

10.4b Optimal glucose control: Carbohydrate restricted formula + insulin therapy

There are no new randomized controlled trials since the 2015 updates and hence there are no changes to the following summary of evidence.

Question: Does tight blood sugar control result in better outcomes in the critically ill adult patient?

Summary of evidence: There was one level 2 study reviewed that compared a carbohydrate restrictive enteral diet with insulin therapy (to maintain blood sugars <180 mmol/L) vs intensive insulin therapy to maintain blood sugars <150 mmol/L.

Mortality: Based on the single study, carbohydrate restricted formula plus insulin therapy aimed at higher blood sugar range (<180 mmol/L) had no effect on mortality when compared to intensive insulin therapy aimed at a tighter blood sugar of < 150 mmol/L (RR 1.10, 95% CI 0.75, 1.61, p=0.63)*.

Infections and length of stay: Based on the single study, carbohydrate restricted formula plus insulin therapy aimed at higher blood sugar range (<180 mmol/L) when compared to intensive insulin therapy aimed at a tighter blood sugar of < 150 mmol/L had no effect on incidence of pneumonia (RR 0.95, 95% CI 0.67, 1.35, p=0.78)* or ICU length of stay (p=0.9)*.

Hypoglycemia: Based on the single study, carbohydrate restricted formula plus insulin therapy aimed at higher blood sugar range (<180 mmol/L) was associated with a significant decrease in hypoglycemic events when compared to intensive insulin therapy aimed at a tighter blood sugar of < 150 mmol/L (RR 0.22, 95% CI 0.09, 0.52, p<0.001)*.

Conclusions:

- 1) Carbohydrate restricted formula plus insulin therapy aimed at blood sugar range (<180 mmol/L) vs intensive insulin therapy to maintain blood sugars < 150 mmol/L, has no effect on mortality, incidence of pneumonia or ICU length of stay in critically ill patients.
- 2) Carbohydrate restricted formula plus insulin therapy aimed at blood sugar range (<180 mmol/L) vs, vs intensive insulin therapy to maintain blood sugars < 150 mmol/L, is associated with a decrease in hypoglycemia in critically ill patients.

*Risk ratio, confidence interval, and p-value calculated using Review Manager 5.1.

Table 1. Randomized studies evaluating carbohydrate restricted formula + insulin therapy in critically ill patients

Study	Population	Methods (score)	Intervention	Mortality # (%)		Infections # (%)	
				Carb Restriction ICU	Intensive Insulin ICU	Carb Restriction	Intensive Insulin
1) de Azevedo 2010	Multidisciplinary ICU and trauma ICU N=351	C.Random: no ITT: no Blinding: no (6)	Carbohydrate restrictive EN with insulin therapy (to maintain BG <180) vs intensive insulin therapy (BG <150)	42/169 (25)	38/168 (22.6)	Carb Restriction Pneumonia 44/169 (26) UTI 16/169 (9) Surgical 16/169 (9) Catheter-related 8/169 (5)	Intensive Insulin Pneumonia 46/168 (27) UTI 11/168 (7) Surgical 15/168 (9) Catheter-related 10/168 (6)

Table 1. Randomized studies evaluating carbohydrate restricted formula + insulin therapy in critically ill patients (continued)

Study	LOS days		Ventilator days		Other
	Carb Restriction ICU	Conventional Insulin ICU	Carb Restriction	Intensive Insulin	
1) de Azevedo 2010	8 (4-14)	7 (4-15)	NR	NR	Carb Restriction Hypoglycemia 6/169 (4) Intensive Insulin 27/168 (16) Nutritional intake (%) requirement at day 3 80 (89) 97 (92)

C. Random: concealed randomization
ICU: intensive care unit
UTI: urinary tract infection

ITT: intent to treat
LOS: length of stay

NR: not reported
EN: enteral nutrition