Inpatient Glycemic Management
2016

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Disclosures – Speakers Bureaus

Merck & Co.
Janssen Pharmaceutical Companies
Sanofi-Aventis U.S.
Son, someday you will make a girl very happy, for a short period of time. Then she’ll leave you and be with new men who are ten times better than you could ever hope to be.

These men are called hockey players.
Inpatient Glycemic Management

- Review data on association between glucose levels and clinical outcomes in hospitalized patients and patients undergoing surgery
- Review results of inpatient and perioperative glycemic control trials
- Discuss potential mechanisms for discrepancies seen in largest inpatient glycemic control trials
- Review current consensus guidelines for inpatient and perioperative management of hyperglycemia
- Review strategies for evidence-based IV insulin and subcutaneous insulin use
- The St. Mark’s Inpatient Glycemic Control Project
Inpatient Glycemic Management

Review data on association between glucose levels and clinical outcomes in hospitalized patients and patients undergoing surgery.
Early Postoperative Glucose Control Predicts Nosocomial Infection Rate in Diabetic Patients (N=100)

Serum Glucose Postoperative Day 1

- Infections
  - BG < 220 mg/dL: 11.5%
  - BG > 220 mg/dL: 31.3%

- Infections Excluding UTI
  - BG < 220 mg/dL: 4.2%
  - BG > 220 mg/dL: 24.6%

Inpatient Glycemic Management

Hyperglycemia: An Independent Marker of In-Hospital Mortality in Patients with Undiagnosed Diabetes (N=2030)

- Normoglycemia: 1.7%
- Known Diabetes: 3.0%
- New Hyperglycemia: 16%*

*P<0.01

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Hyperglycemia-Related Mortality in Critically-Ill Patients Varies with Admission Diagnosis

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Review results of inpatient and perioperative glycemic control trials
Inpatient Glycemic Management

Intensive Insulin Therapy in Critically Ill Patients (LEUVEN-1 Study)

Study design: 1,548 patients admitted to surgical ICU randomized to either conventional insulin treatment or intensive insulin therapy:

- **Conventional therapy**
  - BG 180 – 200 mg/dL
  - (Mean 153 mg/dL)

- **Intensive therapy**
  - BG 80 – 100 mg/dL
  - (Mean = 103 mg/dL)

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Intensive Insulin Therapy in Critically Ill Patients
(LEUVEN-1 Study)

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Benefits and Risks of Tight Glucose Control in Critically Ill Adults: A Meta-Analysis

Study selection: 29 randomized controlled trials totaling 8,432 patients met criteria for tight vs. usual glucose control in adults intensive care patients

Results: Hospital mortality did not differ significantly 21.6% intensive vs. 23.3% conventional

No difference in mortality stratified by very tight goal (≤ 110 mg/dL) vs. moderately tight goal (< 150 mg/dL)

Tight glucose control not associated with decreased risk for new dialysis, but was associated with decreased risk for septicemia
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Study design: 6104 critically-ill patients randomized to intensive (81-108 mg/dl) vs. conventional (< 180 mg/dl) glucose control in adult intensive care patients.

Results: Increased mortality in intensive glucose arm (28%) vs. conventional glucose arm (25%) (p=0.02)

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Discuss potential mechanisms for discrepancies seen in largest inpatient glycemic control trials
Inpatient Glycemic Management

LEUVEN-1 Study vs. Subsequent Intervention Trials

Confounding Factors

1. Patients were ‘fed’ at a very high rate (200-300 grams CHO/day)

2. Hypoglycemia (blood glucose < 40 mg/dl):
   5.1% in Leuven 1 Study vs. 18.7% in Leuven II Study vs. 6.8% in NICE-SUGAR Study

3. Glucose measurement methods:
   Leuven I = arterial blood with ABG analyzer
   Leuven II = arterial or capillary blood with POC glucometer
   NICE-SUGAR = arterial blood with ABG or POC glucometer
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Blood glucose levels $\leq 180$ mg/dl are OK for most inpatients (critically ill $\leq 150$ mg/dl)!

