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RISK FACTORS FOR HYPOGLYCEMIA DURING INSULIN INFUSIONS IN CRITICALLY ILL SURGICAL PATIENTS

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INTRODUCTION/HYPOTHESIS: Continuous insulin infusions are commonly used for glycemic control in critically ill patients. Several studies of examined the safety and efficacy of insulin infusions targeting blood glucoses (BG) of 80-110 mg/dL; however, there is a lack of data looking at the safety of using insulin infusions targeting euglycemia. The purpose of our study is to examine the risk factors for severe hypoglycemia (SH) in critically ill surgical patients on an insulin infusion with a target blood glucose of 70-150 mg/dL.

METHODS: This is a single-center, retrospective, IRB approved, cohort study conducted from 1/1/18 - 7/31/20. Patients were included if they were ≥ 18 years, admitted to the cardiac or surgical ICU, and given an insulin infusion. Patients were excluded for an admission diagnosis of DKA. The primary outcome was the incidence of SH defined as BG < 40 mg/dL. Secondary outcomes included incidence of hyperglycemia, glucose variability, glucose sourse, and mortality. Logistic regression was used to examine risk factors for SH and mortality. Statistical analysis was performed using SPSS v27.

RESULTS: A total of 4,556 patients and 262,250 BGs were included. There were 328 BGs (0.1%) that were < 40 mg/dL, and 195 patients (4.3%) had at least one severe hypoglycemic event. The hypoglycemic patients were more likely to have diabetes (38.5% vs 31.5%,p=0.04), higher peak lactate (5 vs 2.9, p< 0.001), require vasopressors (88.7% vs 68.8%,p< 0.001), CKD (32.8% vs 23.2%,p=0.002), and AKI (80% vs 47.3%,p< 0.001) compared to patients who did not experience SH. There was no difference in glucose source (p=0.09), and glucose variability (p=0.06). A majority of BGs were 71-150 mg/dL (70.5%). Independent predictors for SH were peak lactate (OR 1.09, 95% CI 1.06-1.13), AKI (OR 2.857, 95% CI 1.95-4.19), duration of insulin infusion (OR 1.1, 95% CI 1.06-1.14), and history of DM (OR 1.45, 95% CI 1.05-2.02). SH was an independent predictor for mortality (OR 1.91, 95% CI 1.27-2.88).

CONCLUSIONS: Insulin infusions can be used to maintain euglycemia in critically ill surgical patients and result in a low incidence of SH. However, caution should be given to patients with renal impairment, a history of DM, higher severity of illness, and require long durations of insulin infusion as they may be at an increased risk for SH.

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SAFETY OF ENDOTOOL VERSUS FIXED-DOSE INSULIN INFUSIONS FOR DKA OR HHS IN THE EMERGENCY DEPARTMENT

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INTRODUCTION: EndoTool is a glucose management software system used for titrating insulin infusions. Literature evaluating the safety of EndoTool for management of diabetic ketoacidosis (DKA) or hyperosmolar hyperglycemic syndrome (HHS) in the emergency department (ED) are lacking. Within our health system, University of North Carolina (UNC) REX Hospital ED utilizes EndoTool to titrate insulin infusions, while UNC Medical Center utilizes fixed dosing (0.1 units/kg/hr). The goal of this project was to evaluate the safety between these practices in DKA and HHS patients. We hypothesized EndoTool would be safer than fixed dosing.

METHODS: This retrospective evaluation included adults who presented to UNC REX Hospital or UNC Medical Center ED between 1/1/2019 and 12/31/2019 with DKA or HHS and received an insulin infusion. All included patients at UNC REX Hospital received insulin infusions titrated using EndoTool, while all patients at UNC Medical Center received fixed dosing. Outcomes compared included mean blood glucose values, mean insulin infusion rates, and incidence of hypoglycemic events (blood glucose < 70 mg/dL). All outcomes were evaluated while patients were in the ED.

RESULTS: Two hundred twenty-three patients were included (n = 117 EndoTool, n = 106 fixed dosing) and the majority presented with DKA (n = 199). Initial point-of-care (POC) blood glucose (583.2 ± 124.7 vs 480.9 ± 133.4, p = 0.893) and average POC blood glucose (409.2 ± 132.5 mg/dL vs 423.7 ± 151.0 mg/dL, p = 0.446) were not different between the EndoTool versus fixed dosing groups. Initial insulin infusion rates were significantly higher for the EndoTool group compared to fixed dosing (9.1 ± 4.1 units/kg/hr vs 7.7 ± 2.7 units/kg/hr, p = 0.003), while average insulin infusion rates were not significantly different (8.0 ± 3.7 units/kg/hr vs 7.7 ± 2.7 units/kg/hr, p = 0.526). The incidence of hypoglycemic events was significantly lower in the EndoTool group compared to fixed dosing (0% vs 4.7%, p = 0.023).

CONCLUSIONS: In patients presenting to the ED with DKA or HHS, titration of insulin infusions using a glycemic control software such as EndoTool may be safer than fixed dosing. Further evaluations are needed to determine if there are efficacy benefits.

