A retrospective review of glycemic control of patients on parenteral nutrition with correctional insulin administered every 4 hours

Haley Rust, PharmD Candidate 2021
Kyle Roof, PharmD Candidate 2021
Daniel Bishop, PharmD, CNSC
Matt Baker, PharmD, BCPS
North Kansas City Hospital

North Kansas City Hospital

Introduction

- Parenteral Nutrition (PN) disrupts the body's dynamic glycemic control leading to hyperglycemia[1]
- The American Diabetes Association (ADA) recommends glucose monitoring every 4 to 6 hours while on PN[2]
- Insulin lispro, the correctional insulin on formulary, has a duration of action of 4 to 5 hours[3]
- Due to the duration of action and need for further evaluation of glycemic control, new parameters were initiated to monitor point of care (POC) blood glucose every 4 hours

Purpose

The primary endpoint compared the overall glycemic control for patients when POC glucose testing was changed from every 6 hours to every 4 hours

Methods

- Prior to this study, POC glucose testing was monitored every 6 hours during PN with correctional scale insulin administered as needed
- Upon verification, pharmacists adjusted the order set from every 6 hours to every 4 hours
- Patient demographics (sex, age, and history of diabetes) and overall glycemic control (day-weighted mean POC blood glucose and number of hypoglycemic events) were collected to compare baseline data to more intensive POC glucose monitoring
- Measures of central tendency were utilized to evaluate both data sets

Inclusion Criteria

- Patients 18 years or older who were initiated on PN and on correctional insulin for glycemic control

Exclusion Criteria

- Patients who were on PN and receiving a continuous infusion of intravenous insulin were not included in our analysis

Results

Table 1: Patient demographics on correctional insulin given every 6 hours vs. every 4 hours

	Correctional insulin administered every 6 hours (n=28)	Correctional insulin administered every 4 hours (n=39)
Female	14 (50%)	24 (61.5%)
Average age at admission (range in years)	64 (44-93)	69 (22-91)
Diabetes Mellitus	17 (60.7%)	11 (28.2%)
TPN/PPN	19 / 9	33 / 6
Average duration of PN (days)	5	7
Intravenous lipid emulsion	27 (96.4%)	36 (92.3%)
Basal insulin (glargine)	14 (50%)	16 (41%)
Average daily units of basal insulin	13.35	11.19
Correctional insulin (lispro)	28 (100%)	39 (100%)
Average daily units of correctional insulin	4.78	4.8

Table 2: Day-weighted mean POC blood glucose during admission (mg/dL)

	Every 6 hours	Every 4 hours	Difference
Pre-PN			
Correctional insulin only	137.1	143.4	+6.3
Basal insulin + correctional insulin	158.3	167.7	+9.4
During PN			
Correctional insulin only	169.6	159.9	-9.7
Basal insulin + correctional insulin	196.8	201.9	+5.1
Post-PN			
Correctional insulin only	130.8	114.8	-16
Basal insulin + correctional insulin	177.6	150.8	-26.8
Difference in blood glucose before PN and during PN			
Correctional insulin only	32.5	14.5	-18
Basal insulin + correctional insulin	38.5	34.3	-4.2
Entire admission			
Correctional insulin only	151.2	149	-2.2
Basal insulin + correctional insulin	173.5	173.2	-0.3
Number of Patients with hypoglycemic events (%)	4 (14.3%)	1 (2.6%)	-3

Figure 1: Patients on correctional insulin only

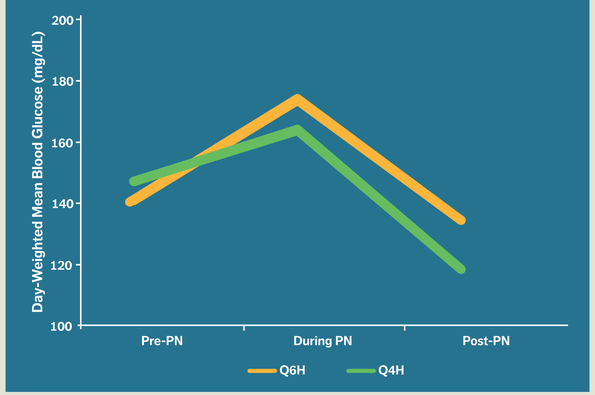
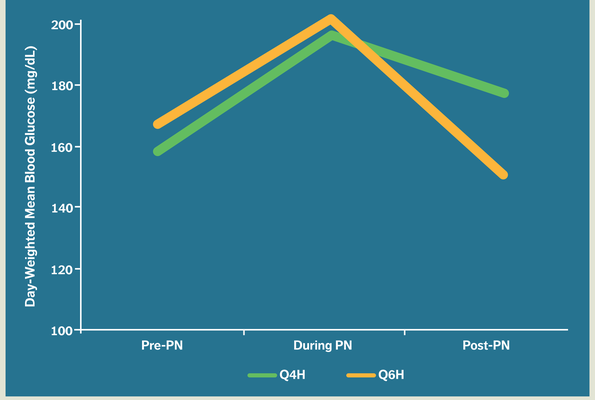


Figure 2: Patients on basal insulin + correctional insulin



THIS STUDY WAS APPROVED BY THE NORTH KANSAS CITY HOSPITAL INSTITUTIONAL REVIEW COMMITTEE

Limitations

- Data was collected retrospectively in a single institution population with limited sample size
- The order set for the correctional insulin scale had a maximum of 8 units that could be administered at a time and was not administered if patients refused
- During 4-hour monitoring, administration of correctional insulin deviated by ± 1.5 hours of scheduled times (which was expected with the increase in monitoring) and may have had an impact on POC day-weighted mean blood glucose values
- PN stop time is based on order set and may not reflect the actual time PN was discontinued
- A larger percentage of diabetic patients were in the 6-hour monitoring group than in the 4-hour monitoring group which may have had a larger impact on glycemic control
- There were fewer POC blood glucose values during the post-PN period compared to the period pre-PN

Conclusions/Implications

- Although blood glucose was higher before PN started, patients that were monitored every 4 hours showed overall improvement in glycemic control while PN was running and after PN was stopped
- Compared to patients receiving correctional insulin every 6 hours, patients that received correctional insulin **every 4 hours had a smaller increase** in day-weighted mean blood glucose once PN started (difference of -18 mg/dL) and had a lower average day-weighted blood glucose overall while PN was running (difference of −9.7 mg/dL)
- **There were fewer patients with hypoglycemic events in the 4-hour monitoring group than in the 6-hour monitoring group**

Citations

1. Vennard, Kaitlyn C., et al. "The Management of Hyperglycemia in Noncritically Ill Hospitalized Patients Treated with Continuous Enteral or Parenteral Nutrition." Endocrine Practice, vol. 24, no. 10, Oct. 2018, p. 900. EBSCOhost.
2. Diabetes Care, vol. 42, pp. S173–S181. EBSCOhost, doi:10.2337/dc19-S015. Accessed 4 Mar. 2020. *Diabetes Care*, vol. 42, pp. S173–S181. *EBSCOhost*, doi:10.2337/dc19-S015. Accessed 4 Mar. 2020.
3. Humalog (insulin lispro) package insert. Indianapolis, IN:Eli Lilly and Company;2019 Nov.

Disclosure

Authors of this presentation have the following to disclose concerning possible or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation: **All Authors: Nothing to Disclose**