Implementation of an Interprofessional Team to Prevent Inpatient Hypoglycemic Events

November 12, 2016
St Joseph’s Health – Fast Facts

- Founded 1869 by Sisters of St. Francis
- Patient Volumes (2014)
  - Inpatient discharges: **27,635**
  - Primary Care Visits: **66,554**
  - Emergency Department Visits: **66,835**
  - Psychiatric Emergency Program: **13,464**
  - Outpatient Surgeries: **9,791**
  - Home Healthcare Admissions: **6,332**
- Employees
  - FTEs: **3,636**
  - Volunteers: **500**
- Medical Staff
  - Physicians and Dentists: **870**
Diabetic Glycemic Control

• High proportion of diabetes in Onondaga County.
  – Onondaga: 13.9%
  – National: 10.4% & New York: 9.4%

• Insulin administered 23% Hospital Days at St Joseph’s
Morbidity and Mortality associated with Severe Hypoglycemia

Current Medical Research & Opinion 29:101-107, 2013
1. Increased in inpatient mortality risk:
   • <70 mg/dL – adjusted odds ratio (OR) 1.66
   • <50 mg/dL – adjusted odds ratio (OR) 1.44
2. Increase LOS: 8.2 vs. 5.2 days.

1. Increase in inpatient mortality risk:
   • 41-70 mg/dL – adjusted odds ratio (OR) 1.62
   • <40 mg/dL – adjusted odds ratio (OR) 2.05
2. Increase LOS cw >70mg/dL group:
   • 41-70 mg/dL – 1.51 fold
   • <40 mg/dL – 2.33 fold
Hypoglycemia 5.19% vs NYSPFP 6.99% (Inpatients with at least one glucose <50mg/dL/100 prescribed insulin) vs Current Medical Research & Opinion 29:101-107, 2013 7.02%
Hypoglycemia Initiatives

1. Interprofessional Hypoglycemia Response Team.
2. Revised Sub Q insulin protocol.
4. Leverage new EHR to create actionable and analytical reports
Hypoglycemia Response Team

• Interprofessional Team:
  – Endocrinology
  – Pharmacy
  – Dietary
  – Nursing

• Patients with severe hypoglycemia <50mg/dL identified.
  – Daily EPIC EHR report

• Plan formulated and attending provider contacted.
No Patients!
Lantus Insulin Protocol

• Proactively identify patients at risk for severe hypoglycemia.
• Patients with a fasting glucose ≤ 100 mg/dL identified.
  – Daily EPIC EHR report.
  – Pharmacy provides Lantus to floors.
  – Glucose 70-100 mg/dL: pharmacy decreases Lantus by 20%.
  – Glucose <70 mg/dL: hypoglycemia protocol started and provider contacted.
# Subcutaneous Insulin Order Form (Adults) - Not for pts on TPN / Enteral Feeds

**Definitions:**
- Frail = Insulin Naive, the elderly and patients with hepatic, cardiac, or renal impairment
- Average = BMI ≤ 35
- Insulin Resistant = BMI > 35 or states of high insulin resistance (e.g., systemic infection or corticosteroids)

1. Is patient a Type 1 diabetic or using an Insulin Pump □ YES □ NO
2. Discontinue all other subcutaneous insulin orders:
3. Fingerstick blood glucose □ ac only □ use glucometer for NPO only □ Other: ______________________
4. HbA1C
5. Diet: Diabetic (Carbohydrate Diet) □ Additional Diet Restrictions: __________________________

### 6. Basal Insulin (Lantus)
- Do not use Basal Insulin (Lantus)
- Starting dose recommendations:
  - Frail = 0.1 units/kg SQ daily at 2100
  - Average = 0.2 units/kg SQ daily at 2100
  - Insulin Resistant = 0.3 units/kg SQ daily at 2100
- Use actual weight (maximum starting dose 40 units in insulin naive patients)

For patients on Lantus prior to admission consider a 25% reduction in outpatient dose. Use caution with inpatient Lantus starting doses >80 units.

