Improving Glycemic Control on a General Medicine Floor

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PROJECT TEAM

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- Kathleen Hands, MD, Endocrine
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“Tele”-Member

Wayne Fisher, MS, PhD
Diabetes is present in at least 26% of hospitalized patients.

Additional 12% of patients with hyperglycemia.

Evidence shows glycemic control improves outcomes
- Surg ICU patients
- Post CABG patients
- CAD, post MI patients

Observation studies in general med patients
- Hyperglycemia=Poor outcomes
- RCT data lacking
WHAT IS THE TARGET GOAL?

- Unclear

- Close to euglycemia without causing hypoglycemia

- 80-110 may be too strict for general medicine patients

- ADA/ACE Recommends: 90-130 pre-prandial
TO ACCOMPLISH THIS GOAL

- **Insulin order sets/protocols should be initiated**
  - Basal insulin/premeal insulin
  - Discontinue Regular insulin sliding scale

- **Institutional support systems should be implemented**
  - Nursing education
  - Patient education
  - Dietary
  - Physician education
BACKGROUND AT UHS

- Sept 2007 - Initial attempts
  - EMR order set with detemir/aspart
  - No specific instructions on how to use
  - Glucose data was not monitored with this
  - RISS protocol still in place

- March 2008 - Team developed
  - 8th floor nursing interested in glucose control
  - Physicians/Pharmacists passionate about the issue
  - Endocrine assistance
AIM STATEMENT

To increase the percent of patients controlled with avg-day glucose 70-140 by 10 percent *without* increasing percent patients with hypoglycemic events by July 25, 2008.
DATA COLLECTION/MEASURES

• All point of care glucose values
  (Except if only one value for patient)

• Discrete data
  – Number patients controlled
  – Number of patients with hypoglycemia

• Variable data
  – Distribution all glucose values
Pre Intervention Flowchart

MD

New patient admitted

Does patient have DM?

RN

MD writes order for AccuCheck

RN receives order

RN reports to assigned Tech

Tech performs AccuCheck

Day Shift? (7am-7pm)

Night Shift? (7pm-7am)

Y

Performs AccuCheck for lunch between 10.30-11 am & Dinner between 4.30-5.00pm

Y

Performs AccuCheck for AM meal between 4-6am & @ Bedtime 10pm

RN documents in Sunrise Flow sheet

Downloads Glucometer back to base

Reports Results to RN

Loads results into Clinical summary of Sunrise

RN gives INSULIN
CAUSE AND EFFECT

 Causes of Poor Glycemic Control

MD/RN (provider) Factors
- Dosing of insulin
- Not changing daily
- Variability in use of protocol
- Easier to use RISS
- Can’t check frequently if necessary
- Only 2 glucometers
- Need at least 5-6
- Finding time for patient is a problem

Process Factors
- Not premeal
- Accuchek done by night shift
- Trays not given timely when pt npo
- No dietary selections avail
- Hypoglycemia
- NPO
- Glycemic targets
- Inaccurate data
- Concurrent illness
- Only two techs
- Non compliant

Patient Factors

Equipment/Resources

Glycemic control
University Hospital
Protocol for the Management of Hyperglycemia for Non-ICU Patients
(May 2008)

- Goals of insulin therapy:
  - Fasting BG ≤140mg/dL
  - 2-hour post-prandial BG ≤180 mg/dL
- Initiate basal + bolus (pre-meal) regimen
  - Total daily dose (TDD) – 0.5 units per kg divided basal & bolus
  - ½ TDD basal (detemir) divided AM & PM
  - ½ TDD bolus (aspart) divided before each meal when food is in front of patient

