EVALUATION OF A BASAL-BOLUS INSULIN PROTOCOL FROM CONTINUING DOSING EFFICACY AND SAFETY OPTIMIZATION IN NON-CRITICALLY ILL HOSPITALIZED PATIENTS

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Background and Significance: Approximately one third of all patients admitted to the hospital have hyperglycemia. Glycemic control has been linked to fewer infections, decreased length of stay, improved mortality and cost-savings. Studies have shown Basal Bolus Insulin (BBI) dosing better reflects natural human insulin release levels throughout the day, and to better control episodes of hyperglycemia while decreasing hypoglycemia events. In response to clinical guidelines developed by AACE in 2009, a clinical pilot test of a weight-based BBI protocol was used on screened patients at the time of admission.

Purpose of the Study/Project: The purpose of this study is to determine if hospitalized patients, who present with hyperglycemia (glucose greater than 180mg/dl) and who meet algorithmic selection criteria placed on a nurse/pharmacist admission weight-based BBI protocol demonstrate better glycemic control than a historic control group.

Sample/Population: Between May and September 2012, adult hospitalized patients on a single cardiopulmonary unit, age 18 and older, were screened by nursing staff in the process of electronic order entry in the following areas: evidence of bedside blood glucose tests (POCT) in excess of 180 mg/dl; diabetes history; eating status; age less than 85 and other demographic and lab data. Ninety-one subjects constituted the protocol-included subjects. Historical controls were compared by month to determine the differences between hospitalist protocol-managed patients and other physicians.

Framework: An algorithmic framework supported by the American Diabetes Association and American College of Endocrinology criteria for hyperglycemic acute care management guided this project.

Method/Approach: This exploratory, descriptive retrospective study was exempt from human subjects review by the Wheaton Franciscan Healthcare Institutional Review Board. Data was extracted from the EHR by registered pharmacists on selected demographic and physiologic variables for a weight-based adjusted dose for hyperglycemia management ranges from 0.2-0.4 units/kg/day.

Results/Outcomes: During the pilot study period, two hundred one subjects were screened for inclusion into the protocol. The sample had a mean POCT of 144mg/dl (SD 83), minimum 37 and max of 500. Of the unit sample 39 subjects (19.4%) had a POCT test greater than 180mg/dl at the time of admission. The overall effect of the BBI protocol on patient average POCT tests greater than 180mg/dl represented a significant decrease rate of 23% during the early study period (May-July 2012) compared with the pre-study period average rate of 33%. The rate of hypoglycemia in the study period significantly dropped in comparison to the house-wide data suggesting this conservative BBI protocol reduces the incidents of adverse hypoglycemia events (house-wide hypoglycemia rates 6.36% verses study group 2.85%).

Conclusions/Implications: The results of this pilot show that using an inclusion algorithm to treat hyperglycemia at the time of hospital admission has the potential for better glycemic quality outcomes across time. Improvements to identify patients who can benefit at the time of admission may also be helpful in addressing changes in dose for insulin sensitive and resistant patients based on weight determinants. A continuing study of this cohort focusing on strength of the insulin doing regimen and subject specific physiologic data is planned for completion in spring 2013.
Evaluation of a Basal-Bolus Insulin Protocol from Continued Dosing Efficacy and Safety Optimization in Non-Critically Ill Hospitalized Patients

Building Bridges to Research
Nursing Education Conference 2013
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Background

- Approx. 1/3 of all patients admitted to the hospital have hyperglycemia
- Glycemic control as been linked to
  - Fewer infections
  - Decreased LOS
  - Improved mortality
  - Cost savings
- Optimizing/standardizing our processes for glycemic control has the opportunity to improve patient safety and quality of care provided
A quality of care issue
A patient safety issue
A length of stay issue
There remain multiple challenges and barriers to practice change

- ACE: American College of Endocrinology
- ADA: American Diabetes Association
“Scheduled subcutaneous administration of insulin is the preferred method for achieving and maintaining glucose control in non-ICU patients with diabetes or stress hyperglycemia. The recommended components of inpatient subcutaneous insulin regimens are a basal, a nutritional, and a supplemental (correction) element.”

“Prolonged therapy with [sliding scale insulin] as the sole regimen is ineffective in the majority of patients (and potentially dangerous in those with type 1 diabetes).”