- □ Do not use Lantus
- □ Dose: ______ units SQ daily at 2100

### Basal Insulin (Lantus) Adjustment based on AM Blood Glucose

<table>
<thead>
<tr>
<th>Blood Glucose</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;70 mg/dL</td>
<td>Nursing to initiate hypoglycemia protocol</td>
</tr>
<tr>
<td>70-100 mg/dL</td>
<td>Pharmacy to decrease total daily Lantus dose by 20%</td>
</tr>
<tr>
<td>101-200 mg/dL</td>
<td>No change</td>
</tr>
</tbody>
</table>

- □ Hyperglycemia adjustment
  - 201 – 300 mg/dL Pharmacy to increase total daily Lantus dose by 10%
  - > 301 mg/dL Pharmacy to increase total daily Lantus dose by 15%

**Standard AM Lantus administration time is 1000**

### 8. If NPO: Give usual Lantus dose and test fingerstick glucose q6h and use Humalog: Siding scale below (0000 - 0600 - 1200 - 1800)

<table>
<thead>
<tr>
<th>Frail</th>
<th>Average</th>
<th>Insulin Resistant</th>
<th>Custom Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>121-170</td>
<td>0 units</td>
<td>0 units</td>
<td>____________ units</td>
</tr>
<tr>
<td>171-220</td>
<td>2 units</td>
<td>3 units</td>
<td>____________ units</td>
</tr>
<tr>
<td>221-270</td>
<td>3 units</td>
<td>5 units</td>
<td>____________ units</td>
</tr>
<tr>
<td>271-320</td>
<td>4 units</td>
<td>7 units</td>
<td>____________ units</td>
</tr>
<tr>
<td>321-370</td>
<td>5 units</td>
<td>9 units</td>
<td>____________ units</td>
</tr>
<tr>
<td>371-420</td>
<td>6 units</td>
<td>11 units</td>
<td>____________ units</td>
</tr>
<tr>
<td>&gt;420 cal MD</td>
<td>7 units</td>
<td>13 units</td>
<td>____________ units</td>
</tr>
</tbody>
</table>

**MD Signature:**
**Nursing Signature:**
**Date/Time:**

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**ST. JOSEPH’S Health**
A Higher Level of Care
Severe Hypoglycemic Episodes (<50mg/dL)

Rate per 1000 Pt-Ins days

Initiation Hypoglycemia Response Team and Pharmacy Lantus Protocol
Severe Hypoglycemic Episodes (<50mg/dL)

Initiation Hypoglycemia Response Team and Pharmacy Lantus Protocol
Severe Hypoglycemic Episodes (<50mg/dL)

Initiation Hypoglycemia Response Team and Pharmacy Lantus Protocol
Inpatient Hyperglycemia

Initiation Hypoglycemia Response Team and Pharmacy Lantus Protocol

Percent Pt-Insulin Days Avg Glc > 200 mg/dL
Repeat Severe Hypoglycemic Episodes (<50mg/dL)

Initiation Hypoglycemia Response Team and Pharmacy Lantus Protocol
Severe Hypoglycemic Episodes (<50mg/dL) and Hyperkalemia

Initiation Hypoglycemia Response Team and Pharmacy Lantus Protocol

Hyperkalemia OS Final

K+ guidelines 50g bolus D10

Rate per 1000 Pt-Ins days
Severe Hypoglycemia and Insulin Administration for Hyperkalemia Treatment

- Hyperkalemia OS Final
- K+ guidelines 50g bolus D10

Percent Insulin Administrations

- May 14
- Jun 14
- Jul 14
- Aug 14
- Sep 14
- Oct 14
- Nov 14
- Dec 14
- Jan 15
- Feb 15
- Mar 15
- Apr 15
- May 15
- Jun 15
- Jul 15
- Aug 15
- Sep 15
- Oct 15
- Nov 15
- Dec 15
- Jan 16
- Feb 16
- Mar 16
- Apr 16
- May 16
- Jun 16
- Jul 16
- Aug 16
- Sep 16
- Oct 16
Hyperkalemia Treatment Order Set Medications

Medications

- For mild hyperkalemia (K+ 5.5 to 6.5 mEq/L):
  - Eliminate sources of potassium administration
  - Use therapies to enhance elimination if normal renal function or mild renal impairment

