

4.2(a) Composition of Enteral Nutrition: (Carbohydrate/fat): High fat/low CHO

June 28th, 2005

Recommendation:

There are insufficient data to recommend high fat/low CHO diets for critically ill patients.

Discussion: The committee noted that with respect to ventilator days, the evidence from two small studies showed only a small treatment effect and wide confidence intervals and the presence of heterogeneity between the two studies. The significant improvement in a surrogate endpoint i.e. glycemic control in the group receiving the higher fat/lower CHO formula in one study was noted. Concerns were expressed about the safety of high fat diets and the committee noted the higher cost of high fat formulas compared to standard. Feasibility was not felt to be a great concern

Values	definition	Score: 0, +, ++, +++
Effect size	magnitude of the absolute risk reduction attributable to the intervention listed--a higher score indicates a larger effect size	1+
Confidence interval	95% confidence interval around the point estimate of the absolute risk reduction, or the pooled estimate (if more than one trial)--a higher score indicates a smaller confidence interval	1+
Validity	refers to internal validity of the study (or studies) as measured by the presence of concealed randomization, blinded outcome adjudication, an intention to treat analysis, and an explicit definition of outcomes--a higher score indicates presence of more of these features in the trials appraised	2+
Homogeneity	similar direction of findings among trials--a higher score indicates greater similarity of direction of findings among trials	1+
Safe	estimated probability of avoiding any significant harm that may be associated with the intervention listed--a higher score indicates a lower probability of harm	2+
Feasible	ease of implementing the intervention listed--a higher score indicates greater ease of implementing the intervention in an average ICU	2+
Cost	estimated cost of implementing the intervention listed--a higher score indicates a lower cost to implement the intervention in an average ICU	2+

4.2(a) Composition of Enteral Nutrition: (Carbohydrate/fat): High fat/low CHO

June 28th, 2005

Question: Does a high fat/low CHO enteral formula affect outcomes in the critically ill adult patient?

Summary of evidence: There were three level 2 studies that compared a high fat, low CHO formula to a standard formula. Two studies compared Pulmocare (55% fat, 28 % CHO) and one compared Novasource Diabetic Plus (40% fat, 40 % CHO) to standard formula (29-30 % fat, 49-53% CHO).

Mortality: Two studies reported on mortality and found no differences between the groups (Al Saady et al, Mesejo et al).

Infections: One study reported infectious complications and found no differences between the two groups (Mesejo et al)

LOS: Only one study reported on ICU length of stay and found no differences between the two groups (Mesejo et al)

Ventilator days: Were significantly lower in the high fat group in one study (Al Saady $p < 0.001$), no difference found in the van de Berg study or the Mesejo study.

Other complications: In the one study that reported on glycemic control, glucose levels and the dose of insulin needed were significantly lower in the group receiving the higher fat, lower CHO formula.

Conclusions:

- 1) A high fat, low CHO enteral formula may be associated with a reduction in ventilated days in medical ICU patients with respiratory failure and better glycemic control in critically ill patients with hyperglycemia.
- 2) No difference in mortality, infections or LOS found between the critically ill patients receiving high fat/low CHO formula or standard.

Level 1 study: if all of the following are fulfilled: concealed randomization, blinded outcome adjudication and an intention to treat analysis.

Level 2 study: If any one of the above characteristics are unfulfilled

Table 1. Randomized Studies Evaluating High Fat/Low CHO Enteral Nutrition In Critically ill Patients

Study	Population	Methods (score)	Intervention	Mortality # (%)		RR (CI)**	Infections # (%)		RR (CI)**
				High fat/low CHO	standard		High fat/low CHO	standard	
van den Berg 1994	Medical ICU patients with COPD Chronically ventilated N= 32	C.Random: not sure ITT: yes Blinding: no (5)	55% fat, 28 % CHO (Pulmocare) vs 30 % fat, 53 % CHO (standard, Ensure Plus)	NA	NA	NA	NA	NA	NA
Al Saady 1994	Ventilated patients Acute respiratory failure N = 40	C.Random: not sure ITT: no Blinding: double (9)	55% fat, 28 % CHO (Pulmocare) vs 30 % fat, 53 % CHO (standard, Ensure Plus)	3/9 (33)	3/11 (27)	1.22 (0.32-4.65)	NA	NA	NA
Mesejo 2003	Critically ill pts with Diabetes or hyperglycemia N = 50	C.Random: not sure ITT: yes Blinding: single (9)	40% fat, 40 % CHO (Novasource Diab Plus) vs. 29 % fat, 49 % CHO (Standard, Isosource Protein)	8/26 (31)	7/24 (29)	1.05 (0.45, 2.47)	10/26 (38.5)	8/24 (33)	1.15 (0.55, 2.43)