But what about blood glucose variability??
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Glycemic Variability: An Independent Predictor of Mortality in Critically-Ill Patients
Inpatient Glycemic Management

Glycemic Variability: An Independent Predictor of Mortality in Critically-Ill Patients (N=3252 between 1999 and 2007)

Krinsley JS. Critical Care Medicine 2008;36:3008-3013
Inpatient Glycemic Management

Increased Glycemic Variability is Independently Associated with Length of Stay and Mortality in Non-Critically Ill Hospitalized Patients (n=935)

Results: For every 10 mg/dL increase in SD and 10–percentage point increase in CV, LOS increased by 4.4% and 9.7%, respectively.

Relative risk of death in 90 days also increased by 8% for every 10-mg/dL increase in SD

Increased Glycemic Variability Is Independently Associated With Length of Stay and Mortality in Noncritically Ill Hospitalized Patients (n=935)
Inpatient Glycemic Management

Detriment Effects of Hyperglycemia on Normal Physiology

Decreased immune response – ↓ global neutrophil phagocytic function

Inflammatory response/oxidative stress – ↑ TNF-α, IL-6, CRP, fatty acids

Coagulation effects – ↑ platelet aggregation


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Normal Myocyte Physiology

2/3 of energy from lipolysis and β-oxidation of FFAs (palmitate)

1/3 of energy from glycolysis

Acetyl coenzyme A

Hydrogen ions for oxidative phosphorylation through Kreb’s cycle

FFA intermediates, ↑O₂ consumption

90%

Pyruvate

↓ Insulin

Lactate
Inpatient Glycemic Management

The Providence Portland St. Vincent Project
Continuous Intravenous Insulin Infusion Reduces the Incidence of Deep Sternal Wound Infection in Diabetic Patients after Cardiac Surgery

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The Providence Portland St. Vincent Project
Continuous Insulin Infusion Reduces Mortality in Patients with Diabetes Undergoing Coronary Artery Bypass Grafting


Mortality

- Cardiac-related mortality
- Non-cardiac related mortality

Average postoperative glucose (mg/dl)

- < 150: 0.9%
- 150-175: 1.3%
- 175-200: 2.3%
- 200-225: 4.1%
- 225-250: 6.0%
- >250: 14.5%
## Inpatient Glycemic Management

Continuous Insulin Infusion Reduces Mortality in Patients with Diabetes Undergoing Coronary Artery Bypass Grafting

<table>
<thead>
<tr>
<th>Postoperative blood glucose (mg/dl, mean ± SD)</th>
<th>SQI</th>
<th>CII</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>214 ± 41</td>
<td>177 ± 30</td>
</tr>
<tr>
<td>Day of surgery</td>
<td>242 ± 61</td>
<td>187 ± 41</td>
</tr>
<tr>
<td>POD 1</td>
<td>205 ± 36</td>
<td>173 ± 28</td>
</tr>
<tr>
<td>POD 2</td>
<td>195 ± 39</td>
<td>176 ± 39</td>
</tr>
<tr>
<td>Observed deaths</td>
<td>5.3%</td>
<td>2.5%</td>
</tr>
<tr>
<td>RRR 57% (p = 0.001)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Inpatient Glycemic Management

Continuous Insulin Infusion Reduces Mortality in Patients with Diabetes Undergoing Coronary Artery Bypass Grafting

The individual daily average glucose levels from the day of surgery (odds ratio 1.006 per 1 mg/dL) and for POD 1 (odds ratio 1.013 per 1 mg/dL) and POD 2 (odds ratio 1.018 per 1 mg/dL) were each significant independent predictors of death. Glucose levels on POD 3 did not have a significant independent effect on mortality.

Inpatient Glycemic Management

Elevated Preoperative Hemoglobin A$_1$c Level is Associated With Reduced Long-Term Survival After Coronary Artery Bypass Surgery (N=3201)

Inpatient Glycemic Management

Elevated Preoperative Hemoglobin A₁c Level is Associated With Reduced Long-Term Survival After Coronary Artery Bypass Surgery (N=3201)

Conclusions: Poor preoperative glycemic control, as measured by an elevated HbA₁c, is associated with reduced long-term survival after coronary artery bypass surgery (p=0.001)

Optimizing glucose control in these patients may improve long-term survival

Inpatient Glycemic Management

Hyperglycemia During Cardiopulmonary Bypass is an Independent Risk Factor for Mortality in Patients Undergoing Cardiac Surgery (N=6280)

