GLUCOSE CONTROL IN THE SURGICAL SETTING

April 14, 2016

Disclosure

• I do not have any conflicts of interest or financial disclosures.
• To receive contact hours for this continuing education activity, the participant must:
  • Attend the entire session
  • Complete the program evaluation at the completion of the event

Objectives

• Outline Management of the surgical diabetic patient
• Summarize the importance of glucose control
• Reproduce fundamental principles for other specialties
• Identify potential complication for a diabetic surgical patient
Purpose

- To tell our journey of how we got to where we are today
- To illustrate the precipitating event that lead to a radical change in surgical patient care
- To show how fundamental principles can be applied to other surgical specialties
- The importance of a Glucose control quality committee
- Need for aggressive pre- and post-op glucose control
- Center of Excellence

Surgical Glucose Control

- A Surgeon's Epiphany
  - From working in the OR to working on the OR
  - From Surgery to Leadership/Quality
    - The IHI experience
    - SCIP
    - OR efficiency
    - A glimpse of what was to come

Initiation of Surgical Quality Improvement

- Surgical Care Improvement Program (SCIP)
- Surgical Site Infections (SSIs)
- Data collection and review
The Precipitating Event

• Data reviewed in 2009 showed 10 deep sternal infections
• SCIP recommendations were to keep POD#1 & #2 glucose levels below 200 mg/dL.
• Some early literature showed significant improvement at levels below 150 mg/dL.
• Implemented that year
• Required standard order sets & midlevel help to comply

EndoTool

• In order to maintain tight control of the post-op cardiac patient, diligent care was required
• New technologic advance with software management of glucose control became available
• EndoTool

Results

• Required closer interoperative glucose control
• Required the development of a glucose control IV insulin protocol
• Fallout
• No SCIP fallouts
• No further deep mediastinal infections since 2009
The Spillover

- SSI data review during the following year or so showed clusters of SSIs in the Orthopedic department.
- In looking at those chart reviews, glucose control was a factor in the SSI.
- Implemented the same tight control in the Ortho department with standard order sets & midlevel attention.

Other areas

- Neurosurgery
- OB/GYN
- Colon Surgery
- All the above became targets for CME survey & factored in to the Value Based Purchasing calculations.

Glucose Control Committee

- Essential for monitoring quality process
- Meets monthly
- Initially used to monitor SCIP compliance
- Has evolved as the complexity of the programs and challenges have increased.
Glucose Control Committee

- Members
  - Denise Blair, RN - Diabetes Clinical Nurse Specialist
  - Julie Koetter, RN - SCIP/SSI coordinator
  - Laura Zamora, RN - data abstractor & analyst
  - T. Kevin Thomas, MD - Physician champion
  - Ortho, CV and General surgery nursing representatives

Evolution of Care

- After making significant improvement in SSI rate on targeted areas it became obvious in reviewing charts that glucose control was a major issue in fallout.
- Approximately 40% of SSIs had a glucose issue peri-operatively
- Needed to find a way to intervene proactively

Pre-op Process

- Initially flagged pre-op glucose greater than 300
- Later incorporated HgA1C into the pre-op screening for all CV, Ortho & Neurosurgery cases
- Adopted for elective colorectal cases
- Recommended for Elective ObGyn & C-sections
- Recommended for all patients with implants
- Department of Surgery recommended screening for all patients
Goals

- Recommendation to the Department of Surgery was to consider cancelling elective cases with morning fasting glucose greater than 300 mg/dL or an HgbA1C greater than 8.5%
- Later further research supported tighter control of 250 mg/dL and 7.5%, respectively

Hemoglobin A1c

- Reflects the average blood glucose level for the past 2-3 months
- Measures the percentage of hemoglobin that is coated with glucose (glycated)
- The higher the A1c level, the more at risk the patient is for surgical site infection (SSI)

Current Process

- If the A1c is >8.5% (this is an average glucose of 196 mg/dL) or random glucose on BMP is >300 mg/dL, the surgeon is contacted with the results (this verbiage is on the pre-op order sets).