Study	LOS days		Ventilator days		Cost		Other	
	High fat/low CHO	Standard	High fat/low CHO	Standard	High fat/low CHO	Standard	High fat/low CHO	standard
van den Berg 1994	NA	NA	4 (median)	6 (median)	NA	NA	1/15 (7) Gastric retention	1/17 (6)
Al Saady 1994	NA	NA	3.6 ± 0.7	6.2 ± 1.5	NA	NA	3/9 (33) Diarrhea	3/11 (27)
Mesejo 2003	ICU 14.8 ± 9.4	ICU 14.8 ± 8.8	8.7 ± 6.2	9.4 ± 6.0	NA	NA	Plasma Glucose Levels (mmol/L) 9.8 ± 2.4	12.4 ± 2.6

C.Random: concealed randomization
ITT: intent to treat
NA: not available

± : mean ± standard deviation
** RR= relative risk, CI= Confidence intervals

TOPIC: 4.2 (a) Composition of EN: CHO/Fat: High fat/Low CHO

(Reviewers: Voula Christofilos, Rupinder Dhaliwal, Christine McCleary)

Article inclusion log

Criteria for study selection

Type of study: RCT or Meta-analysis
Population: critically ill, ventilated patients (no elective surgery patients)
Intervention: TPN and /or EN
Outcomes: mortality, LOS, QOL, functional recovery, complications, cost. Exclude studies with only biochemical, metabolic or nutritional outcomes.

ID #	Author	Journal	I	E	why rejected
31.	1.	Van den Berg	Int. Care Med 1994	√	
32.	2.	Al Saady	Int. Care Med 1994	√	
	3.	Mesejo	Clin Nutr 2003	√	
	4.	Tappy	JPEN 1999		√ Not RCT, no significant outcomes
	5.	Adams	JPEN 1993		√ Not RCT, no significant outcomes
	6.	Diboune	JPEN 1992		√ Not RCT, no significant outcomes
	7.	Van den Berg	Clin Nutr 1989		√ Not RCT
	8.	Schneeweiss	Metabolism 1992		√ No significant outcomes

I = included, E = excluded

References

1. al Saady NM, Blackmore CM, Bennett ED. High fat, low carbohydrate, enteral feeding lowers PaCO₂ and reduces the period of ventilation in artificially ventilated patients. *Intensive Care Med* 1989;15:290-5.
2. Mesejo A, Acosta JA, Ortega C, Vila J, Fernandez M, Ferreres J, Sanchis JC, Lopez F. Comparison of a high-protein disease-specific enteral formula with a high-protein enteral formula in hyperglycemic critically ill patients. *Clin Nutr*. 2003 Jun; 22(3): 295-305.
3. Van den Berg B, Bogaard JM, Hop WC. High fat, low carbohydrate, enteral feeding in patients weaning from the ventilator. *Intensive Care Med*. 1994 Aug; 20(7): 470-5.
4. Tappy L, Berger M, Schwarz JM, McCamish M, Revelly JP, Schneiter P, Jequier E, Chioloro R. Hepatic and peripheral glucose metabolism in intensive care patients receiving continuous high- or low-carbohydrate enteral nutrition. *JPEN* 1999 Sep-Oct; 23(5): 260-7; discussion 267-8.
4. Adams S, Yeh YY, Jensen GL. Changes in plasma and erythrocyte fatty acids in patients fed enteral formulas containing different fats. *JPEN J Parenter Enteral Nutr*. 1993 Jan-Feb; 17(1): 30-4.
5. Diboune M, Ferard G, Ingenbleek Y, Tulasne PA, Calon B, Hasselmann M, Sauder P, Spielmann D, Metais P. Composition of phospholipid fatty acids in red blood cell membranes of patients in intensive care units: effects of different intakes of soybean oil, medium-chain triglycerides, and black-currant seed oil. *J Parenter Enteral Nutr*. 1992 Mar-Apr; 16(2): 136-41.
6. Schneeweiss B, Graninger W, Ferenci P, Druml W, Ratheiser K, Steger G, Grimm G, Schurz B, Laggner AN, Siostrzonek, et al. Short-term energy balance in patients with infections: carbohydrate-based versus fat-based diets. *Metabolism*. 1992 Feb; 41(2): 125-30.