



Use of Computer-Based Insulin Delivery Method in Management of Pediatric Diabetic Ketoacidosis (DKA) in a Pediatric Intensive Care Unit

Narsinghani U, Hutchins J, Sheldon J.
The Children's Hospital at The Medical Center of Central Georgia



Background and aims:

DKA can be prevented, but accounts for a large proportion of mortality, morbidity and hospitalizations in patients with diabetes, and contributes to the high costs of diabetes care.

Treatment of DKA requires hydration and frequent intravenous (IV) fluid modifications.

No studies have shown any clinical benefit in terms of rate of glucose or bicarbonate correction.

We studied the use of Glucommander® a computer-based system to direct IV insulin infusion using bedside blood glucose (BG) measurements. It utilizes a weight based algorithm to suggest a multiplier for pediatric patients.

Algorithm for Insulin dose/hr = (blood glucose) - 60 x multiplier.
Initial multiplier for pediatric patients = weight (kg) x 0.0002. It recommends an insulin infusion rate and a time to check next BG.

New recommendations are offered hourly based on glucose measurements; the multiplier is adjusted up or down depending on the patient's proximity to the target BG.

Method:

After IRB approval a retrospective chart review was conducted on patients admitted to the PICU from January 2009-December 2009.

Inclusion criteria were defined as patient's ages 1-18 years with diagnosis of DKA and/or type 1 diabetes. Patients were treated with the Glucommander®. Key outcome measures were analyzed (Table 1). Adverse events were recorded.

Results:

Total of 59 patient charts were reviewed, 39/59 met inclusion criteria.

Average age of patients was 11.82 ± 4.36 years (2-17 years).

38.46% of patients had new diagnosis of Type 1 diabetes.

There were 69.23% females and 30.77% males with 51.28% Caucasian, 43.59% African Americans and 5.12% Hispanics.

Results are stated in the Table 1.

Conclusion:

Use of Glucommander® is safe and effective for management of pediatric patients with DKA.

There was no hypoglycemia, neurologic complications or morbidity/mortality.

Use of the Glucommander® achieves portability, user friendliness, staff satisfaction, and was intuitively less error prone.

Outcomes	Mean +SD	Median	Range
Admission BG (mg/dL)	447.26 + 273.50	408.00	64.00 – 1323.00
Admission CO ₂ (mmol/L)	11.14 + 4.67	11.00	5.00 – 22.00
Correction to Acidosis [CO ₂ >16mmol/L] Hrs.	17.66 ± 12.33	13.25	4.58 – 58.70
PICU LOS (Hours)	33.16 + 20.77	24.78	10.03 – 96.17
Insulin units/kg/hour (IV)	0.10 + 0.15	0.05	0.01 – 0.89
Time on Glucommander(Hrs.)	17.46 + 7.53	16.27	4.50 – 41.28

Table 1

References:

1. Evaluating the safety and efficacy of Glucommander, a computer-based insulin infusion method, in management of diabetic ketoacidosis in children, and comparing its clinical performance with manually titrated insulin infusion. Fort A, Narsinghani U, Bowyer F. J Pediatr Endocrinol Metab. 2009 Feb;22(2):119-25.
2. Evaluation of the two-bag system for fluid management in pediatric patients with diabetic ketoacidosis. So TY1, Grunewalder E. J Pediatr Pharmacol Ther. 2009 Apr;14(2):100-5.