Safety of EndoTool® Versus Fixed-Dose Insulin Infusions for DKA or HHS in the Emergency Department

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Disclosures

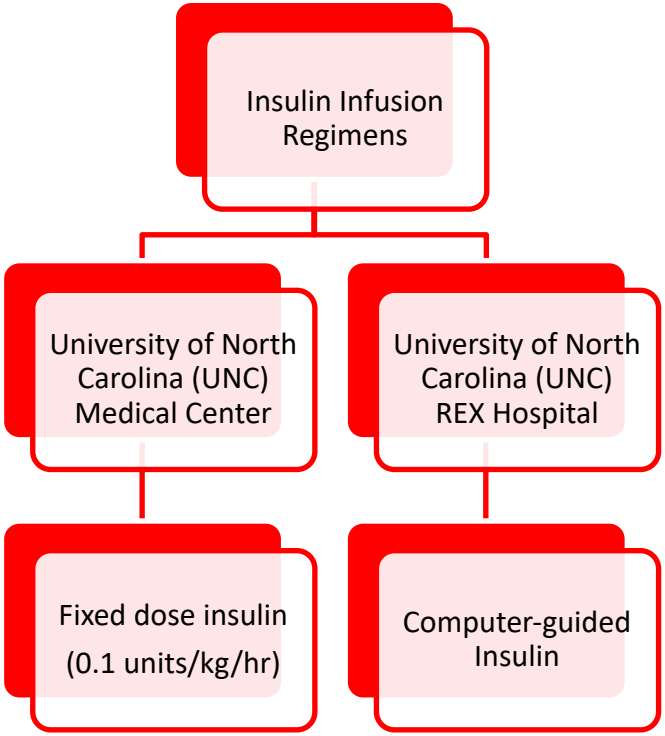
The authors of this abstract have nothing to disclose.

Background

- Emergency Department visits for diabetic ketoacidosis (DKA) [annual percent change (APC) 13.5%] and hyperosmolar hyperglycemic state (HHS) (APC 16.5%) have significantly increased from 2009 to 2015.
- EndoTool® (computer-guided insulin) is a glucose management software system used for titrating insulin infusions
- In small retrospective studies, computer-guided insulin has shown trends in reducing hypoglycemic events and achieving target blood glucose levels more rapidly
  - This data did not focus on DKA and/or HHS populations directly

Benoit SR, et al. *Diabetes Care*. 2020;43(5):1057–64.
John SM, et al. *Diabetes Spectr*. 2017;31(1):26–30.
Tanenberg RJ, et al. *Endocr Pract*. 2017;23(3):331-341.

Comparison of Regimens



Methods

Study Design

- Single center, retrospective analysis
- Data collected via electronic medical records

Patient Population

- 18 years of age or older
- Admitted to the University of North Carolina (UNC) Medical Center or UNC Rex Emergency Department between 1/1/2019 – 12/31/2019 with DKA or HHS

Outcomes

- Primary Outcomes: mean point of care (POC) blood glucose values, mean insulin infusion rates, and incidence of hypoglycemic events

Patient Demographics

Characteristic	Computer-guided (n=117)	Fixed Dosing (n=106)	P value
Mean age ± SD, years	47.0 ± 19.1	43.7 ± 17.5	0.179
Race/ethnicity, n (%)			0.464
Caucasian	54 (46.2)	47 (44.3)	
African American	49 (41.9)	49 (46.3)	
Asian	1 (0.9)	1 (0.9)	
Other	7 (5.9)	8 (7.6)	
Unknown	6 (5.1)	1 (0.9)	
Mean weight ± SD, kg	73.4 ± 20.2	72.1 ± 30.4	0.779
Diabetes Type n (%)			0.418
T1DM	66 (56.4)	60 (56.6)	
T2DM	49 (41.9)	41 (38.7)	
Unknown	2 (1.7)	5 (4.7)	

Patient Demographics

Characteristic	Computer-guided (n=117)	Fixed Dosing (n=106)	P value
Admission Diagnosis, n (%)			
DKA	104 (88.9)	95 (89.6)	0.860
HHS	13 (11.1)	11 (10.4)	
Mean labs on admission ± SD			
Anion Gap	20.1 ± 6.1[a]	22.8 ± 6.4[b]	0.004
CO2	16.5 ± 13.2[a]	13.2 ± 5.7[b]	<0.001
Serum Creatinine	2.0 ± 2.8	2.7 ± 4.5	0.173
Potassium	4.9 ± 1.1	5.3 ± 1.1	0.009
Venous pH	7.2 ± 0.1[c]	7.2 ± 0.1[d]	0.515
Arterial pH	7.3 ± 0.1[e]	7.2 ± 0.2[f]	0.100

[a]n = 93, [b]n = 94, [c]n = 92, [d]n = 105, [e]n = 39, [f]n = 17

Results

Insulin Infusion Characteristics	Computer-guided (n=117)	Fixed Dosing (n=106)	P value
Mean POC blood glucose ± SD, g/dL			
Initial	583.2 ± 124.7	480.9 ± 133.4	0.893
Maximum	488.3 ± 119.1	491.1 ± 133.6	0.868
Minimum	336.0 ± 156.1	366.1 ± 287.0	0.193
Average	409.2 ± 132.5	423.7 ± 151.0	0.446
Mean insulin infusion rates ± SD, units/kg/hr			
Initial	9.1 ± 4.1	7.7 ± 2.7	0.003
Maximum	9.7 ± 3.9	7.8 ± 3.0	< 0.001
Minimum	6.6 ± 4.2	7.7 ± 2.7	0.031
Average	8.0 ± 3.7	7.7 ± 2.7	0.526
Experienced hypoglycemic event (BG < 70), n (%)	0 (0.0)	5 (4.7)	0.023

[a]n = 113, [b]n = 102

Conclusions

- Titration of insulin infusions via glycemic control software may be safer than fixed dosing regimens for patients presenting to the ED with DKA or HHS
- Larger studies evaluating glycemic control software for DKA and HHS management are warranted to determine if there are efficacy benefits given we have demonstrated a difference in safety
- A randomized study is also warranted as a next step given the limitations to our observations at two different hospitals