



Assessing BG Control – a Case Study

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NEED FOR STUDY

- Recognized discrepancy between evidence / best practices and actual glucose management practices
 - ⊗ Not sure whether this resulted in true adverse outcomes
 - ⊗ Needed data to share with medical and nursing staff to support QI initiatives
 - ⊗ Wanted to establish baseline assessment in order to evaluate future QI efforts

DATA ASCERTAINMENT

- Used our financial software HealthLand, formerly known as Dairyland, to generate a list of patients (inpatients, observation patients and swing bed patients) who were charged for capillary glucose monitoring.
- Consecutive list of 30 patients in fall 2007 and another 30 patients in fall 2008 after implementation of standardized insulin order set
- Order set was developed using samples from several hospitals including Shands and was approved by the Medical Staff. Acceptance and implementation of the order set by Weems Medical staff was the result of the positive support Shands/UF's pharmacists showed for improving the quality of care at Weems.

DATA STRUCTURE

Patient ID Number	Date	Time	Blood Glucose (mg/dL)	Source
1	10/6/2008	21:00	178	CS
1	10/7/2008	7:00	113	CS
1	10/7/2008	11:00	163	CS
1	10/7/2008	16:30	128	CS
1	10/7/2008	23:45	160	CS
1	10/8/2008	6:30	109	CS
1	10/8/2008	8:20	94	Lab
1	10/8/2008	11:30	101	CS
1	10/8/2008	16:00	127	CS
1	10/8/2008	22:00	105	CS
1	10/9/2008	6:00	103	CS
1	10/9/2008	7:57	97	Lab
1	10/9/2008	11:00	160	CS
1	10/9/2008	16:00	198	CS
1	10/9/2008	21:00	168	CS
1	10/10/2008	7:00	126	CS
1	10/10/2008	7:43	112	Lab
1	10/10/2008	11:00	134	CS
2	3/6/2009	17:03	38	Lab
2	3/6/2009	22:00	87	CS
2	3/6/2009	23:00	74	CS
2	3/7/2009	0:00	93	CS
2	3/7/2009	1:00	82	CS
2	3/7/2009	2:00	82	CS
2	3/7/2009	4:00	86	CS

DATA ANALYSIS

Patient ID Number	Date	Time	Time Difference	Cumulative Time	Average BG	Blood Glucose (mg/dL)
1	11/1/2007	22:54				98
1	11/2/2007	1:00	2:06:00	2:06:00	121.0	144
1	11/2/2007	2:00	1:00:00	3:06:00	157.5	171
1	11/2/2007	3:00	1:00:00	4:06:00	165.0	159
1	11/2/2007	4:00	1:00:00	5:06:00	144.5	130
1	11/2/2007	6:30	2:30:00	7:36:00	90.5	51
1	11/2/2007	6:45	0:15:00	7:51:00	173.5	296
1	11/2/2007	8:01	1:16:00	9:07:00	238.5	181
1	11/2/2007	11:00	2:59:00	12:06:00	134.0	87
1	11/2/2007	14:56	3:56:00	16:02:00	95.5	104
1	11/2/2007	15:00	0:04:00	16:06:00	116.5	129
1	11/2/2007	19:00	4:00:00	20:06:00	139.5	150
1	11/2/2007	21:00	2:00:00	22:06:00	125.5	101
1	11/2/2007	23:00	2:00:00	24:06:00	124.0	147
1	11/3/2007	3:00	4:00:00	28:06:00	131.5	116
1	11/3/2007	6:30	3:30:00	31:36:00	109.0	102
1	11/3/2007	11:00	4:30:00	36:06:00	134.5	167
2	11/2/2007	16:48				181
2	11/2/2007	23:00	6:12:00	6:12:00	354.0	527
2	11/2/2007	23:45	0:45:00	6:57:00	503.5	480
2	11/3/2007	2:00	2:15:00	9:12:00	448.5	417
2	11/3/2007	3:00	1:00:00	10:12:00	371.0	325
2	11/3/2007	4:00	1:00:00	11:12:00	279.5	234
2	11/3/2007	5:15	1:15:00	12:27:00	194.0	154



Status Quo of Blood Glucose Management

George E Weems Memorial Hospital
November-December 2007

Target for patients on medical floors (American Association of Clinical Endocrinologists/ American College of Endocrinology recommendations):
Preprandial- 110mg/dL Maximal Glucose- 180mg/dL

Data Collected and Analyzed from 30 Patients, Including 53 Hospital Days with Glucose Readings:
 For purposes of this analysis, glucose readings reflecting the first 2 hours of available values were omitted, because they may have occurred at or soon after admission and are not in control of the hospital.

Total number of Glucose Readings		394
Hyperglycemic Event ≥ 150 mg/dL		63
Hyperglycemic Event ≥ 200 mg/dL		39
Severe Hyperglycemia (at least one glucose reading ≥ 400 mg/dL)*		4
Prolonged Hyperglycemia (at least three consecutive glucose readings ≥ 250 mg/dL)*		8
Total Number of Blood Glucose Readings ≥ 150 (%)		191 (48.5%)
Total Number of Blood Glucose Readings ≥ 200		114 (28.9%)
Average Time in Hyperglycemia (≥ 150) during the time of glucose readings per patient		50.80%
Average Time in Hyperglycemia (≥ 200) during the time of glucose readings per patient		25.96%

A "new hyperglycemic event" is defined as when a patients' blood glucose was ≥ 150 mg/dL OR ≥ 200 mg/dL (depending of the threshold) for the first glucose reading, or the first reading following a "normal" value (<150 mg/dL).
 * defined by American Diabetes Association (ADA)

Total time in hyperglycemia was calculated by averaging the glucose readings from the beginning and end of a given time period. Total time of glucose measurement is the time period between the first and last reading available for each patient. The graph shows the % of time each patient spent in hyperglycemia defined by 2 thresholds for the average of 2 values ≥ 150 or 200mg/dL, respectively.

