

Comparative Analysis between Weight Based Insulin (WBI) and Sliding Scale Insulin Orders

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Purpose: This evidenced based practice initiative was piloted on admissions to Medical and Surgical unit populations to evaluate the blood glucose control based on administration of insulin utilizing weight based order sets as compared to sliding scale insulin order sets.

Design of study: Randomized selection of patients to receive either WBIO or Non-WBIO, National Hospital and Medical Center, Lahore, Pakistan. July to December of 2008.

Material and Method: Patients with uncontrolled Diabetes Mellitus who were admitted to medical and surgical unit for all causes were inducted in the study except patients who were already under control on either Insulin or oral hypoglycemic agents. Finger stick glucometer reading were used and patients were randomized to be either on weight based insulin orders or Non-weight based insulin order, the order forms were freely available for use.

Results: Over the period of 6 months 155 patients were assigned to receive WBIO and 154 were assigned to receive Non-WBIO. The patients were kept in the study for a maximum of 5 days. There was significant difference in episodes of Hyperglycemia more marked in patients receiving Non-WBIO versus WBIO. There was no significant difference in episodes of Hypoglycemia.

Conclusion: WBIO had better glycemic control and equal hypoglycemic episodes as compare to Non-WBIO. Recommends usage of weight based insulin order sheets (WBIO) while the patients are hospitalized.

Key word: WBIO (Weight Based Insulin Order), Non-WBIO (Non Weight Based Insulin Order).

Introduction

Diabetes Mellitus is the commonest one of wide spread disease. It is the emerging pandemic. A recent survey estimated that 22% of all hospital inpatient days were incurred by people with diabetes and that hospital inpatient care accounted for half of the \$174 billion total US medical expenditures for this disease.¹ These findings are due, in part, to the continued expansion of the worldwide epidemic of type 2 diabetes. In the United States alone, there are approximately 1.6 million new cases of diabetes each year, with an overall prevalence of 23.6 million people (7.8% of the population). In Pakistan the diseases burden not less than any western population. Optimum glucose control has been the aim and dream of the physician especially for the admitted patients. Hyperglycemia in hospitalized patients, irrespective of its cause, is unequivocally associated with adverse outcomes.⁴⁻⁸ As uncontrolled glucose levels are associated with increase complications, prolong stay, more infections and increase health cost.^{2,3,9,10}

Good glycemic control is the part and parcel of the treatment strategies. In the Portland Diabetic Project, a 17-year prospective nonrandomized study of 4,864 patients with diabetes who underwent open heart surgical procedures, institution of continuous IV insulin therapy to achieve predetermined target BG levels reduced the incidence of deep sternal wound infections by 66%, resulting in a total net savings to the hospital of \$4,638 per patient (148). In another study, intensive glycemic control in 1,600 patients

treated in a medical ICU was associated with a total cost savings of \$1,580 per patient.¹¹

A topic that deserves particular attention is the persistent overuse of what has been branded as sliding scale insulin (SSI) or non weight based insulin order (Non-WBIO) for management of hyperglycemia.¹²⁻¹⁴ The term "weight based insulin order(WBIO)" which refers to the use of short- or rapid-acting insulin according to body weight of patient to treat BG levels above desired targets, is preferred.^{12,14} Prolonged therapy with Non-WBIO as the sole regimen is ineffective in the majority of patients (and potentially dangerous in those with type 1 diabetes).¹⁵⁻¹⁸

Not only the glucose remain High and patients remain susceptible to adverse effect even while in the Hospital, this uncontrolled glucose levels also increase the stay in Hospital and delays discharge and higher costs³. Thus we embarked to see if we can improve the Blood glucose levels and eventually hasten patients discharge.¹⁹

Aims and Objectives

Compare glucose control on WBIO versus Non-WBIO.

Hypothesis

There is no difference on glycemic control while using Weight based insulin or sliding scale insulin.

Material and Method

Patients admitted to medical and surgical units with diffe-

rent etiologies and also having uncontrolled glucose levels were inducted to this study. The patients were randomized to either be placed from day 1 on WBIO or Non-WBIO. The blood glucose levels were checked every six hours and the nurses were ordered to follow which ever order Form was placed on the chart. The Patients were kept in the study for a maximum of five days. During the six months of our study 155 patients were assigned on WBIO and 154 were assigned Non-WBIO. The record of all the glucometer glucose checks were kept and episodes of Hypo and Hyperglycemia's were evaluated.

Inclusion Criteria

All patients male and female admitted on medical or surgical unit having uncontrolled glucose levels and can take meals were included in the study.

Patients were also inducted during the stay in hospital once they were allowed oral intake.

Exclusion Criteria

Patients with controlled glucose levels on both Insulin and Hypoglycemics.

Patients admitted for Diabetic Ketoacidosis.

Patients in shock.

All patients who were NPO.

WBIO:

Total insulin was calculated and given according to the formula as follow:

0.5mg/kg wt total insulin/day.