  - furosemide (LASIX) injection
  - Sodium polystyrene sulfonate (Kayexelate):

- For severe hyperkalemia (K+ greater than 6.5 mEq/L) or hyperkalemia with EKG changes or rapidly increasing K+:
  - Use therapies to stabilize myocardium and redistribute potassium (rapid, short acting therapies: calcium lasting 30-60 minutes; insulin peak 30-60 minutes lasting 4-6 hours; Beta agonists peak 90 minutes)
  - Consider hemodialysis. Also use therapies
  - Eliminate sources of potassium administration

- Insulin & Dextrose with Fingersticks

  - Calcium Replacement (for cardiac membrane)
  - Insulin & Dextrose with Fingersticks
  - Bicarbonate
  - albuterol (PROVENTIL) nebulizer solution
  - furosemide (LASIX) injection
  - Sodium polystyrene sulfonate (Kayexelate)
## Timing POC Glc and Insulin Administration

<table>
<thead>
<tr>
<th>Glucose to Insulin Administration Times</th>
<th>All Months</th>
<th>Three Months Ago</th>
<th>Two Months Ago</th>
<th>Last Month</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summary for All Units</strong></td>
<td>70% (AvgT=29 n=20911)</td>
<td>66% (AvgT=31 n=6696)</td>
<td>69% (AvgT=29 n=6839)</td>
<td>75% (AvgT=27 n=7376)</td>
</tr>
<tr>
<td><strong>SJH 3-4 PROGRESSIVE CARE UNIT</strong></td>
<td>69% (AvgT=30 n=913)</td>
<td>60% (AvgT=37 n=332)</td>
<td>73% (AvgT=28 n=279)</td>
<td>76% (AvgT=26 n=302)</td>
</tr>
<tr>
<td><strong>SJH AMBULATORY CARE</strong></td>
<td>14% (AvgT=67 n=14)</td>
<td>17% (AvgT=81 n=6)</td>
<td>0% (AvgT=57 n=3)</td>
<td>20% (AvgT=57 n=5)</td>
</tr>
<tr>
<td><strong>SJH BIRTH PLACE/L&amp;D</strong></td>
<td>100% (AvgT=12 n=1)</td>
<td>100% (AvgT=12 n=1)</td>
<td>100% (AvgT=12 n=1)</td>
<td>100% (AvgT=12 n=1)</td>
</tr>
<tr>
<td><strong>SJH CARDIOVASCULAR LAB</strong></td>
<td>0% (AvgT=63 n=1)</td>
<td>0% (AvgT=63 n=1)</td>
<td>0% (AvgT=63 n=1)</td>
<td>0% (AvgT=63 n=1)</td>
</tr>
<tr>
<td><strong>SJH COMP PSYCH ED</strong></td>
<td>29% (AvgT=48 n=34)</td>
<td>44% (AvgT=32 n=9)</td>
<td>29% (AvgT=44 n=21)</td>
<td>0% (AvgT=106 n=4)</td>
</tr>
<tr>
<td><strong>SJH D3 EAST SURGICAL ICU UNIT</strong></td>
<td>72% (AvgT=29 n=1736)</td>
<td>70% (AvgT=30 n=541)</td>
<td>67% (AvgT=31 n=502)</td>
<td>78% (AvgT=27 n=693)</td>
</tr>
<tr>
<td><strong>SJH D3 WEST MEDICAL ICU UNIT</strong></td>
<td>93% (AvgT=10 n=1477)</td>
<td>93% (AvgT=11 n=503)</td>
<td>92% (AvgT=12 n=500)</td>
<td>95% (AvgT=8 n=474)</td>
</tr>
<tr>
<td><strong>SJH D4 CARDIOVASCULAR SURGERY UNIT</strong></td>
<td>63% (AvgT=33 n=2328)</td>
<td>58% (AvgT=35 n=812)</td>
<td>61% (AvgT=34 n=803)</td>
<td>71% (AvgT=29 n=713)</td>
</tr>
<tr>
<td><strong>SJH D5 CARDIOVASCULAR TELEMETRY UNIT</strong></td>
<td>76% (AvgT=24 n=1721)</td>
<td>61% (AvgT=35 n=443)</td>
<td>76% (AvgT=24 n=587)</td>
<td>85% (AvgT=16 n=691)</td>
</tr>
<tr>
<td><strong>SJH EMERGENCY</strong></td>
<td>49% (AvgT=64 n=136)</td>
<td>50% (AvgT=56 n=30)</td>
<td>52% (AvgT=66 n=31)</td>
<td>48% (AvgT=67 n=75)</td>
</tr>
<tr>
<td><strong>SJH ENDOSCOPY UNIT</strong></td>
<td>100% (AvgT=3 n=1)</td>
<td>100% (AvgT=3 n=1)</td>
<td>100% (AvgT=3 n=1)</td>
<td>100% (AvgT=3 n=1)</td>
</tr>
<tr>
<td><strong>SJH HEMODIALYSIS IP</strong></td>
<td>34% (AvgT=69 n=110)</td>
<td>40% (AvgT=81 n=40)</td>