"EXAMPLE OF INSULIN INITIATION**"
- 72kg patient × 0.5 units insulin = 36 units TDD
  - 36 units TDD × ½ = 18 units (basal) – 2 = 9 units detemir QAM & 9 units QPM
  - 36 units TDD × ½ = 18 units (bolus) – 3 = 6 units aspart pre-prandial daily
- Initial dose (0.5 units/kg/day) is starting point—titrate as needed
- Dosing regimen may be altered within order set
- e.g., different doses for each administration time
- ***Use caution in patients with acute renal failure or fulminant hepatic failure***
- Consider starting dose of 0.25 units/kg/monitor closely & titrate cautiously
- Insulin adjustments
  - Maintain AM FBG 80-140 mg/dL
  - FBG <150mg/dL—increase detemir 4 units (2 units QAM, 2 units QPM)
  - FBG > 200 mg/dL—increase detemir 6 units (3 units QAM, 3 units QPM)
  - Adjust pre-prandial bolus (aspart) insulin if:
    - Pre-prandial BG > 140 mg/dL
    - Patient 2 hr post-prandial BG > 180 mg/dL
- Sunrise default pre-prandial dose correction (may be revised if needed at order entry)

"EXAMPLE of INSULIN TITRATION***"
- Basal insulin = 18 units daily prescribed
- Prandial insulin = 18 units daily prescribed
  - Serum FBG 195 mg/dL
    - Increase detemir (basal) by 4 units to 22 units/day (11 units QAM & QPM)
  - Pre-prandial insulin dose adjustments from previous day
    - 2 units in ADDITION to scheduled dose (6 units pre-breakfast) required
    - 1 unit in ADDITION to scheduled dose (6 units pre-lunch) required
    - 3 units in ADDITION to scheduled dose (6 units pre-supper) required
  - Increase SCHEDULED pre-prandial insulin aspart doses to 8 units before each meal
  - 24 units total daily pre-prandial insulin
- Total daily basal and total daily pre-meals doses no longer equal
  - If the next day’s FBG remains >150 mg/dL
    - Increase basal insulin to 24 units daily (12 units QAM, 12 units QPM)
- If frequent correction doses required
  - Increase scheduled prandial insulin aspart to average dose pt has been receiving
  - Patient may require different doses at each meal
- With adjustments to basal/bolus insulin, attempt to maintain an approximate 50:50 basal to bolus ratio within new TDD

***Precautions***
- Avoid ordering different insulin with similar profiles
  - Basal insulins
    - Detemir, glargine, NPH or combination insulins (70/30, 75/25 or 50/50)
  - Prandial insulins
    - Aspart, lispro, regular (***regular insulin should ONLY be used for continuous infusion, NOT for prandial or "sliding scale")
POST INTERVENTION FLOWCHART

MD

- New patient admitted
- Does patient have DM?
  - MD writes order for AccuCheck

RN

- RN receives order
- RN reports to assigned Tech
- Tech performs AccuCheck
  - Day Shift?: (7am-7pm)
    - Performs AccuCheck before AM meal JUST BEFORE 7.30 am; for lunch between 10.30-11 am & Dinner between 4.30-5.00pm
  - Night Shift?: (7pm-7am)
    - Performs AccuCheck @ Bedtime 10pm

Technician

- Reports Results to RN

RN documents in Sunrise Flow sheet
- Downloads Glucometer back to base
- Loads results into Clinical summary of Sunrise
- RN gives INSULIN
Boxplot of BaseGlucose2 (mg/dL) vs BaseDate2

BaseGlucose2 (mg/dL) vs BaseDate2
Boxplot of IntvnGlucose vs IntvnDate
Boxplot of Glucose vs Date

Baseline Period

Intervention Period

Date

Glucose (mg / dL)
LESSONS LEARNED

• Overall increase in glucose control was obtained, with decline in early July.

  • New Housestaff

  • Vacations

• Slight increase in hypoglycemic episodes, but acceptable.

• If trend continues will need to track severe hypoglycemia, symptomatic episodes.
FUTURE INTERVENTIONS

• EMR implementation

• Education- Housestaff, Nurses

• Empower nurses to encourage change of insulin regimen daily

• Use of “real time” data for feedback


• Web: http://glucometrics.med.yale.edu
www.hospitalmedicine.org