½ given at bedtime as long acting.

½ was split in 3 portions to be given with meals(short acting).

Non-WBIO:

Sliding Scale insulin as follow:

0 – 100 mg/dl	0units insulin
101 – 150 mg/dl	2 units insulin
151 – 200 mg/dl	4 units insulin
201 – 250 mg/dl	6 units insulin
251 – 300 mg/dl	8 units insulin
301 – 350 mg/dl	10 units insulin
351 – 400 mg/dl	12 units insulin

Results

We found that there was no significant difference in episodes of hypoglycemia's on either arm. 2-3% incidence of mid-moderate Hypoglycemia. There were 2 patients on both arms who developed severe Hypoglycemia all related missing meals due to in 2 patients clerical error and in 2 due to family related error. But there were significantly higher incidence of Hyperglycemia on the arm of sliding scale insulin orders that we usually use. There 1168 (40%) episodes of mild Hyperglycemia's while using sliding scale insulin orders i.e Non-WBIO. And there were 339 (12%)

episodes of severe Hyperglycemia's while using sliding scale insulin orders. On the other had patients assigned WBIO had only 96(3%) severe Hyperglycemic episodes they were statistically significant and also had 1003(34%) mild Hyperglycemic episodes, these were significantly less than sliding scale insulin orders but did not reach statistically significant level.

Data Analysis

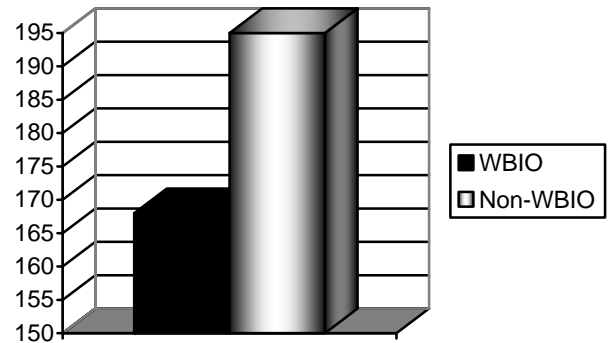


Fig. 1: Average Blood Glucose for WBIO versus Non-WBIO.

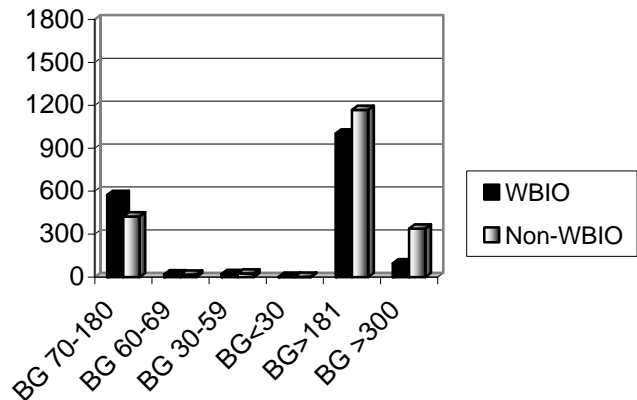


Fig. 2: Episodes of Blood Glucose levels in WBIO versus Non-WBIO

Discussion

- In our both relatively small sample studies, we demonstrated that WBIO implementation could be easily done in community based hospital.
- WBIO is more effective in achieving glucose control compared to Non-WBIO.
- Most importantly, low incidence of hypoglycemia in both groups.

- Safe and effective.
- More episodes of blood glucoses that are within the goal range.
- Guided by patients weight.
- Fewer incidences of hypoglycemia and hyperglycemia.
- Increase in clinical benefit and decrease in financial costs associated with patients with diabetes.

Conclusion

Recommends usage of weight based insulin order sheets (WBIO) while the patients are hospitalized.

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Table 1: Data Charts.

Episodes of Blood Glucose levels	WBIO	Average Blood glucose
Total # of patients reviewed	N = 155	
Total episodes	2940	168
BG 70 – 180 (within goal)	1719 (58%)	131
BG 60 – 69 (mild hypoglycemia)	57 (2%)	64
BG 30 – 59 (moderate hypoglycemia)	63 (2%)	40
BG < 30 (severe hypoglycemia)	2	
BG > 181 (mild hyperglycemia)	1003 (34%)	224
BG > 300 (severe hyperglycemia)	96 (3%)	341

Episodes of Blood Glucose levels	Non-WBIO	Average Blood glucose
Total # of patients reviewed	N = 154	
Total episodes of blood glucose levels	2907	195
BG 70 – 180 (within goal)	1272 (44%)	128
BG 60 – 69 (mild hypoglycemia)	51 (2%)	66
BG 30 – 59 (moderate hypoglycemia)	75 (3%)	49
BG < 30 (severe hypoglycemia)	2	
BG > 181(mild hyperglycemia)	1168 (40%)	232
BG > 300 (severe hyperglycemia)	339 (12%)	351

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