- On 12/2/13, glucose control in the surgical patient was discussed at the Surgery Section meeting. Based on evidence relating SSI to glucose control, it was recommended that ideal glucose control pre-op in elective surgical cases consider an A1c to be <7.5% (this is an average glucose of 168 mg/dL) or random glucose <250 mg/dL before undergoing surgery.
  - Further, if the patients with levels outside either of these ranges should therefore be considered for cancellation and further glucose control measures implemented.
Interpreting the Hemoglobin A1c

<table>
<thead>
<tr>
<th>A1c Level</th>
<th>Estimated Average Blood Glucose Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>97 mg/dL</td>
</tr>
<tr>
<td>6%</td>
<td>106 mg/dL</td>
</tr>
<tr>
<td>7%</td>
<td>115 mg/dL</td>
</tr>
<tr>
<td></td>
<td>126 mg/dL</td>
</tr>
<tr>
<td>8%</td>
<td>133 mg/dL</td>
</tr>
<tr>
<td>9%</td>
<td>150 mg/dL</td>
</tr>
<tr>
<td>10%</td>
<td>167 mg/dL</td>
</tr>
<tr>
<td>11%</td>
<td>183 mg/dL</td>
</tr>
<tr>
<td></td>
<td>196 mg/dL</td>
</tr>
<tr>
<td>12%</td>
<td>212 mg/dL</td>
</tr>
<tr>
<td>13%</td>
<td>229 mg/dL</td>
</tr>
<tr>
<td>14%</td>
<td>246 mg/dL</td>
</tr>
</tbody>
</table>

Preadmission Test for A1c

- On pre-admission, a BMP and an A1c is performed on all total hip/knee replacements, CABG/Valve and Neuro surgeries.
- On all other surgical cases, the A1c is listed but the box is not hard checked – therefore left up to the surgeon to order (or not).

Hip & Knee Arthroplasties at UR

- 2011 – 2015:
  - 1,573 hip & knee arthroplasties (total & hemic) have been performed.
  - The average A1c has been 5.9%
  - Major focus on glucose control pre-op and in the immediate post-op period (goal of fasting glucose <150 mg/dL on POD #1 & #2)
  - Only 16 cases (1.0%) have been reported as SSIs
CABG/Valves at UR

- 2011 – 2015:
  - 811 CABG/Valves have been performed
  - The average A1c has been 6.6%
  - Major focus on glucose control — initiating EndoTool on all post-op patients who meet the glucose threshold of 130 mg/dL or more, known diabetics or those meeting the pre-diabetes criteria are kept on EndoTool 48 hours (those with normoglycemia who required EndoTool are converted off to a correction scale until glucose are consistently <140 mg/dL). As of 2014, the goal is glucose control in the 18-24 hours post-anaesthesia end time window.
  - Only 14 cases (1.7%) have been reported as SSIs (chest & leg)

SSIs at UR

- 2011 – 2015:
  - 249 SSIs have been reported
  - 106 (42.6%) did not have an A1c done

<table>
<thead>
<tr>
<th>Type</th>
<th># of Cases</th>
<th>A1c Average (%)</th>
<th>A1c Range (%)</th>
<th>No A1c (#)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuro</td>
<td>39</td>
<td>6.1%</td>
<td>4.7 – 8.3%</td>
<td>13</td>
</tr>
<tr>
<td>Orth (non TKA/THA)</td>
<td>20</td>
<td>6.3%</td>
<td>4.5 – 12.6%</td>
<td>6</td>
</tr>
<tr>
<td>Cardiac (non CABG/Valve)</td>
<td>16</td>
<td>6.6%</td>
<td>4.9 – 11.3%</td>
<td>9</td>
</tr>
<tr>
<td>Obst/Gyn</td>
<td>38</td>
<td>8.4%</td>
<td>5.8 – 13.1%</td>
<td>33</td>
</tr>
<tr>
<td>General</td>
<td>78</td>
<td>6.5%</td>
<td>4.8 – 12.2%</td>
<td>31</td>
</tr>
<tr>
<td>Cosmetic</td>
<td>11</td>
<td>6.3%</td>
<td>5.8 – 6.8%</td>
<td>8</td>
</tr>
<tr>
<td>CABG/Valve</td>
<td>14</td>
<td>7.6%</td>
<td>5.1 – 13.3%</td>
<td>2</td>
</tr>
<tr>
<td>TKA/THA (total &amp; hemi)</td>
<td>16</td>
<td>6.1%</td>
<td>5.3 – 7.0%</td>
<td>1</td>
</tr>
<tr>
<td>EHS</td>
<td>7</td>
<td>6.3%</td>
<td>5.9 – 6.6%</td>
<td>5</td>
</tr>
<tr>
<td>TOTALS</td>
<td>249</td>
<td>6.6%</td>
<td>4.5 – 13.7%</td>
<td>106</td>
</tr>
</tbody>
</table>
SSI Incidence as related to Hemoglobin A1c

