

6.1 Enteral Nutrition (Other): Closed vs. Open System

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

Question: Does the use of a closed system for enteral feeding result in better outcomes when compared to an open system in the critically ill adult patient?

Summary of evidence: There was one level 2 study that compared the incidence of bacterial contamination and diarrhea using a closed system i.e. aseptic techniques (ready to use bags, aseptic insertion of feeding tubes, tube changes every 24 hours) vs. an open system i.e. routine technique of enteral nutrition administration (open system).

Mortality: Not reported.

Infections, LOS, ventilator days: Not reported.

Diarrhea: The use of a closed system/aseptic technique of enteral nutrition administration vs. open system/routine resulted in less bacterial contamination and the incidence of diarrhea was lower in the group receiving aseptic vs routine enteral feeds ($p=0.06$ from article, $p=0.11^*$).

Conclusion:

- 1) Closed system/aseptic techniques of enteral nutrition compared to open/routine are associated with a reduction in diarrhea in critically ill patients.

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

*p-value calculated using Review Manager 5.1

Table 1. Randomized studies evaluating a closed vs. open system in critically ill patients

Study	Population	Methods (score)	Intervention	Other	RR (CI)*														
1) Mickschl 1990	ICU N=36	C.Random: not sure ITT: yes Blinding:no (7)	Aseptic EN vs routine EN	<table border="0"> <tr> <td>Aseptic</td> <td>Routine</td> </tr> <tr> <td># Contaminated Feeds</td> <td></td> </tr> <tr> <td>1/18 (6)</td> <td>7/18 (39)</td> </tr> <tr> <td></td> <td>p=0.06*</td> </tr> <tr> <td></td> <td>Diarrhea</td> </tr> <tr> <td>5/18 (28)</td> <td>10/18 (57)</td> </tr> <tr> <td></td> <td>p=0.11*</td> </tr> </table>	Aseptic	Routine	# Contaminated Feeds		1/18 (6)	7/18 (39)		p=0.06*		Diarrhea	5/18 (28)	10/18 (57)		p=0.11*	<p>RR 0.14, 95% CI 0.02, 1.05</p> <p>RR 0.50, 95% CI 0.21, 1.17</p>
Aseptic	Routine																		
# Contaminated Feeds																			
1/18 (6)	7/18 (39)																		
	p=0.06*																		
	Diarrhea																		
5/18 (28)	10/18 (57)																		
	p=0.11*																		

C.Random: concealed randomization

ITT: intent to treat

Mortality, Infections, LOS days, Ventilator days and Cost: not reported

ICU: intensive care unit

EN: enteral nutrition

*p-values, RR= relative risks & CI= Confidence intervals calculated using Review Manager 5.1

Table 2. Excluded Articles

#	Reason excluded	Citation
1	No clinical outcomes	Levinson M, Bryce A. Enteral feeding, gastric colonisation and diarrhoea in the critically ill patient: is there a relationship? <i>Anaesth Intensive Care</i> . 1993 Feb;21(1):85-8.
2	No clinical outcomes	Wagner DR, Elmore MF, Knoll DM. Evaluation of "closed" vs "open" systems for the delivery of peptide-based enteral diets. <i>JPEN J Parenter Enteral Nutr</i> . 1994 Sep-Oct;18(5):453-7.
3	Not ICU patients	Herlick SJ, Vogt C, Pangman V, Fallis W. Comparison of open versus closed systems of intermittent enteral feeding in two long-term care facilities. <i>Nutrition in Clinical Practice</i> . 2000 15:287-298
4	No clinical outcomes	Mathus-Vliegen EM, Bredius MW, Binnekade JM. Analysis of sites of bacterial contamination in an enteral feeding system. <i>JPEN J Parenter Enteral Nutr</i> . 2006 Nov-Dec;30(6):519-25.