved after switching to basal-bolus regimen after persistent severe hyperglycemia despite increasing doses of RISS.
Conventional Glucose Control
- Target: < 180 mg/dl
- Mean: 144 +/- 23 mg/dl
- Death: 24.9%

Intensive Glucose Control
- Target: 81-108 mg/dl
- Mean: 115 +/- 18 mg/dl
- Death: 27.5%

NICE-SUGAR
- “…should NOT lead to an abandonment of the concept of good glucose management in the hospital setting.”
- “…compared to a control group whose glucose control was good (average glucose 144 mg/dl).”
- “…reasonable for clinicians to treat critical care patients with the less intensive, yet good-glucose control strategies used in the conventional arm…”

Recommended Insulin Regimen

<table>
<thead>
<tr>
<th>Phase</th>
<th>Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Op</td>
<td>Basal + SS</td>
</tr>
<tr>
<td>Intra-Op</td>
<td>IV Insulin</td>
</tr>
<tr>
<td>Post-Op</td>
<td>IV Insulin → Basal + SS +/- Nutritional</td>
</tr>
</tbody>
</table>
Diabetic type
- Type I: **need** basal insulin
- Type II: +/- basal insulin

Surgery Characteristics
- Type (Major vs Minor)
- Timing
- Duration
- Anesthesia (epidural vs general)

Preoperative Evaluation:

Outpatient Diabetic Rx
- Diet-controlled
- Oral agents
  - Secretagogues -> hypoglycemia
  - Biguanides -> lactic acidosis
  - Thiazolidinediones -> fluid retention
- Insulin

Diabetic Control prior to OR
- A1c

Preoperative Evaluation:

Diet-controlled
- FBG check prior to OR + SS

Oral Rx
- Hold am of surgery
- FBG check prior to OR + SS +/- Basal (0.2-0.3u/kg)

Insulin
- NPH: ½ am dose + D5 + SS
- Glargine: 100% dose + SS
- Insulin Pump: cont basal rate

Insulin **gtt** for MAJOR OR
VII: Honor Thy Turf (Or Thou Shalt Not Covet Thy Neighbor's Patient)

**Intra-operative Management:**

- Transition to SQ insulin
  - Address basal, nutritional, & correction needs
- Consider restarting Oral Rx
  - Tolerating PO well
  - Uncomplicated post-op course
  - No further OR needed
  - No contrasted studies

**Post-operative Management:**

- Transition to SQ insulin
  - Address basal, nutritional, & correction needs
- Consider restarting Oral Rx
  - Tolerating PO well
  - Uncomplicated post-op course
  - No further OR needed
  - No contrasted studies

**Transitions Discharge Planning:**

- Starts at admission
  - Prior Dx of DM/Hyperglycemia
  - Management of DM
  - Prior glycemic control (A1c)
  - Resource availability
“Survival Skills” Education
- 1. Level of understanding
- 2. Home BG goals & monitoring
- 3. S/Sx of hyper/hypoglycemia, prevention & treatment
- 4. Outpt MD
- 5. Eating patterns
- 6. Rx management
- 7. Sick-day management
- 8. Needle/syringe disposal

Transitions Discharge Planning:
- PCP F/u w/in 1 month
- Communication w/ PCP

Take-home Points:
- Diabetes is VERY prevalent in the surgical population
- Diabetes IMPACTS surgical outcomes
- Multiple INTERACTIONS between diabetes and surgery
- Requires ACTIVE management thru continuum of perioperative period
Questions?

References