<td>30% (AvgT=61 n=27)</td>
<td>30% (AvgT=63 n=43)</td>
</tr>
<tr>
<td><strong>SJH MED SURG UNIT 1-4</strong></td>
<td>76% (AvgT=25 n=2122)</td>
<td>73% (AvgT=26 n=750)</td>
<td>75% (AvgT=27 n=636)</td>
<td>79% (AvgT=23 n=736)</td>
</tr>
<tr>
<td><strong>SJH MED SURG UNIT 1-5</strong></td>
<td>70% (AvgT=29 n=1987)</td>
<td>70% (AvgT=29 n=643)</td>
<td>70% (AvgT=29 n=752)</td>
<td>68% (AvgT=31 n=592)</td>
</tr>
<tr>
<td><strong>SJH MED SURG UNIT 1-8</strong></td>
<td>56% (AvgT=51 n=16)</td>
<td>56% (AvgT=51 n=16)</td>
<td>56% (AvgT=51 n=16)</td>
<td>56% (AvgT=51 n=16)</td>
</tr>
<tr>
<td><strong>SJH MED SURG UNIT 2-4</strong></td>
<td>56% (AvgT=40 n=1889)</td>
<td>55% (AvgT=40 n=693)</td>
<td>54% (AvgT=42 n=608)</td>
<td>59% (AvgT=39 n=590)</td>
</tr>
<tr>
<td><strong>SJH MED SURG UNIT 2-5</strong></td>
<td>59% (AvgT=38 n=1518)</td>
<td>54% (AvgT=40 n=524)</td>
<td>54% (AvgT=38 n=426)</td>
<td>67% (AvgT=35 n=568)</td>
</tr>
<tr>
<td><strong>SJH MED SURG UNIT 2-8</strong></td>
<td>79% (AvgT=21 n=1181)</td>
<td>78% (AvgT=21 n=223)</td>
<td>79% (AvgT=22 n=439)</td>
<td>80% (AvgT=19 n=519)</td>
</tr>
<tr>
<td><strong>SJH MED SURG UNIT 3-1</strong></td>
<td>66% (AvgT=29 n=953)</td>
<td>57% (AvgT=34 n=297)</td>
<td>65% (AvgT=32 n=306)</td>
<td>75% (AvgT=23 n=350)</td>
</tr>
<tr>
<td><strong>SJH MED SURG UNIT 3-2</strong></td>
<td>71% (AvgT=27 n=579)</td>
<td>75% (AvgT=21 n=151)</td>
<td>70% (AvgT=27 n=169)</td>
<td>69% (AvgT=30 n=259)</td>
</tr>
<tr>
<td><strong>SJH MED SURG UNIT 4-1</strong></td>
<td>73% (AvgT=27 n=561)</td>
<td>66% (AvgT=35 n=140)</td>
<td>68% (AvgT=28 n=240)</td>
<td>85% (AvgT=19 n=181)</td>
</tr>
<tr>
<td><strong>SJH MED SURG UNIT 4-2</strong></td>
<td>74% (AvgT=25 n=381)</td>
<td>74% (AvgT=22 n=113)</td>
<td>68% (AvgT=27 n=110)</td>
<td>78% (AvgT=26 n=158)</td>
</tr>
<tr>
<td><strong>SJH MED SURG UNIT 4-7</strong></td>
<td>80% (AvgT=27 n=455)</td>
<td>64% (AvgT=32 n=166)</td>
<td>85% (AvgT=21 n=163)</td>
<td>92% (AvgT=28 n=126)</td>
</tr>
<tr>
<td><strong>SJH MED SURG UNIT 5-2</strong></td>
<td>58% (AvgT=35 n=36)</td>
<td>56% (AvgT=31 n=18)</td>
<td>63% (AvgT=28 n=8)</td>
<td>60% (AvgT=47 n=10)</td>
</tr>
<tr>
<td><strong>SJH MOTHER/BABY</strong></td>
<td>13% (AvgT=69 n=8)</td>
<td>0% (AvgT=75 n=7)</td>
<td>100% (AvgT=24 n=1)</td>
<td>100% (AvgT=24 n=1)</td>
</tr>
<tr>
<td><strong>SJH OBSERVATION</strong></td>
<td>74% (AvgT=24 n=382)</td>
<td>77% (AvgT=22 n=105)</td>
<td>77% (AvgT=21 n=103)</td>
<td>70% (AvgT=28 n=174)</td>
</tr>
<tr>
<td><strong>SJH ONE DAY UNIT</strong></td>
<td>33% (AvgT=73 n=3)</td>
<td>0% (AvgT=113 n=1)</td>
<td>50% (AvgT=55 n=2)</td>
<td>50% (AvgT=55 n=2)</td>
</tr>
<tr>
<td><strong>SJH PACU/RECOVERY</strong></td>
<td>89% (AvgT=16 n=44)</td>
<td>50% (AvgT=59 n=2)</td>
<td>67% (AvgT=25 n=6)</td>
<td>94% (AvgT=12 n=36)</td>
</tr>
<tr>
<td><strong>SJH PERIOPERATIVE SERVICES</strong></td>
<td>89% (AvgT=16 n=130)</td>
<td>95% (AvgT=13 n=58)</td>
<td>85% (AvgT=18 n=46)</td>
<td>85% (AvgT=20 n=26)</td>
</tr>
<tr>
<td><strong>SJH PSYCHIATRIC UNIT</strong></td>
<td>53% (AvgT=42 n=194)</td>
<td>35% (AvgT=46 n=96)</td>
<td>74% (AvgT=27 n=68)</td>
<td>63% (AvgT=62 n=30)</td>
</tr>
</tbody>
</table>
POC Glc to Insulin Admin