Mortality (%)

90 - 180 180 - 270 270 - 360 > 360

Highest Glucose Level on CPB (mg/dl)

Non-Diabetics

Diabetics

Inpatient Glycemic Management

Benefits of ‘Tight’ Glucose Control (<200 mg/dl) vs. Standard Therapy (200-250 mg/dl) in Patients Undergoing Cardiac Surgery

- Decreased mortality rates
- Decreased rates of deep sternal wound infections
- Improved LV function and decreased need for inotropes
- Decreased length of stay (LOS)
- Decreased mechanical ventilator time
- Decreased incidence of atrial fibrillation
- Decreased incidence of venous thromboembolic events
- Decreased incidence of UTI and pneumonia
Inpatient Glycemic Management

Review current consensus guidelines for inpatient and perioperative management of hyperglycemia
# Inpatient Glycemic Management Recommendations in 2016

## American Diabetes Association/AACE: 2016 Standards of Care

<table>
<thead>
<tr>
<th>Patient</th>
<th>Premeal BG</th>
<th>Random BG</th>
<th>Evidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critically ill</td>
<td>140-180 mg/dL</td>
<td>140-180 mg/dL</td>
<td>A</td>
</tr>
<tr>
<td>Noncritical</td>
<td>&lt;140 mg/dL</td>
<td>&lt;180 mg/dL</td>
<td>C</td>
</tr>
</tbody>
</table>

## American Heart Association: Hyperglycemia and Acute Coronary Syndrome

<table>
<thead>
<tr>
<th>Patient</th>
<th>Blood Glucose</th>
<th>Evidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critically ill</td>
<td>90-140 mg/dL</td>
<td>C</td>
</tr>
<tr>
<td>Noncritical</td>
<td>&lt;180 mg/dL</td>
<td>C</td>
</tr>
</tbody>
</table>

## Society of Thoracic Surgeons

<table>
<thead>
<tr>
<th>Patient</th>
<th>Blood Glucose</th>
<th>Evidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac surgery</td>
<td>&lt;180 mg/dL</td>
<td>B</td>
</tr>
<tr>
<td>IABP, HD, LVAD, &gt; 3 days ICU</td>
<td>&lt;150 mg/dL</td>
<td>B</td>
</tr>
</tbody>
</table>
Inpatient Glycemic Management

Use Insulin Drip For:

👍 Critically-ill patients
👍 DKA and hyperglycemic hyperosmolar state (HHS)
👍 Cardiovascular surgery patients
Inpatient Glycemic Management

IV insulin infusions should be administered based on validated written or computerized protocols:

http://inpatient.aace.com/protocols-and-order-sets

- Yale insulin infusion protocol
- UPMC regular insulin IV infusion protocol
Bode: Transition from Intravenous Insulin Infusion to Subcutaneous Therapy

Example

- Patient has received an average of 2 U/h IV during previous 6 h. Recommended doses are as follows:
  - SC TDD is 80% of 24-h insulin requirement:
    - 80% of (2 U/h x 24) = 38 U
  - Basal dose is 50% of SC TDD:
    - 50% of 38 U = 19 U of long-lasting analogue
  - Bolus total dose is 50% of SC TDD:
    - 50% of 38 U = 19 U of total prandial rapid-acting analogue or ~6 U with each meal
  - Correction dose is actual BG minus target BG divided by the CF, and CF is equal to 1,700 divided by TDD:
    - CF = 1,700 ÷ 38 = ~40 mg/dL
    - Correction dose = (BG – 100) ÷ 40

* BG = blood glucose; CF = correction factor; IV = intravenously; SC = subcutaneous; TDD = total daily dose

Pharmacokinetics of Insulin Preparations

- Short acting Analog
- Regular
- NPH
- Glargine
- Detemir
Basal-Bolus Insulin Therapy: Insulin Glargine at HS and Mealtime Lispro or Aspart

