



# Glycemic Control in Hospitalized Patients Receiving Enteral Nutrition

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## BACKGROUND

- Artificial nutrition is sometimes necessary for patients that cannot tolerate oral intake of food or nutrition, and one of the forms of delivery is known as enteral nutrition, or delivery via nasogastric tube or ostomies into the digestive system.
- About 30% of patients experience hyperglycemia while receiving enteral nutrition.<sup>1</sup>
- Current practices for high blood sugar management include basal and bolus insulin regimens, plus glucose checks every four hours.

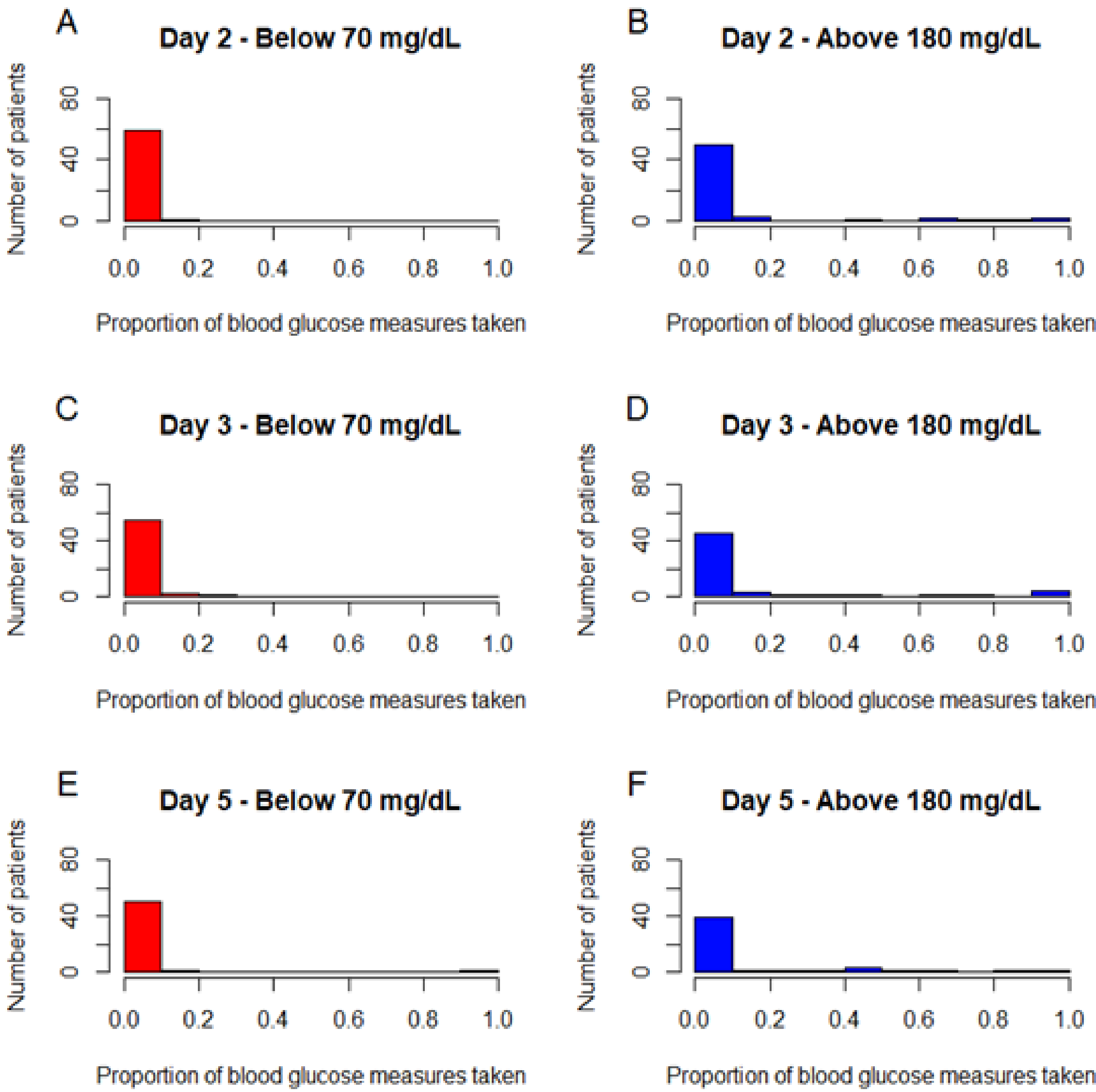
## METHODS

- We conducted a retrospective, single-center chart review of 60 hospitalized patients on enteral nutrition with a blood glucose target range of 70 mg/dL to 180 mg/dL. Patients were put on a regimen of sliding scale insulin, either insulin regular or insulin lispro.
- Statistics used to analyze the data were descriptive, and patients’ glucose levels and insulin given were observed from days 2, 3, and 5 of their respective visits.
- The **primary outcome** was to determine the effectiveness of glycemic control for those receiving enteral nutrition while hospitalized. **Secondary outcomes** include identifying variables that predict hypo- or hyperglycemia while on enteral nutrition and evaluating the referral process to endocrinology for glucose management.