Initiative to decrease variability in glucose testing to insulin administration time: unit and clinician metrics.
POC Glc to Insulin Admin

Percent Change Last Mos: 2015

POC Glc to Insulin Admin ≤30min

Baseline 2015
%Glc-InsAdmin < 30.
Summary

• Reduction of hypoglycemic episodes <50mg/dL by 44%

• Reduction of repeat episodes by 78%

• Treatment of Hyperkalemia:
  – 16% episodes
  – 5.6% after Order Set Optimization

• Timing POC Glc-Insulin Admin <30min
  – 60% to 75% administrations

➤ No initial but gradual increase in hyperglycemia
Lessons Learned

• Interprofessional team is a powerful resource.
  – A team of key stake-holders critical
    • Amplified knowledge
    • Amplifies manpower
    • Identify and make system changes
    • All levels of patient care
Lessons Learned

• Daily patient reviews identify areas for focused improvement:
  – Timing of insulin dosing
    • Stacking
    • A la carte meals
    • Frequency POC glucose IV insulin
  – Creative community insulin regimens
  – Hypoglycemia associated with hyperkalemia treatment
    • Order set incorporating insulin, glucose, monitoring
Lessons Learned

• Ripple effect of principles from Core Group.
  – Key insulin regimen principles knowledge
  – Permeate throughout community to improve diabetes care
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