Insulin Effect

B L D HS

Insulin aspart/glulisine/lispro
Insulin glargine

Inpatient Glycemic Management

Roller Coaster Effect of Insulin Sliding Scale

- Insulin shot
- No insulin given

Glucose vs. Time graph
Initiating Insulin Therapy in the Hospital

1. Obtain patient weight in kg
2. Calculate total daily dose (TDD) as 0.4-0.5 units per kg/day
3. Choose the dosing schedule:
   - Give 50-60% of TDD as basal insulin
   - Give 40-50% of TDD as bolus (premeal or nutritional) insulin
4. Use Correction Insulin for BG above goal range
5. Adjust according to results of BSGM
6. Adjust dose for NPO status or changes in clinical status
Randomized Study of Basal-Bolus Insulin Therapy in the Inpatient Management of Patients With Type 2 Diabetes (RABBIT 2 Trial)

- 130 nonsurgical insulin-naive patients age 18-80 with known type 2 diabetes admitted to noncritical care unit
- Randomly assigned to sliding scale insulin (SSI) or a basal-bolus regimen with glargine and glulisine
  - 0.4 units per kg/day for BG 140-200
  - 0.5 units per kg/day for BG > 200
  - 50% given as glargine and 50% as glulisine
- Oral antidiabetic drugs discontinued
- 2 hypoglycemic events (BG < 60 mg/dl) in each group


AACE Inpatient Glycemic Control Resource Center
Adjusting scheduled insulin regimen

If fasting and premeal BG > 140 mg/dl, dose of glargine increased by 20%

For BG < 70 mg/dl, glargine reduced by 20%


AACE Inpatient Glycemic Control Resource Center
Randomized Study of Basal-Bolus Insulin Therapy in the Inpatient Management of Patients With Type 2 Diabetes (RABBIT 2 Trial)

Blood Glucose (BG) Concentration Over Time for Both Groups

- SSI
- Basal-Bolus

*P<.01; †P<.05.


AACE Inpatient Glycemic Control Resource Center
Persistent hyperglycemia (BG > 240 mg/dL) is common (15%) with SSI therapy.

Inpatient Glycemic Management

Predictive Value of Admission Hemoglobin A1c on Inpatient Glycemic Control and Response to Insulin Therapy in Medicine and Surgery Patients With Type 2 Diabetes

<table>
<thead>
<tr>
<th>Admission A1c</th>
<th>Mean Hospital BG</th>
<th>Mean Insulin Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 7%</td>
<td>152 ± 35</td>
<td>28 ± 20</td>
</tr>
<tr>
<td>7-9%</td>
<td>161 ± 29</td>
<td>36 ± 21</td>
</tr>
<tr>
<td>&gt;9%</td>
<td>178 ± 38</td>
<td>40 ± 23</td>
</tr>
</tbody>
</table>

The St. Mark’s Hospital Inpatient Glycemic Control Project
Implement best-practice, validated subcutaneous basal-bolus insulin protocol in non-critically ill patients (RABBIT-2 study)

Implement safe, validated insulin infusion protocol in perioperative period for cardiac surgery patients (modified Portland protocol)

Initiate pre-operative intervention for poorly-controlled patients with diabetes and patients with newly-diagnosed diabetes anticipating cardiac surgery (The St. Mark’s Insulin Protocol)

Form ‘Glucose Rounding Team’ to round daily in ICU, medical and surgical floors – make presence felt, show commitment from hospital, consult based on blood glucose triggers

Gather data: glucometrics and clinical outcomes
NOTE: A physician order is required prior to initiation of this protocol.
Include this protocol with all ICU cardiovascular surgery admission post op order sets.

ICU TARGET BLOOD GLUCOSE (BG): 100 to 150 mg/dL

1. **INSULIN INFUSION INITIATION CRITERIA:**
   - BG check upon arrival to ICU, then Q 2 hours x 2, then Q 4 hours at the allotted times (1200, 1600, 2000, 0000, 0400, 0800) continuously until POD#2 at 0400.
   - Send blood for HgbA1c if not already done.
   - Start Insulin Infusion Protocol for any BG > 125 mg/dL.

2. **GENERAL ORDERS** for ALL patients on Insulin Infusion Protocol:
   a. **ALL intermittent (non-continuous) IV medications** should be mixed in normal saline if no compatibility issues exist.
      - Do **NOT** administer intermittent (non-continuous) IV medications mixed in dextrose-containing solutions if possible.
   b. Do **NOT** use any dextrose-containing IV solutions for maintenance IV or daily IV fluids except when TPN is required.

