Improving Intrapartum Glycemic Control using a Software-driven Insulin Infusion Protocol

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INTRODUCTION

- GlucoStabilizer™ is a FDA approved software for managing Insulin infusions in the hospital setting.
- The software has an algorithm, (Blood Glucose-60) x multiplier to calculate the dosing of the Insulin infusion.
- This tool has been validated in the critical care setting and has been shown in multiple studies to be superior to paper protocols.

Evidence in Labor and Delivery on software-guided insulin dosing includes one study.

- GlucoStabilizer™ program to be superior to the standard protocol. GlucoStabilizer™ patients mean blood sugar were lower (p-value: 0.02)
- these patients achieved values in the target range at delivery (p-value: 0.001).

OBJECTIVES

We hypothesize that a software-driven program, GlucoStabilizer™ will provide more accurate blood glucose control during the early and active labor process than the current paper-driven insulin infusion protocol by:

1) Allowing for less opportunities for human error to occur.

2) Allowing for changes on the infusion dosing to be made based on patient response to insulin infusion rates.

METHODS

This study was a retrospective chart review of two groups of patients. Inclusion criteria includes:

- 18-50 year old pregnant gestational and pregestational diabetics
- Insulin infusion for at least 2 hours.
- Group 1- patients from SJH who received intrapartum glucose control via a paper driven insulin dosing protocol.
- Group 2- patients from SMH who received intrapartum glucose control via the GlucoStabilizer™ protocol.

Data collected from both groups consisted of:

- patients in the target range of 90-120 mg/dL at time of delivery.
- mean blood glucose level while receiving the insulin infusion,
- time of any hypoglycemic events and time on insulin
- Newborn initial blood glucose

Descriptive statistics, Student's t-tests and chi-square tests were performed to compare differences in clinical outcomes between both groups in SAS 9.4. Our significance threshold was 0.05.

Table 1. Descriptive Statistics of Clinical Outcomes

Clinical Outcomes	Paper Protocol (Group 1) N	Mean	Std Dev	Glucostabilizer™ (Group 2) N	Mean	Std Dev	p-value
Mean Blood Glucose (mg/dL)	82	117.7	24.1	25	125.2	21.0	0.17
Newborn Initial BG (mg/dL)	76	48.9	23.0	23	46.3	20.7	0.62
Time of Any Hypoglycemic Events (min)	81	18.1	47.8	25	2.8	6.7	0.007
Total Time on Insulin (min)	81	1031.5	882.3	25	1378.1	1149.8	0.11
Target Range of 90-120 mg/DL at Time of Delivery- N(%)	79 (59.5%)			25 (64.0%)			0.69

Figure 1. Distribution of Mean Blood Glucose (mg/dL) by Group

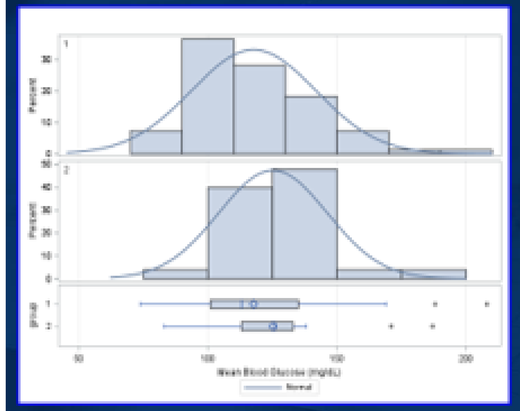
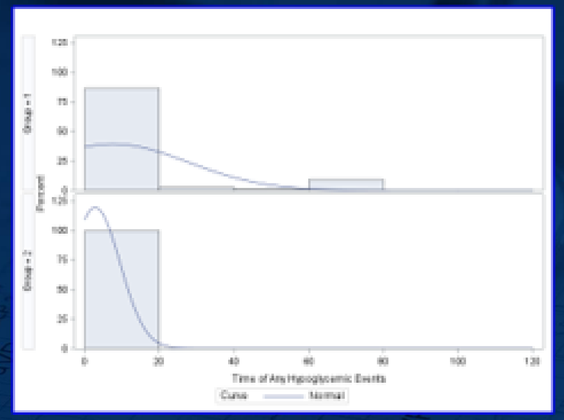


Figure 2. Distribution of Time of Any Hypoglycemic Events < 120 minutes



RESULTS

A total of 106 patients were included in this study. 81 patients met inclusion criteria in Group 1, while 25 patients met inclusion criteria for Group 2.

- Descriptive statistics by group are shown in Table 1.
- The mean blood glucose in Group 1 was 117.7 mg/dL and 125.2 mg/dL in Group 2 (p-value: 0.17) (Figure 1).
- The amount of time spent hypoglycemic in Group 1 was 18 minutes and 2.8 minutes in Group 2 which showed that using the Glucostabilizer™ statistically significantly reduces time spent hypoglycemic compared to the paper protocol (p-value: 0.007) (Figure 2).

DISCUSSION

Tight glycemic control during labor is essential for favorable maternal and neonatal outcomes. Use of the Glucostabilizer™ during labor may provide benefits in decreasing the risk for hypoglycemic episodes with tighter glycemic control.

There were some limitations in our study. Our first limitation was an issue with nurses at SMH not having the maintenance fluid infusion as part of the insulin order set. There was concern for misinterpretation of the maintenance fluid orders. Another limitation was, given this is a pilot study, additional research is needed with greater sample size and prospectively collection of patient information to determine the long term impact of using the Glucostabilizer™.

SJH has implemented the GlucoStabilizer™ program as of May of 2022 with great success and is currently working with SMH in creating a region wide evidence-based order set.

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