Next Steps

• Day of Surgery
  • Perform an A1c on ALL patients who either have an implant or will receive an implant in surgery.
  • Continue to have an automatic A1c on those who are already pre-checked now (total joints, CABG/Valves, neuro).
  • Make sure all known diabetic patients are having an A1c done.
  • Add a FSBG pre-op on AM of surgery.
  • Consider ordering an A1c on all “high risk” patients pre-op.

Next Steps (continued)

• Day of Surgery
  • If FSBG is ≤250 mg/dL or less, initiate the standard pre-op anesthesia correction scale (can be modified as the current scale is conservative).
  • If FSBG is >250 mg/dL, consider EndoTool. If EndoTool is ordered, an automatic referral goes to the Diabetes Inpatient APN who can access the patient while in the hospital setting and follow-up with the patient for up to 4 weeks post-op for further diabetes medication/insulin adjustment.
  • We are required to track all SSI’s for 30 days (90% of SSI’s occur in the initial 30 days post-op). Patients who receive an implant are tracked for 90 days.
Who is at risk for developing SSI's?

• Criteria for the Diagnosis of Diabetes
  • A1c > 6.5% or
  • FPG (fasting plasma glucose) is 126 mg/dL (after an 8-hr fast) or
  • 2-h PG in the 75-g OGTT and glucose is 140 mg/dL or
  • Random glucose of 200 mg/dL with symptoms of hyperglycemia or in hyperglycemia crisis.

• Criteria for Diagnosis of “Categories of increased risk for diabetes” also known as pre-diabetes
  • A1c 5.7 - 6.4% or
  • Impaired Fasting Glucose (IFG): when fasting glucose is 100 mg/dL to 125 mg/dL or
  • Impaired Glucose Tolerate (IGT): 2-h PG in the 75-g OGTT is 140 mg/dL to 199 mg/dL.

Criteria for testing for diabetes in asymptomatic adult individuals

• Testing should be considered in all adults who are overweight (BMI ≥ 25 kg/m²) and have one or more additional risk factors:
  • Physical inactivity
  • First-degree relative with diabetes
  • High-risk ethnicity (e.g., African American, Latino, Native American, Asian American, Pacific Islander)
  • Women who delivered a baby weighing ≥ 9 lbs. or were diagnosed with gestational diabetes
  • Hypertension (≥ 140/90 mmHg or on therapy for hypertension)
  • HDL cholesterol level ≤ 35 mg/dL and/or triglyceride level ≥ 250 mg/dL.
  • Women with polycystic ovarian syndrome
  • A1c ≥ 5.7%, IGT or IFG on previous testing
  • Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)
  • History of CVD

• In the absence of the above criteria, testing for diabetes should begin at age 45 years.

* At-risk BMI may be lower in some ethnic groups.

Transition of Care

• Ensure an appropriate hand-off is made on the discharge to the primary care physician/provider as it relates to their diabetes.
• The Discharge Summary should reflect what the results of the A1c test was and what interventions were made as a result (was the patient placed on insulin, diabetes education ordered, followed by the APN, etc.).
Questions

• Discussion