3. “**INITIAL” INSULIN INFUSION DOSING TABLE / “TITRATION” INSULIN INFUSION DOSING TABLE / FREQUENCY OF BG MONITORING:**

   **Table 1. “Initial” Insulin Infusion Dosing Table**
   Begin using Table 2 with the first BG check 30 minutes after the insulin infusion is started.

<table>
<thead>
<tr>
<th>Blood Glucose (mg/dL)</th>
<th>IV Regular Insulin Bolus Doses</th>
<th>Initial Regular Insulin Infusion Rate (Units/Hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NIDDM</td>
</tr>
<tr>
<td>110 – 124</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>125 – 150</td>
<td>2 Units</td>
<td>1</td>
</tr>
<tr>
<td>151 – 180</td>
<td>4 Units</td>
<td>2</td>
</tr>
<tr>
<td>181 – 240</td>
<td>6 Units</td>
<td>3.5</td>
</tr>
<tr>
<td>241 – 300</td>
<td>8 Units</td>
<td>5</td>
</tr>
</tbody>
</table>
St. Mark’s Hospital Inpatient Glycemic Control Project

Weight-Based Basal-Bolus Subcutaneous Insulin Order

- dextrose 50% in water (D50W) injection 25 mL
- glucose chewable tablet 12 g
- glucagon (human recombinant) injection 1 mg

Order Basal-Bolus Insulin

Order Home Insulin Regimen

Order Corrective Dose Insulin

Corrective Dose Insulin Algorithms:
- Low-Dose Algorithm
- Medium-Dose Algorithm
- High-Dose Algorithm
- Very High-Dose Algorithm

Additional SmartSet Orders
St. Mark’s Hospital Inpatient Glycemic Control Project

Weight-Based Basal-Bolus Subcutaneous Insulin Order

<table>
<thead>
<tr>
<th>Basal Bolus Insulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Blood Glucose Greater Than 200 mg/dL (0.5 units/kg daily)</td>
</tr>
<tr>
<td>Initial Blood Glucose Less Than or Equal to 200 mg/dL (0.4 units/kg daily)</td>
</tr>
</tbody>
</table>

-glucagon (human recombinant) injection 1 mg

1 mg, Intramuscular, As needed, Low blood sugar, Low Blood Sugar
St. Mark’s Hospital Inpatient Glycemic Control Project

Weight-Based Basal-Bolus Subcutaneous Insulin Order

Order Basal-Bolus Insulin

Basal Bolus Insulin

- Initial Blood Glucose Greater Than 200 mg/dL (0.5 units/kg daily)
  - insulin glargine (LANTUS) injection 19 Units
    - 0.25 Units/kg × 75.3 kg = 19 Units, Subcutaneous, Bedtime

And

- insulin lispro (HumaLOG) injection 6 Units
  - 0.083 Units/kg × 75.3 kg = 6 Units, Subcutaneous, 3 times

Order Home Insulin Regimen

Home Insulin

Order Corrective Dose Insulin
# St. Mark’s Hospital Inpatient Glycemic Control Project

## RALS Mean BG Values

<table>
<thead>
<tr>
<th>Category</th>
<th>2009</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>All BG measurements</td>
<td>St. Mark’s Hospital 163 (165)</td>
<td>St. Mark’s Hospital 159 (166)</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>2013</td>
</tr>
<tr>
<td>ICU measurements</td>
<td>St. Mark’s Hospital 157 (157)</td>
<td>St. Mark’s Hospital 149 (161)</td>
</tr>
<tr>
<td>Non-ICU measurements</td>
<td>St. Mark’s Hospital 164 (168)</td>
<td>St. Mark’s Hospital 162 (168)</td>
</tr>
</tbody>
</table>
St. Mark’s Hospital Inpatient Glycemic Control Project

CMS Reported Core Measure for Glucose Control After Heart Surgery (Timely and Effective Care)

2011: 84-87% success rate

2015: 98-99% success rate

2015 U of U: 88-89% success rate
2015 IMC: 93% success rate

www.medicare.gov/hospitalcompare
Association of Postoperative Hyperglycemia With Clinical and Economic Outcomes in Cardiac Surgery (isolated valve, isolated coronary artery bypass graft [CABG], transplantation or ventricular assist device, CABG with valve, thoracic aortic, other)