Summary

Out of the 30 patients with glucose screening within 53 days of admission, only six were never hyperglycemic. Half of the patients (15 out of 30) experienced hyperglycemia (≥ 150 mg/dL) for at least 50% of their total time in glucose measurement and four patients were hyperglycemic (≥ 150 mg/dL) 100% of their admission. Six out of the 30 patients experienced hyperglycemia (≥ 200 mg/dL) for at least 50% of their visit. Four patients had severe hyperglycemia (at least one glucose reading ≥ 400 -450mg/dL) during their admission and eight patients were in prolonged hyperglycemia (at least three consecutive glucose readings ≥ 250 mg/dL).

Recommendations

The majority of patients analyzed here would benefit from more stringent glucose management. As the particular characteristics of the studied population are unknown, recommendations are very general and may be refined upon discussion:

1. Present and discuss the results of this analysis with your hospital and medical staff.
2. For patients on oral medications, review the effectiveness of therapy and consider adding oral agents or insulin.
3. For patients managed with insulin on sliding scale, consider switch to a basal/prandial insulin regimen instead of sliding scale. If sliding scale is used, review / optimize the titration criteria for sliding scale, and introduce a single standardized protocol.
4. Continue to measure glucose management to track the effectiveness of changes.



RESULTS

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PHYSICIAN'S ORDERS – SLIDING SCALE INSULIN ORDERS

Sliding Scale Insulin Orders: (orders with a must be checked to activate)

- Blood glucose monitoring (choose one of the following).**
 Before Meals Before Meals and Hour of Sleep every _____ hours
 If blood glucose 70 mg/dl or below, administer 4 oz of juice, recheck glucose every 30 minutes until greater than 70 mg/dl, and call MD if not rising for further instructions.
- Standard insulin regimens (select all that apply)**
 Basal insulin – choose one of the following
 LANTUS
 _____ units subcutaneously at am
 _____ units subcutaneously at pm
 HUMULIN N
 _____ units subcutaneously at am (only 1/2 of am dose if patient NPO in am)
 _____ units subcutaneously at pm
 Other: _____
 Prandial Insulin – choose one of the following
 NOVOLOG (HOLD IF PATIENT IS NPO)
 _____ units subcutaneously within 15 minutes of each breakfast meal
 _____ units subcutaneously within 15 minutes of each lunch meal
 _____ units subcutaneously within 15 minutes of each dinner meal
 HUMULIN R (HOLD IF PATIENT IS NPO)
 _____ units subcutaneously within 30 minutes of each breakfast meal
 _____ units subcutaneously within 30 minutes of each lunch meal
 _____ units subcutaneously within 30 minutes of each dinner meal
- Sliding Scale Insulin coverage – choose one of the following** (Optional, but if given, should be given before meals IN ADDITION to Prandial Insulin and should be the SAME INSULIN as PRANDIAL insulin)
- Physician will be notified on daily rounds if BS > 250 x 3 episodes in 24 hours.**

Scale (mg/dL)	Insulin Coverage: <input type="checkbox"/> HUMULIN R (Regular) <input type="checkbox"/> Humalog		
	<input type="checkbox"/> Low Dose	<input type="checkbox"/> Moderate Dose	<input type="checkbox"/> High Dose
Less than 70	Give 4 ounces of juice	Give 4 ounces of juice	Give 4 ounces of juice
70 – 150	0 units	0 units	0 units
151 – 180	1 units	2 units	4 units
181 – 200	2 units	4 units	8 units
201 – 250	3 units	6 units	10 units
251 – 300	4 units	8 units	12 units
301 – 350	5 units	10 units	14 units
351 – 400	6 units	12 units	16 units
Greater than 400	Notify Physician	Notify Physician	Notify Physician

<input type="checkbox"/> Patient Specific	Dose
Scale (mg/dL)	
_____	_____ units
_____	_____ units
_____	_____ units
_____	_____ units
_____	_____ units
_____	_____ units

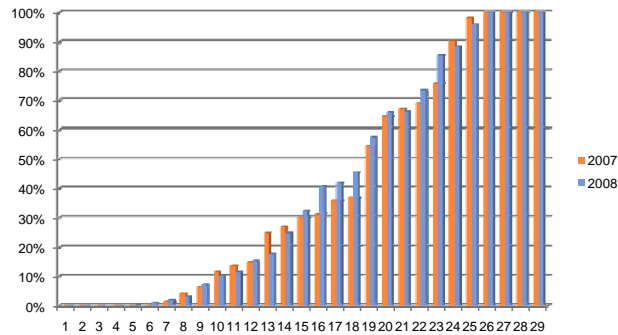
MD Signature: _____
 Date: _____ Time: _____

PATIENT LABEL



RE-EVALUATION AFTER IMPLEMENTATION OF ORDER SET

- Percent time in BG < 150 mg/dL
- ⌚ 2007: 39.9%
- ⌚ 2008: 40.9%



NEXT STEPS

- Only accept accucheck and sliding scale orders on pre-printed order set
- Remove patient specific scale option