AACE = American Association of Clinical Endocrinologists
ADA = American Diabetes Association
Purpose

- To determine if hospitalized patients who present with a BG > 180mg/dl and meet algorithmic selection criteria when placed on a nurse/pharmacist admission BBI protocol demonstrate better glycemic control than those who are treated with “usual care”
Process

- IHI framework of small-tests -of-change
- One nursing unit chosen for pilot- 4CPT
- Pilot population limited to patients managed by the Hospitalist physicians- regardless of diagnosis
- Protocol developed by Endocrinology and Diabetes CNS
- Process/project oversight by Glycemic Initiative Team
- MD, RN, and Pharmacy education in-service's completed
  - Huge culture change implemented on nursing unit “Timing is Everything” – Blood glucose monitoring
Project AIMS

★ To achieve $\leq 30\%$ of hyperglycemia prevalence (defined as BG $\geq 180$) for all POCT results by unit by month (minus ED)

★ To achieve $\leq 2.5\%$ hypoglycemia (defined as BG $\leq 70$) for all POCT results by unit by month (minus ED)
Nursing Flow Process for Glycemic Management (non-ICU)

All patients <85 yrs admitted to unit receive BG finger stick

- Is BG > 350?
  - Yes: Order STAT BMP
  - No: Initiate Basal/Bolus insulin Protocol

- Is pt a known diabetic?
  - Yes: Call MD ASAP
  - No: Discontinue BG finger sticks

- Is the BG <140?
  - Yes: Order HbA1c & finger sticks
  - No: Initiate Basal/Bolus insulin Protocol

- Is the BG >250?
  - Yes: Is BG >180 for TWO consecutive finger sticks?
    - Yes: Initiate Basal/Bolus insulin Protocol
    - No: Continue BG finger sticks
  - No: Is BG <140 for TWO consecutive finger sticks?
    - Yes: Discontinue BG finger sticks
    - No: Continue BG finger sticks

Initiate Basal/Bolus Insulin Protocol Repeat BG finger stick in ONE hour
Dosing Algorithm – Total Daily Dose (TDD)

**History of Diabetes**

- **Taking insulin at home**
  - Use patient’s total home dose of insulin

- **Not on insulin at home**
  - Patient is **under** 65 yrs. old and GFR is > 60 mL/min
    - Insulin calculation will be **0.4** units/kg/day
  - Patient is **under** 65 yrs. old but GFR is < 60 mL/min
    - Insulin calculation will be **0.3** units/kg/day
  - Patient is **older** than 65 yrs.
    - Insulin calculation will be **0.3** units/kg/day

**No History of Diabetes**

- Patient is **under** 65 yrs. old and GFR is > 60 mL/min
  - Insulin calculation will be **0.3** units/kg/day
- Patient is **under** 65 yrs. old but GFR is < 60 mL/min
  - Insulin calculation will be **0.2** units/kg/day
- Patient is **older** than 65 yrs.
  - Insulin calculation will be **0.2** units/kg/day
Pilot Data

Percent of BBG for In Protocol Pilot Subjects

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<th>Number of BBG</th>
<th>Percent of Pilot In Protocol Groups within Ranges n</th>
<th>Percent of Pilot In Protocol Groups within Ranges %</th>
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Pilot Data

Percent of BBG for Not In Protocol Pilot Subjects

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<tr>
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Data Management

✦ Use of two data repositories
  – Point of care blood glucose readings from a dedicated Precision system downloaded daily to meet CLIA requirements
  – Physician orders for Basal Bolus protocol (pilot)

✦ Data Merger:
  – Use of excel spreadsheets to merge data for analysis using Pivot table and filter options
  – Analysis of counts, average BG by patient, percentages
Barriers and Challenges

- Bedside Blood Glucose files hold large volumes of data across multiple units
- Need for experts in excel and quality management to merge files
- Missing data due to inaccuracy of “pull” methods, large files blocked in email transfer
- Need to revisit the study aims to assure output reflects the study needs by unit.
Renewed Focus

- Assuring the aim of the project for positive patient outcomes remains in the forefront of practice change and implementation
- Improve data management through the use of decision support analyst for more effective means of data retrieval and analysis: MS Access data base and Pivot Tables
- Consider other variables of interest: New diabetic (by ICD-9/10 coding)
Dissemination and Discussion of Data with Key Stakeholders

- Building glycemic management regimens for hospital blood sugar management
- Transitioning patients to primary care for ongoing chronic disease management
  - New diagnosis
  - Continuing care
- Reduce readmission rates
Questions

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