<table>
<thead>
<tr>
<th>Demographics</th>
<th>No DM (n = 3,344)</th>
<th>NITDM (n = 553)</th>
<th>ITDM (n = 419)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>64.7 (54.9, 74.5)</td>
<td>67.6 (60.0, 75.2)</td>
<td>66.0 (57.7, 72.9)</td>
</tr>
<tr>
<td>Male</td>
<td>2,209 (0.66)</td>
<td>380 (0.69)</td>
<td>261 (0.62)</td>
</tr>
<tr>
<td>White</td>
<td>2,824 (0.84)</td>
<td>421 (0.76)</td>
<td>294 (0.70)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laboratory analyses</th>
<th>No DM (n = 3,344)</th>
<th>NITDM (n = 553)</th>
<th>ITDM (n = 419)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nontight glucose control*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum glucose, mg/dL</td>
<td>170 (152, 194)</td>
<td>201 (178, 232)</td>
<td>213 (181, 249)</td>
</tr>
<tr>
<td>Average glucose, mg/dL</td>
<td>135 (126, 146)</td>
<td>150 (137, 164)</td>
<td>153 (140, 170)</td>
</tr>
<tr>
<td>Hyperglycemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥180 mg/dL</td>
<td>820 (0.37)</td>
<td>239 (0.73)</td>
<td>195 (0.76)</td>
</tr>
<tr>
<td>&lt;70 mg/dL</td>
<td>87 (0.04)</td>
<td>11 (0.03)</td>
<td>10 (0.04)</td>
</tr>
<tr>
<td>≥2 Hyperglycemic measures, n (%)</td>
<td>287 (12.9)</td>
<td>144 (43.8)</td>
<td>138 (53.7)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tight glucose control**</th>
<th>No DM (n = 3,344)</th>
<th>NITDM (n = 553)</th>
<th>ITDM (n = 419)</th>
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</thead>
<tbody>
<tr>
<td>Maximum glucose, mg/dL</td>
<td>168 (151, 189)</td>
<td>196 (170, 234)</td>
<td>209 (169, 243)</td>
</tr>
<tr>
<td>Average glucose, mg/dL</td>
<td>133 (123, 144)</td>
<td>147 (131, 163)</td>
<td>145 (125, 169)</td>
</tr>
<tr>
<td>Hyperglycemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥180 mg/dL</td>
<td>374 (0.34)</td>
<td>140 (0.62)</td>
<td>110 (0.68)</td>
</tr>
<tr>
<td>&lt;70 mg/dL</td>
<td>44 (0.04)</td>
<td>11 (0.05)</td>
<td>15 (0.09)</td>
</tr>
<tr>
<td>≥2 Hyperglycemic measures, n (%)</td>
<td>125 (11.2)</td>
<td>89 (39.7)</td>
<td>75 (46.3)</td>
</tr>
<tr>
<td>HbA1c%</td>
<td></td>
<td>NA</td>
<td>6.7 (6.3, 7.4)</td>
</tr>
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Association of Postoperative Hyperglycemia With Clinical and Economic Outcomes in Cardiac Surgery (isolated valve, isolated coronary artery bypass graft [CABG], transplantation or ventricular assist device, CABG with valve, thoracic aortic, other)

Association of Postoperative Hyperglycemia With Clinical and Economic Outcomes in Cardiac Surgery
(isolated valve, isolated coronary artery bypass graft [CABG], transplantation or ventricular assist device, CABG with valve, thoracic aortic, other)

Association of Postoperative Hyperglycemia With Clinical and Economic Outcomes in Cardiac Surgery (isolated valve, isolated coronary artery bypass graft [CABG], transplantation or ventricular assist device, CABG with valve, thoracic aortic, other)

St. Mark’s Hospital Inpatient Glycemic Control Project
The Future – Continuous Glucose Monitoring
Provider Perceptions of Diabetes Education

USU IRB Approval: 2/10/2015
Approval Terminates: 2/9/2018
Protocol #6344

http://tinyurl.com/dmedresearch
Sorry, not my job...