## RESULTS

Characteristic	Normal BG at Day 3 (N = 45)	At least one high BG at day 3 (N = 13)	p
Age, years, mean (SD)	47.9 (18.6)	68.4 (20.8)	0.005
Male, n (%)	33 (73.3)	9 (69.2)	0.74
BMI, kg/m2, mean (SD)	26.5 (5.4)	28.5 (5.3)	0.26
eGFR, median (IQR)	102 (77.5, 119.5)	85 (74, 104)	0.21
SCr, median (IQR)	0.8 (0.7, 1.0)	0.9 (0.7, 1.4)	0.04
Diabetes, n (%)	6 (13.3)	8 (61.5)	0.001
Home insulin use, n (%)	0 (0)	2 (15.4)	0.047
Insulin before EN, n (%)	1 (2.2)	3 (23.1)	0.03
Steroid during EN, n (%)	0 (0)	1 (7.7)	0.22
Indication for EN, n (%)			0.92
Inadequate oral intake	22 (48.9)	7 (53.8)	
Increased nutrient need	10 (22.2)	2 (15.4)	
Intubated	11 (24.4)	3 (23.1)	
Other	2 (4.4)	1 (7.7)	
Enteric feed type			0.20
Jevity	6 (13.3)	5 (38.5)	
Osmolite	9 (20.0)	2 (15.4)	
Vital	30 (66.7)	6 (46.2)	
Feed type			1
Trickle	0 (0)	0 (0)	
Bolus	0 (0)	0 (0)	
Continuous	43 (95.6)	13 (100)	
Cyclic	2 (4.4)	0 (0)	
Day 2 avg tube feed rate, median (IQR)	60 (50, 75)	60 (52.5, 65)	0.81
Day 3 avg tube feed rate, median (IQR)	60 (50, 75)	60 (52.5, 65)	0.81
Day 5 avg tube feed rate, median (IQR)	70 (60, 90)	60 (58.8, 77.5)	0.27
Endo referral, n (%)	0 (0)	3 (23.1)	0.009
LOS, days, median (IQR)	23 (10, 34)	26 (18, 46)	0.06
Mortality, n (%)	7 (15.6)	1 (7.7)	0.67

**Table 1:** Patient characteristics by whether a patient had an abnormally high blood reading on day 3 of Enteral Nutritio. P-values were calculated using t-tests, Mann-Whitney tests, and Fisher’s exact test where appropriate.



**Figure 1:** Histogram of the proportion of blood glucose measures on days 2, 3, and 5 that were low (A, C, and E) and high (B, D, and F). Most individuals had normal blood glucose as evidenced by the large number of patients with no low or high measures.

## OUTCOMES

- Hospitalized patients on enteral nutrition showed that there are improvements that can be made in terms of glycemic control, including more focus on overweight patients, and patients that are staying for an extended period of time.
- Most patients (78%) were at goal on their insulin regimens; less frequent checks may be appropriate for some patients, which would challenge long-standing practices for glucose checks every 4-6 hours.
- Statistically significant characteristics included age (P=0.005), diabetes (P=0.001), home insulin use (P=0.047), insulin before enteral nutrition (P=0.03), and endocrine referral (P= 0.009).

## DISCUSSION

- 22% of patients experienced a hyperglycemic event on day 3, while 23% experienced a hyperglycemic event on day 5, showing that the majority of patients’ glycemic control regimen was appropriate and effective.
- Only 5% of patients received an endocrinology referral, suggesting that patients that did experience hyperglycemia were not properly cared for and would have benefited from an endocrinology consult.
- With patients that had at least one high blood glucose reading on day 3 (13 patients), this population was mostly treated in the ICU, had higher average BMI, were older, and had a longer length of stay.

## FUTURE PLANS

- Future studies can explore varying insulin regimens, and the types of insulins used. Less frequent glucose checks for select patients on EN may be possible if glycemic control is maintained. A larger study would likely have better predictions for potential hyperglycemic events as well as endocrinology referrals for this population.

## CONCLUSION

Overall, most patients observed were maintained at a range of 70-180 mg/dL for days 2, 3, and 5 of EN during their visits. This suggests that current sliding scale insulin regimens are being used appropriately and effectively.

1: Pancorbo-Hidalgo PL, Garcia-Fernandez FP, Ramirez-Perez C. Complications associated with enteral nutrition by nasogastric tube in an internal medicine unit. J Clin Nurs 2001;10:482–490